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Abstracts Booklet

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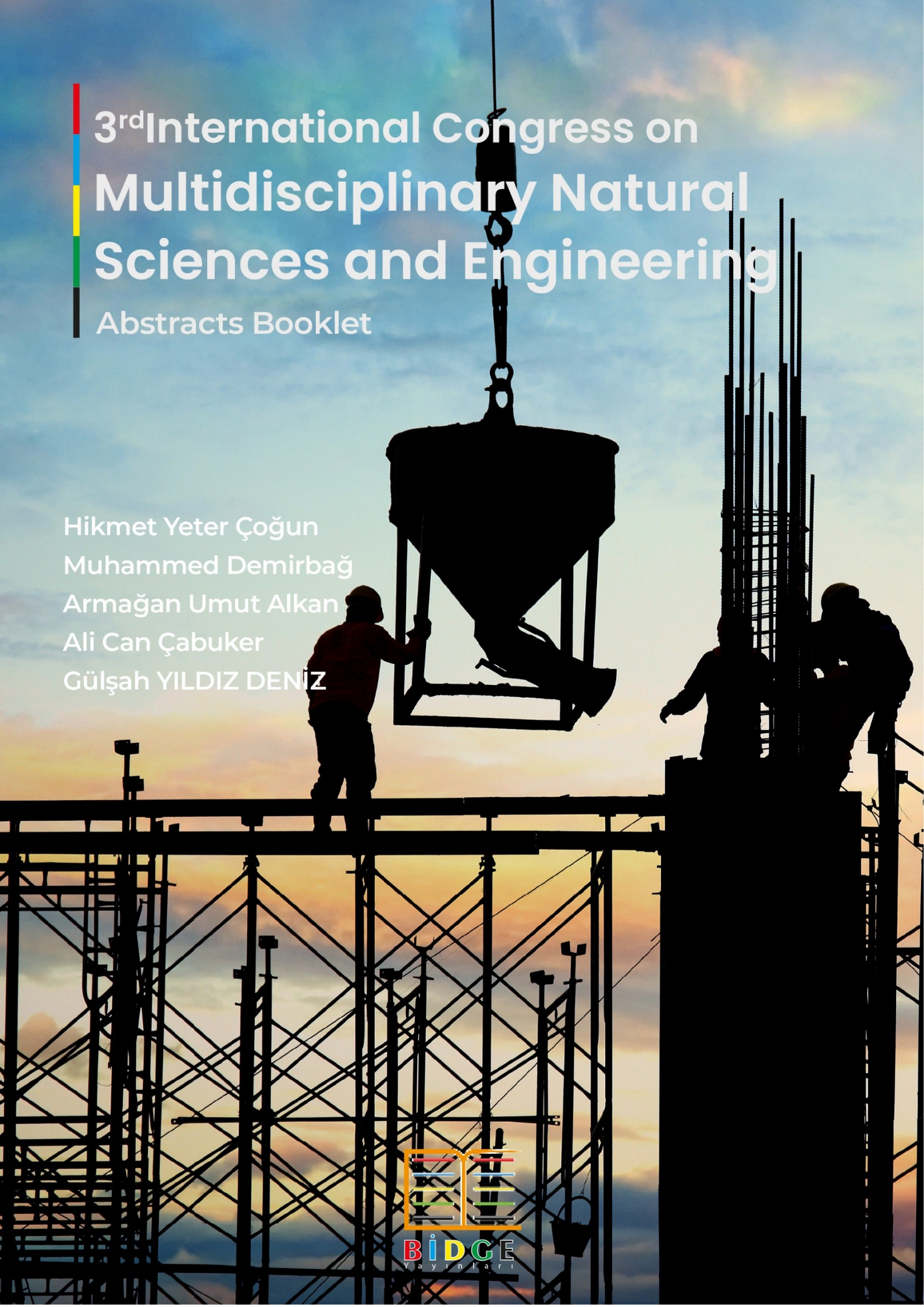

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ABSTRACTS

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Examination of Design Parameters of Wire Bending Machines

Yunus Emre DANIŞKAN[1]
Naci KURGAN

Abstract

Wire bending and shaping machines are crucial in various sectors and play a significant role in numerous applications. These machines are designed to perform the bending and shaping processes of metal wires. The determination of optimal design parameters directly influences the efficiency and quality of the machines. This study aims to investigate the design parameters of wire bending machines, focusing on selecting the appropriate machine type and applying design considerations for parameters such as wire material, wire diameter, bending angle, and other related criteria.In this study, various design parameters of wire bending machines have been examined. The working principles of wire bending machines and the different bending methods employed were analyzed. The effects of wire shaping parameters on machine efficiency and production time were evaluated using data from industrial applications, with a particular focus on machine design optimization. Additionally, manual, semi-automatic, and fully automated CNC-controlled machines were compared, highlighting the advantages and limitations of each type.The examined parameters play a critical role in determining the final wire form. Factors such as wire diameter, bending angle, material type, and springback angle are essential in selecting the appropriate machine design. Furthermore, the bending sequence for the fabrication of complex wire forms has been discussed. These parameters influence the precision of the workpiece and enhance the efficiency of the production process.In conclusion, the optimization of design parameters in wire bending machines is crucial, as it directly impacts production costs and cycle time. The selection or design optimization of the appropriate wire bending machine can enable the manufacturing of more complex parts with higher speed and lower costs. This study emphasizes that optimizing the design of wire bending machines offers significant advantages in terms of both efficiency and manufacturability.

Keywords: Wire bending , Wire bending machines ,Design parameters ,Bending angle ,Springback angle

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Design Improvements in Bus Driver Seat Floor Connection to Meet FMVSS 210 Requirements

Emirhan KOÇ, [1]
Vural KART [2]

Abstract

Bus driver seats are critical components of road safety and must comply with various international standards in terms of both design and durability. These seats play a vital role in ensuring the driver maintains control of the vehicle safely while minimizing potential negative impacts during accidents. In particular, the durability of the seat's floor connections has a direct influence on the overall safety of the vehicle. A driver seat tested under UN ECE standards failed to meet FMVSS 210 requirements, highlighting the need for design improvements in its floor connection system. FMVSS 210 is a key standard that evaluates the load carried by seatbelt anchorages and its impact on the seat's floor connection. The design improvements addressed not only the weaknesses of the existing system but also required a comprehensive evaluation of engineering solutions.

The improvement efforts focused on increasing the number of connection points and fasteners in the floor connection bracket. These structural changes aimed to strengthen the seat's connection to the floor and enhance its durability. Subsequent testing revealed that the improved connection system withstood a load of 3580 kgf for 15 seconds. This result successfully validated the design's compliance with FMVSS 210 standards.

This study serves as a valuable guide for engineers aiming to design driver seats that comply with FMVSS standards. The enhancements not only met safety requirements but also provided a robust solution to improve the overall safety performance of buses. The redesigned connection system contributes significantly to reliability and durability in engineering processes.

Keywords: Driver seat connection, FMVSS 210 compliance, Floor bracket design, Structural durability, Safety performance improvement

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Improving the Adhesion Performance of Photoluminescent Emergency Exit Labels

Emirhan KOÇ [1]
Vural KART [2]

Abstract

Photoluminescent emergency exit labels, mandated by the ECE R107 regulation, are essential safety components in buses. However, these labels often experience peeling issues at the edges over time due to environmental factors. Sunlight exposure, high temperatures, humidity, and other external conditions exacerbate this problem, particularly on surfaces such as ABS or glass. This peeling significantly reduces the functionality and longevity of the labels. The current photoluminescent label structure consists of double-sided photoluminescent material layered around a black lamination sheet. The photoluminescent layers adhere to the black lamination, but this structure tends to lose its durability over time, leading to peeling at the edges. To address this issue, a study was conducted to reinforce the label structure by incorporating transparent double-sided tapes. As a result, the original three-layer structure was transformed into a five-layer "sandwich" configuration. The improved design underwent high-temperature testing in an industrial oven to assess its resistance to environmental factors. The test results demonstrated that the structure reinforced with 3M tape exhibited significantly enhanced durability and effectively eliminated edge peeling problems compared to the previous design. This innovative approach serves as a valuable resource for engineers responsible for label design in the automotive sector, contributing to the maintenance of safety standards and the extension of product lifespan. Efforts to improve the performance of photoluminescent emergency exit labels represent a critical step in enhancing both product durability and overall safety in the industry.

Keywords: Photoluminescent emergency exit labels, ECE R107 regulation, Durability, Edge peeling, Environmental factors

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Structural Improvements in Driver Seat Pull Test

Vural KART[1]

Emirhan KOÇ [2]

Abstract

The safety of the driver's seat in buses plays a critical role in ensuring overall passenger safety. To achieve the proper viewing angle and ergonomic seating position, the driver's seat must be positioned at the H-point. This study evaluates the performance of a U-shaped bracket used to position the driver's seat at the H-point during the R14 pull test. In the initial design, the U-shaped bracket did not include any support springs (feder). In the first pull test, the driver's seat failed to meet the required technical standards, resulting in test failure. A detailed engineering analysis was then conducted. The analysis revealed no deformation in the driver's seat rail. However, notching was observed at specific points on the seat bracket. This notching indicated weak points in the bracket and areas of stress concentration under load, highlighting the need for structural modifications to the bracket.To address the issue and improve the bracket's strength, support springs were added to the bracket. These springs were integrated into the frame to enhance its structural integrity, allowing the bracket to better distribute the loads experienced during the pull test. After these improvements, a second pull test was conducted, and the seat successfully met the required standards. The addition of support springs significantly improved the bracket's durability.This study demonstrates the impact of engineering modifications on the safety and durability of driver seat connection elements. It emphasizes the importance of such improvements for engineers in the automotive industry, especially those responsible for designing seat floor brackets. The findings provide valuable insights for future designs and serve as a guide for engineers facing similar design challenges.In conclusion, this study highlights the critical role of design improvements and the use of support elements in successfully passing the R14 pull test and ensuring driver safety.

Keywords: R14 pull test, H-point, U-shaped bracket, Support spring, Structural integrity

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Comparıson Of Surface Durabılity of Sheet Metal Materıals

Vural KART [1]
Emirhan KOÇ [2]

Abstract

In this study, the corrosion resistance of different sheet and protective materials used in the mounting of function buttons in the driver area of buses was examined under environmental factors. The corrosion resistance of ST37 steel, CSR 6112 steel, and polypropylene homopolymer-based protective labeled sheet materials was compared. The results demonstrated that the type of material has a significant impact on surface corrosion.

The material with the highest corrosion resistance was identified as the protective labeled sheet, followed by CSR 6112 steel and ST37 steel. The protective labeled sheet stood out as the most durable material against environmental conditions, providing superior surface quality and aesthetic appearance. Although CSR 6112 steel performed better than ST37 steel, it was not as effective as the protective labeled sheet.

It was observed that changing the material improved surface quality while maintaining aesthetic appearance. Additionally, the study highlighted the effects of various environmental factors on the long-term durability of materials. In this context, it facilitates the development of more robust, long-lasting, and aesthetically superior solutions in the automotive sector.

This research provides critical data on corrosion resistance for engineers responsible for the mounting sheets of function buttons in the driver area. It emphasizes the importance of selecting the right material for vehicle safety and aesthetics. The findings contribute to the development of innovative and durable products in the industry.

Keywords: function button bracket, surface quality, corrosion resistance, surface corrosion, protective label

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Development of Electromagnetic Shielding Effectiveness of Functional Nanocomposite Papers

Osman Fatih DAMNALI[1]
Hüseyin ARIKAN[2]
Volkan ESKİZEYBEK[3]

Abstract

This study aims to develop a lightweight, multifunctional composite material with electrical conductivity and electromagnetic shielding effectiveness, designed and produced through the vacuum infusion method. Focusing on integrating EMI shielding properties with the advantages of multifunctionality and lightweight design, the study aims to meet current expectations in cost, time, and performance for strategically significant sectors such as defense, aerospace, and space technology—areas that will determine nations' future global influence. To enhance the in-plane electrical conductivity (EC) and electromagnetic shielding effectiveness (EMI SE) of recycled cellulosic papers, three different designs were created: CNT Paper, Graphene Paper, and a two-layer Hybrid Paper. These designs function as EMI shielding layers reinforced with multifunctional micro-thickness cellulose fibers, carbon nanotubes (CNTs), and graphene nanoparticles. Using the vacuum infusion method, which is suitable for scalable processes, nanocomposite papers were fabricated with two different volumes and weight percentages of CNT and graphene reinforcements for each layer, resulting in 24 flexible and electrically conductive functional nanocomposite papers with eight parameter variations. The functional nanocomposite papers had thicknesses ranging from 120 to 410 micrometers, with the lowest measured electrical resistance being 12.5 ohms. The maximum EMI shielding effectiveness of 33.83 dB was achieved in the hybrid paper group. These results make the hybrid nanocomposite paper a promising material with significant potential applications in various flexible, portable electronic devices requiring electromagnetic protection.

Keywords: Nanocomposite, Electromagnetic Shielding Effectiveness, Functionality, Carbon Nanotube, Graphene

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Structural Optimization of Rear Structure in Curtainside Semi-Trailers: Structural Analysis and Design Improvements

Hakan GÖRGÜN[1]

Abstract

Global transportation networks rely heavily on road freight, with semi-trailers playing a crucial role in modern logistics. This study examines the posts, measuring 2800 mm in length, located at the rear of curtain-sided semi-trailers, which are essential for the assembly of door and curtain rails. To analyze the structural effects of lateral oscillations occurring in these long posts while the vehicle is in motion, deformation, stress, and natural frequency differences between the existing and new designs were evaluated. It was observed that oscillations were particularly concentrated in the upper sections of the posts.

The new post design was developed using CATIA V5, and comprehensive finite element analyses (FEA) were performed in ANSYS to determine structural strength and natural frequency values. Different thicknesses of S355 material were employed in the design. Analysis results indicated that the deformation observed in the previous design, measured at 171.3 mm, was reduced to 78.77 mm in the new design. This improvement led to decreased oscillations in the vehicle's rear section during movement, thereby reducing impacts on the vehicle chassis. The modifications resulted in a more stable and predictable motion in the rear section of the vehicle.

In conclusion, this study presents a novel approach to designing safer, more durable, and longer-lasting components for semi-trailers, aiming to contribute to a more robust and sustainable transportation infrastructure within the logistics sector.

Keywords: Curtain side semi trailer, Structural analysis, Lateral oscillation, CATIA V5, FEM

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Evaluating Effective and Optimal Control Strategy in Response to External Vibration

Murat IŞIK[1]

Abstract

This study investigates the vibration characteristics of printed circuit boards (PCBs) and the electronic components mounted on them, focusing on the effects of external vibration inputs typically encountered in automotive environments. Using an electrodynamic shaker, comprehensive vibration tests were performed on a real-world PCB structure to analyze its dynamic behavior under various scenarios. The goal was to determine the most effective and reliable methodologies for mitigating vibration-induced damage, particularly in the context of automotive reliability. Special attention was given to PCB vibration and fatigue failure mechanisms occurring at the solder joints of electronic components. Sinusoidal sweep tests were employed to characterize the natural frequencies of the PCB and its components, with a comparative analysis to assess potential damage. The damage types were analyzed using the Steinberg approach and low-cycle fatigue accumulation models to provide insights into industrial solutions for improving durability and performance. A critical finding was the occurrence of unexpected vibrations in the BLDC motor when attached to a fixture, due to modal interactions. This resulted in fatigue damage to the capacitors. Based on these findings, several corrective actions were proposed, including the introduction of control sensors to regulate amplitude, the addition of ribs to the jig to increase stiffness, and the alignment of the jig with the ground plate to reduce the overhang effect. Simulation studies were conducted in multiple phases to evaluate the stress on hardware components, including the copper pins of the capasitors, under PSD (Power Spectral Density) loads. These simulations progressively incorporated the PCB assembly and different jig configurations to optimize the design for vibration resilience. The proposed control strategies and structural improvements aim to enhance the overall reliability and durability of the PCB and its components in the face of environmental vibration challenges.

Keywords: Durability, Fatigue, Control Strategy, BLDC

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Noise Reduction in BLDC Motors for Automotive HVAC: ERP-Based Vibro-Acoustic Optimization

Murat IŞIK[1]

Abstract

This study addresses the challenge of noise reduction in BLDC (Brushless Direct Current) motors used in automotive HVAC systems, specifically focusing on the vibro-acoustic behavior of stamped thin-walled component. While these components provide electromagnetic compatibility (EMC) protection, their resonance characteristics can unintentionally amplify noise emitted by the motor. The primary objective of this research is to optimize the PCB cover design to minimize noise amplification through an innovative ERP (Equivalent Radiated Power) analysis approach. ERP analysis allows for an efficient assessment of radiated noise energy based on the normal velocity of each structural element, using results from MFBD (Modal Frequency Boundary Decomposition) without requiring complex coupled vibro-acoustic simulations. The study involves improving the modal characteristics of the PCB cover by shifting its resonance frequencies to higher ranges and reducing modal density, which is expected to decrease the overall noise propagation. The results show that this optimization can significantly attenuate noise emissions, achieving reductions within critical RPM ranges. By leveraging ERP analysis, this research offers a more computationally efficient yet effective method for noise reduction, contributing to the development of quieter BLDC systems in automotive applications and enhancing both comfort and acoustic performance in vehicle environments.

Keywords: ERP, noise, optimization, modal density, radiation

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Improving Noise Performance in Bldc Motors and Simulation Correlation Through Rotor-stator Alignment Adjustments

Murat IŞIK[1]

Abstract

This study examines the complex relationship between magnetic distortion and resonance frequency excitation in Brushless Direct Current (BLDC) motors, with a particular focus on Heating, Ventilation, and Air Conditioning (HVAC) systems. The investigation explores how axial misalignment between the rotor and stator induces deviations in the phase current waveform, leading to harmonic distortions that affect motor performance. These distortions contribute to resonance frequency excitation, which can result in unwanted noise and vibration. During HVAC-level acoustic tests, the system failed to meet customer-specified noise limits, which prompted the need for optimization. To address this challenge, the study proposes adjustments to tolerance specifications to minimize magnetic distortion and its effects on resonance frequency excitation, thereby improving the acoustic performance of the system. Time-domain measurements of phase current were analyzed using Fast Fourier Transform (FFT), which helped identify key electrical harmonics. These harmonics were incorporated into simulation models to assess their influence on magnetic pressure and force distributions at various rotor-stator axial positions and motor speeds. The simulations, carried out using Altair Flux, revealed that the 8th and 24th orders were dominant in the magnetic force FFT, with the 24th order being particularly pronounced at lower speeds. The strong correlation between test and simulation data highlights the significant role of rotor-stator alignment in generating harmonic excitation, ultimately affecting noise levels. This study emphasizes the importance of precise rotor-stator centering to mitigate resonance-induced noise and improve the overall acoustic performance of BLDC motors in HVAC systems.

Keywords: Alignment, phase current, magnetic pressure, NVH, acoustic

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Experimental investigation of the effect of flow rate on PV-Canal systems

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Abstract

Photovoltaic (PV) panel systems are one of the most common energy generation systems that convert solar energy, one of the renewable energy sources, directly into electrical energy. As the cell temperature, which affects the performance of PV panels, increases due to solar radiation, panel efficiency is adversely affected. In this study, it is aimed to investigate the effect of water flow rate on panel performance in the cooling method through PV-canal installation, which is a method used to reduce the effect of this negative situation. In addition, since access to water resources is limited in hot and arid climate regions, it is aimed to reduce the amount of evaporation in the canal by means of PV panels placed on the canal with shading effect. As a result of the study, there was a difference in the average temperature of the panel surface due to the difference in flow rate between the canals. In the experiment using one pump in one canal and two pumps in the other canal, the maximum difference between the average surface temperatures of the panels was 5.1 ℃ and the average difference was 2 ℃, so that the performance of the PV-canal system with two pumps was better. The maximum difference between the canal water temperatures was 0.9 ℃ and the average difference was 0.1 ℃. The amount of evaporation was 8 litres in the canal with one pump flow and 10 litres in the canal with two pumps flow. The maximum difference in the efficiency of the panels was 1.03% and the average efficiency difference was 0.6%.

Keywords: PV Systems, Energy Efficiency, Canal, Flow Rate

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Contributions of Laser Surface Modification to Wear Resistance: A Literature Review

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Abstract

This study systematically examines the contributions of laser surface modification, particularly through methods like laser texturing, to the wear resistance of engineering materials. In recent years, laser surface modification has enabled micro and nano-scale surface adjustments, thanks to its high precision and energy density capabilities. Laser surface texturing provides advantages such as increased microhardness, reduced friction coefficients, and enhanced surface durability, especially in materials like metal alloys and ceramics that require wear resistance. This literature review analyzes the impact of laser parameters (such as power, focusing, and speed) and texturing techniques on wear performance. The findings highlight the potential of laser surface modification to enhance material performance and provide a significant foundation for future research. Our study emphasizes the capacity of laser surface modification to offer sustainable, high-performance solutions in materials engineering, focusing on its role in extending component life and reducing maintenance costs. Particularly in high-wear environments, laser surface modification is concluded to provide a sustainable solution.

Keywords: Laser surface modification, Wear resistance, Surface improvement, Laser texturing.

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Examination of Wear Performance of Surface-Hardened Materials by Boronizing Method: A Literature Review

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Abstract

This study focuses on examining the wear performance of materials surface-hardened through the boronizing method. Boronizing is an effective thermal treatment technique that enhances hardness and wear resistance by introducing boron to the surface of metals and alloys. This process plays a critical role in increasing the durability of components, especially those in contact with abrasive surfaces. The hardened surfaces achieved through boronizing become more resistant to high-temperature and frictional conditions. As a result, it allows for longer lifespans of critical components in sectors such as automotive, aerospace, and manufacturing, while also reducing maintenance costs. The literature has explored the effects of the boronizing process on material surfaces from various perspectives. Studies show that boronizing not only impacts the surface but also positively influences the underlying layers, improving the overall mechanical properties of the material. This technique significantly enhances the performance of engineering materials, particularly under high wear conditions, offering more sustainable solutions. The literature review details how boronizing improves material surfaces, increases wear resistance, and summarizes key findings from current research in this field. The boronizing process emerges as a crucial technique for improving the performance of engineering materials, with expectations for its wider application in the future. This study aims to assess the potential of boronizing in engineering applications, contributing to the development of next-generation solutions in materials engineering.

Keywords: Boriding Method, Surface Hardening, Wear Performance, Performance Improvement

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Optimizing PID Control for Noise Reduction in BLDC Blower Motors: An Acoustic-Based Approach

Ahmet Arif KÖSE[1]
Murat IŞIK[2]

Abstract

This study addresses noise issues caused by disturbances in the magnetic field of BLDC (Brushless Direct Current) blower motors through modifications to the software of the Electronic Control Unit (ECU). Widely used in automotive HVAC (Heating, Ventilation, and Air Conditioning) systems, BLDC motors are valued for their efficiency and durability. However, changes in the magnetic field and instability in control can cause noise problems, which affect cabin comfort and how end-user perceive quality, often leading to dissatisfaction.

In this study, the goal is to improve the acoustic performance of BLDC motors by optimizing the PID (Proportional-Integral-Derivative) control parameters within the ECU. By adjusting these parameters carefully, the motor's speed and torque control can become more stable, reducing the changes caused by the magnetic field. This improves the software's ability to control and monitor the motor, while also making the sound quality better, without affecting the motor's efficiency and overall performance.

The experimental part of this study included detailed testing of various PID settings to see how they affect noise levels. The results showed that specific changes to PID settings can greatly reduce motor noise and improve the overall sound performance. This approach offers an effective way to solve noise problems in BLDC motors and helps in designing quieter and more advanced automotive HVAC systems. It also provides useful guidance for future strategies aimed at improving sound quality, especially in cases where flexible electronic control and user comfort are important.

Keywords: BLDC, PID, NVH, Noise, Blower.

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Investigating the Correlation Between Vibration, and Noise in BLDC Motors Enhancing EOLT Testing Methodologies

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Murat IŞIK[2]

Abstract

In Brushless DC (BLDC) motors, there is a potential correlation between each harmonic frequency and the resulting vibration and noise. This study aims to investigate whether noise produced by BLDC motors always correlates directly with vibrations or if certain frequencies manifest solely as noise without corresponding vibrations. The research explores the dominant frequencies in BLDC motors and analyzes the relationships between them to determine if they affect performance and contribute to issues such as noise and vibrations.

Additionally, the study evaluates the capabilities of End of Line Testing (EOLT) systems, which utilize order analysis to detect performance issues in final products, based on vibration measurements. One key question is whether vibration alone is sufficient to identify all relevant issues, or if noise-related problems are missed when vibrations are the primary focus.

Through a detailed analysis of these correlations, this paper investigates the limitations of current testing methodologies and explores possible improvements. The goal is to determine how to refine the testing process for more reliable and consistent measurements. By considering both vibration and noise together, manufacturers can improve the accuracy of their testing protocols, leading to better detection of performance issues and, ultimately, more reliable motor designs.

The findings of this research contribute to the understanding of the complex relationship between vibration and noise in BLDC motors and offer suggestions for enhancing testing methods to improve motor performance and quality control.

Keywords: EOLT, BLDC, NVH, Blower.

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Improving Durability and Performance of BLDC Motors in HVAC Systems Through Topring Reinforcement

Engin Mert NAYIR[1]

Abstract

We had a problem with the wheel in our BLDC motor for automotive HVAC systems. This wheel creates airflow, but it would sometimes break during high-speed and high-temperature conditions. This caused performance issues and made the motor less reliable, which was a significant concern for our product's overall efficiency and long-term durability.

To find out what was wrong, we did several tests and looked closely at the design and materials used in the wheel. We analyzed its structure, evaluated stress points, and simulated high-speed and high-temperature conditions to replicate the failures we were seeing. After these investigations, we discovered that the topring of the wheel was too thin. So it couldn't handle the stress during high speeds and high temperatures. This has caused to the breakage under demanding conditions.

For solution, we increased the thickness of the topring and tested the motor again under the same conditions. This adjustment made a big difference—the wheel passed all the endurance tests without any issues, even under high stress. The thicker topring proved to be strong enough to withstand the operational loads and maintain its shape and function.

By making the topring thicker, we were able to prevent the wheel from breaking and improve the motor's overall durability and reliability. This change means the motor can keep running smoothly, even under tough conditions. It makes the HVAC system more dependable for automotive use and significantly reduces the chance of failure over time, ensuring better performance and customer satisfaction.

Keywords: BLDC motor, Wheel breakage, HVAC system, Topring thickness, Durability improvement

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Enhancing Reliability of BLDC Motor Wheels for Temperature Fluctuations

Engin Mert NAYIR[1]

Abstract

BLDC (Brushless DC) motors are popular in automotive HVAC systems because of their efficient performance and reliability. During one of our tests, which included both hot and cold temperature cycles, we had a problem: the wheel in our BLDC motor broke. After some temperature cycles, the wheel started moving up and down along the shaft's surface. This movement made it touch the deflector, causing damage and breakage.

To find out what was wrong, we reviewed the design and process drawings and did some tests with just the wheel. These tests showed that the shaft removal force at high temperatures was too low. It was close to the acceptable limit but not strong enough to keep the wheel in place. To fix this, we made the inner diameter of the wheel 2% smaller to increase the shaft removal force.

The results were good. The new wheel design had a stronger shaft removal force and passed the same tests. When we tested the new wheels in the same temperature cycles, there was no more breakage. The new design held the wheel tightly on the shaft. Stopping any movement and keeping it reliable even when temperatures changed.

This change made our design more durable which helped it handle temperature changes better. It's a smart solution for automotive HVAC systems, improving efficiency and the life of the product.

Keywords: BLDC motor, Temperature cycles, Shaft removal force, Wheel stability, Automotive HVAC systems

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Preventing Motor Failure: The Role of Varnish in Protecting Stator Windings

Engin Mert NAYIR[1]

Abstract

We produce BLDC motors for HVAC systems in automobiles, and we found a big problem with the stator windings. During assembly, the wiring sometimes got scratched, which damaged the insulation. This made the motors more likely to fail, especially when exposed to heat and humidity. To see how serious this issue was, we made some motors using stators with scratches and ran a series of tests.

One important test was putting these motors in high humidity. Out of six blowers tested, three stopped working. This showed that the scratched windings couldn't handle the stress and failed when conditions got tough.

We needed to find a solution. We looked at different options and decided the best one was to apply varnish to the scratched areas. This varnish acted as a protective coating, strengthening the insulation and stopping moisture from getting in and spreading. We made six new motors with varnish applied to the damaged stators and ran the same tests again, including the high humidity test.

The results were great. All six varnished motors passed without any failures. This proved that applying varnish fixed the insulation problem and protected the windings from temperature and moisture.

In the end, this solution helped us make our BLDC motors more reliable and longer-lasting for car HVAC systems. It also showed how important it is to test for problems and come up with creative solutions when making products.

Keywords: BLDC motor, Stator windings, Insulation damage, Varnish coating, Humidity testing

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Comparison of Defrosting Methods in Evaporators and Their Selection According to Energy Efficiency and Cost

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Jan Gabriyel CUR[3]

Abstract

Evaporators are essential components in refrigeration systems, used to lower temperatures and absorb heat. However, frost formation on their surfaces during low-temperature operation reduces heat transfer efficiency, leading to increased energy consumption. Various defrost methods are employed to mitigate this issue, including electric defrost, water defrost, glycol defrost, and hot gas defrost. Electric defrost, using resistive heating elements, is widely adopted in commercial systems due to its simplicity and effectiveness. Despite its high energy consumption, it is suitable for light frost applications and is easy to install and maintain. Water defrost involves spraying warm water over the evaporator surface, effectively removing frost while being energy-efficient. Glycol defrost, utilizing heated glycol solution, offers enhanced energy efficiency and low operational costs but requires complex system design and higher initial investment. Hot gas defrost is a widely used industrial method that directs compressed refrigerant gas to the evaporator, effectively melting the frost and offering energy recovery. While the initial cost is higher, it significantly reduces long-term energy expenses. Comparisons of electric defrost with glycol and hot gas systems reveal substantial differences in energy efficiency and operational costs. For instance, glycol and hot gas systems consume only about 9.5% and 7.5% of the energy required by electric defrost systems, respectively. Though the upfront cost of these advanced systems is higher, they recover their investment within short terms through energy savings. In conclusion, the choice of defrost method depends on factors such as energy efficiency, installation costs, and system requirements. Electric defrost is suitable for smaller applications with limited budgets, while glycol and hot gas defrost systems are more efficient and sustainable options for industrial and high-capacity systems, aligning with long-term economic and environmental goals.

Keywords: Evaporators, defrost methods, energy efficiency, refrigeration systems, operational costs.

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Determination of *In Vitro* Antagonistic Effects of Poplar Vinegar against Some Fungal Pathogens

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Raziye KOÇAK[2]
Muhammet KARAŞAHİN[3]

Abstract

Wood vinegar is a liquid mixture with organic properties that results from the condensation of smoke produced by the pyrolysis of wood and its residues during processing. Its chemical composition varies depending on the plant material used. In addition to improving soil quality and regulating plant growth, it also controls fungal plant diseases. This study was conducted to analyze the antimicrobial effect of vinegar obtained from the wood parts of poplar (*Populus nigra, P. alba*). The effects of wood vinegar on *Botrytis cinerea*, the causal agent of gray mold in tomatoes, and *Sclerotinia sclerotiorum*, the causal agent of root rot in sunflowers, were evaluated. It was observed that different concentrations of wood vinegar inhibited the mycelial growth of the pathogens in a dose-dependent manner. Fresh mycelium discs of *B. cinerea* and *S. sclerotiorum* were placed on petri dishes containing wood vinegar at different concentrations (0.2%, 0.5%, and 0.7%) *in vitro* to examine the effects of wood vinegar. It was found that all doses, except the 0.2% concentration, completely halted the mycelial growth of *S. sclerotiorum* (at 0.35%). For *B. cinerea*, the mycelial growth inhibitory dose was determined to be 0.65%. The study showed that wood vinegar significantly inhibited the mycelial growth of both pathogens and could potentially serve as an alternative to synthetic fungicides.

Keywords: Antimicrobial effect, Fungal pathogen, Poplar wood vinegar, *In vitro*, Biopesticide

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Impact of Global Climate Change on The Potential For Tropical Fruit Growing in Subtropical Conditions

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Abstract

Agricultural production is directly affected by environmental factors such as weather conditions and climate. It is also largely dependent on soil, water and other natural resources affected by climate. Climate change, whose negative effects we feel strongly today, negatively affects agricultural production and industry, especially agriculture-based industries. Agricultural production and food security are under serious threat due to the negative effects of climate change. Especially severe droughts, heat waves, storms, floods caused by excessive and sudden rainfall, and changes in rainfall regimes can have negative effects on conventionally grown plants.

Our country has significant potential in terms of cultivation of temperate and subtropical fruit species due to its geographical location. However, significant developments have been recorded in cultivation areas and production amounts of tropical fruit species, especially banana and avocado, which have the chance to be cultivated in subtropical conditions. With the effect of global climate change, interest in cultivation of tropical species such as papaya, pitaya, passionflower, mango, longan litchi and carombola has started to increase in our country, apart from banana and avocado. It is thought that the fact that a significant part of our tropical fruit needs are met by import and that we have the chance to export due to our proximity to European countries in case of surplus production plays a role in this increase in interest. Fruit growing is a long-term investment and adaptation studies are definitely needed in different locations in order to decide on the species that can be cultivated in the future. In this report, tropical fruit species that stand out as a result of adaptation studies in our country, apart from banana and avocado, and the commercialization potential of these species will be included.

Keywords: Tropical fruit, climate change, subtropical climate, adaption, production

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Qualitative and Quantitative Modeling of Aquaculture Processing Wastes For Different Application Areas

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Veysel PARLAK[3]
Muhammed ATAMANALP[4]

Abstract

The increasing environmental impact of fish waste has brought more attention to the development of simpler, greener and more effective utilization methods. In this review, an intensification and awareness strategy for a potential process for the valorization of marine and freshwater fish wastes, which are remarkably similar in chemical composition, is attempted.

For this purpose, especially in a process where the use and management of fishery by-products is prioritized, the present review is very meaningful in terms of creating solutions for an unmet need for the utilization of by-products by transforming them into functional and nutritious ingredients, and the potential for bioactive components in processing process wastes (including head, skin, scales, fins, bones, fillet trimmings and internal organs excluding intestines) for medical, medical, dental, cosmetic, agricultural and other sectors has been revealed.

Keywords: processing waste, fish, aquaculture, medical, food

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Presence, Monitoring and Control of Phthalate Esters in Aquaculture Products

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Muhammed ATAMANALP[4]

Abstract

Phthalates or phthalate esters (PAEs) have been widely used globally, especially in packaging materials and consumer products in recent years. These chemicals, which have very high functional properties, have become a serious concern due to their toxicity and risk of migration from food contact materials into food matrices and the environment.
The aim of this study was to compile information on the migration of microplastics, especially PAEs, in packaged seafood and to raise awareness on this issue.
Keywords: Aquaculture, breeding, phthalates, residues

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Effects of High and Low Doses of Glutamine on the Germination of Rocket Under Salt Stress Conditions

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Ayse Gul NASIRCILAR [2]

Abstract

Glutamine (Gln) is the most abundant amino acid in plants and is the precursor of all nitrogenous compounds in cells. In recent years, it has been found to be effective against abiotic stresses, which has led to an increase in studies on this subject. Salt stress is one of the abiotic stresses that is increasing day by day and causing significant yield losses. The aim of this study was to determine the effects of high and low doses of glutamine applied to seeds under salt stress conditions using two rocket varieties. Germination percentage (GP), mean germination time (MGT), coefficient of velocity of germination (CVG), and germination index (GI) were determined as germination parameters. Analysis of variance showed that the applications had a statistically significant effect on all germination parameters at the 0.001 level. In addition, the responses of the varieties to Gln differed. 1 mM Gln applied to Izmir cultivar under salt stress conditions increased the GP (90%), CVG (43.69), and GI (3.21), and shortened the MGT (2.29). High dose Gln had a negative effect on both varieties. It is recommended that these results obtained for germination should also be considered in terms of plant development and biochemical contents of the plants.

Keywords: Germination, glutamine, rocket, salt stress

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How Different Doses Of Glutamine Priming Affect The Germination Parametres of Garden Cress (Lepidium Sativum L.) Under Salt Stress?

Ayse Gul NASIRCILAR[1]
Kamile ULUKAPI[2]

Abstract

Glutamine (Gln) is an amino acid that provides tolerance to stress conditions in plants. This study was conducted to determine which dose of Gln is more effective on germination parameters in garden cress (*Lepidium sativum*) under normal and salt stress conditions. The effects of low (1,2,3 mM) and high doses (10, 20, 30 mM) of Gln on some germination parameters were investigated in the study with two different cress cultivars (BT and Gülfem) under normal and salt stress (150 mM NaCl) conditions. For this purpose, germination percentage (GP), mean germination time (MGT), coefficient of germination velocity (CVG), and germination index (GI) were determined. In both cultivars, high and low doses of Gln priming did not increase GP under normal conditions. On the other hand, it reduced the MGT, had a positive effect on CVG and GI, and increased these values. Morover, it reversed the negative effects of salt stress by promoting germination under saline conditions. In BT, the GP, which was 47% under salt stress, increased to 63% with 30 mM Gln priming and to 69% with 3 mM Gln application. In Gülfem, 10 and 1 mM applications in saline conditions increased the GP to 78% and 81%, respectively. As a result, it was determined that Gln priming promotes seed germination and seedling emergence in cress plants especially under salt stress conditions and different doses are effective on various parameters.

Keywords: Cress, Germination, Glutamine, Priming, Salt stress

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The Effect of Water Deficit, Used as Eustress, on Green Basil (Ocimum Basilicum)

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Erdinç GÜNAY[2]

Abstract

Basil (*Ocimum basilicum*), which is rich in phenolic compounds and essential oils, is widely used in agriculture, food, and pharmacy. The reduction of available water resources and changing consumer awareness make it necessary to optimize the yield and quality of agricultural products. The study examined the changes that occurred in green basil subjected to water deficit eustress treatments. In 18-liter pots, the basil plants, placed inside a high tunnel, were subjected to water deficit treatments at 80% (light stress), 60% (moderate stress), and 40% (severe stress) of field capacity, starting 15 days before harvest. Water deficit treatments were performed before each harvesting period on plants that were harvested twice at different times. Accordingly, fresh plant and fresh leaf weight did not change with light stress treatments in both harvests, while they significantly and relatively decreased with other water deficit treatments. Chlorophyll concentration was not affected by the treatments in the first harvest, while it significantly decreased with moderate and severe stress in the second harvest. The total phenolic compounds in the leaves increased with moderate and severe stress in the first harvest, while all water deficit treatments led to an increase in the second harvest. When evaluating the results as a whole, it can be concluded that light water deficit treatments in green basil did not negatively affect photosynthetic pigments and yield, while phenolic compounds, which are highly important for human health, increased. In today's world, where water resources are increasingly scarce, it has been determined that optimum yield and quality can be achieved in green basil by using less water.

Keywords: *Ocimum basilicum*, eustress, water deficit, yield, phenolic compounds

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Livestock and Climate Change: An Integrated Review of Adaptation and Mitigation Strategies for Sustainable Development

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Kürşat DEMİRYÜREK[2]
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Ahmet Yesevi KOÇYİĞİT[4]

Abstract

Climate change poses significant challenges to livestock systems worldwide, affecting animal health, productivity, and the sustainability of production systems. The livestock sector is also a major contributor to greenhouse gas emissions, particularly methane and nitrous oxide, requiring strategies that balance adaptation to climate impacts and mitigation of environmental harm. This chapter provides a comprehensive review of adaptation and mitigation strategies aimed at building sustainable and resilient livestock systems. Adaptation strategies include genetic improvements for climate-resilient breeds, precision feeding practices to optimize nutrition and reduce waste, and the adoption of advanced livestock farming technologies to monitor animal health and environmental conditions. These measures enhance the sector's ability to cope with climate variability while maintaining productivity. Mitigation strategies focus on reducing emissions through innovative manure management systems, dietary interventions to lower enteric methane production, and the integration of renewable energy sources, such as biogas and solar power, into livestock operations.

The chapter also highlights socio-economic and policy dimensions, emphasizing the importance of supporting farmers in adopting climate-smart practices. Coordinated efforts, such as financial incentives, capacity building, and technology transfer, are essential for the widespread implementation of sustainable solutions. Case studies from diverse agro-climatic regions provide insights into tailoring strategies to specific contexts, demonstrating the feasibility of localized approaches. This holistic analysis underscores the need to integrate scientific advancements with effective policies to address food security, environmental sustainability, and climate resilience in livestock systems. The findings serve as a valuable resource for researchers, policymakers, and practitioners seeking sustainable solutions for the livestock sector.

Keywords: Livestock, Climate Change, Adaptation Strategies, Mitigation Strategies, Sustainable Development, Greenhouse Gas Emissions.

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Citrus Sector in the World, Turkey and Antalya

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Abstract

Citrus fruits, which are included in the Citrus genus and whose homeland is China, Southeast Asia and India, have many features such as their species and variety richness, a very long harvest period, a very long storage period, suitability for transportation and being an industrial raw material, both in the world and in Turkey; it is a product group consisting of rare fruits that are subject to production, consumption, industry and trade. As of 2022, citrus fruit production, which accounts for 17.82% of the world's total fruit production, was carried out in 138 countries and on 10.5 million hectares of land, and approximately 166 million tons of citrus were obtained from these areas. Orange ranks first among citrus fruits produced with 76.4 million tons, followed by tangerine (44.1 million tons), lemon (21.5 million tons), grapefruit (9.8 million tons) and other citrus species (14.4 million tons). China, Brazil and India are the leading citrus producing countries, and Turkey ranks 8th with a share of 2.83%. Citrus fruits constitute the most grown product group with a share of 30.64% in the total fruit production in Turkey in 2023. Among the 19 provinces where citrus fruit is produced in Turkey, Antalya ranks 4th with a share of 8.28%. Although the importance of citrus fruits in the agricultural sector is increasing, the fact that the enterprises are small and fragmented, the unconscious use of pesticides and chemical fertilizers by the producers, and the inadequacy of organization cause problems in production and marketing. In this study; it is aimed to reveal the development of the citrus industry over the years in the world, Turkey and Antalya. For this purpose, data were compiled from secondary sources such as FAO and TURKSTAT.

Keywords: Citrus Fruit, Foreign trade, Agriculture, World, Turkey

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Nutrient Management in Vertical Farming Systems: Innovations and Challenges

Meriç BALCI

Abstract

Vertical farming represents a transformative approach to agriculture, enabling crops to be grown in vertically stacked layers under controlled environmental conditions. This system has gained increasing attention due to its potential to address urban food security challenges, resource limitations, and the environmental impacts of traditional agriculture. However, nutrient management remains a critical component for optimizing plant growth, maximizing yields, and ensuring the sustainability of vertical farming systems.

This review explores the latest innovations in nutrient management, focusing on advanced technologies such as automated nutrient delivery systems, real-time sensor monitoring, and artificial intelligence (AI) for optimizing nutrient uptake. These innovations have significantly enhanced the precision of nutrient management, reducing resource waste and improving overall system efficiency. Additionally, this review discusses the challenges faced in nutrient solution optimization, including pH and electrical conductivity (EC) control, nutrient imbalances, and the complexities of nutrient recycling and reuse. Further, the paper examines the role of sustainable nutrient solutions and energy-efficient technologies in mitigating the environmental impact of vertical farming. Key success stories from both international and local vertical farms are highlighted, showcasing best practices and the integration of cutting-edge technologies. Finally, the review addresses future perspectives, emphasizing the need for continued research into emerging technologies, sustainability, and policy frameworks that support the widespread adoption of vertical farming. By investigating the latest advancements and ongoing challenges, this review offers valuable insights into the potential of vertical farming as a sustainable solution for future food production, highlighting the pivotal role of nutrient management in achieving this goal.

Keywords: Vertical Farming, Nutrient Management, Hydroponics, Aeroponics, Sustainable Agriculture, Controlled-Environment Agriculture, Innovative Nutrient Solutions

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Sustainable Agriculture and Ecotourism: New Economic Models in Ecovillages

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Abstract

Ecovillages represent a unique blend of community-oriented living, sustainable agriculture, and ecotourism practices, aiming to harmonize environmental preservation with social well-being. By addressing the challenges posed by conventional agriculture and tourism—such as environmental degradation, biodiversity loss, and social inequities—ecovillages offer a nature-compatible and responsible lifestyle. These communities serve as experimental hubs for implementing eco-friendly production methods and alternative tourism models, contributing to economic, ecological, and social sustainability.

Through sustainable agricultural practices, ecovillages enhance soil fertility, reduce chemical dependency, and promote food security while fostering resilience in rural areas. At the same time, they develop ecotourism initiatives that immerse visitors in nature, create economic opportunities for local communities, and raise environmental awareness. These dual functions position ecovillages as laboratories for pioneering innovative and inclusive economic models that align with global sustainable development goals.

This study examines the integration of sustainable agricultural practices and ecotourism within ecovillages, providing a comprehensive overview of their current practices, challenges, and opportunities. It further evaluates the potential of ecovillages to address pressing environmental and social issues, offering actionable recommendations for policymakers, practitioners, and researchers to enhance their effectiveness. By doing so, this research contributes to a deeper understanding of how ecovillages can serve as models for a sustainable and inclusive future.

Keywords: Eco-Villages, Sustainable Agriculture, Ecotourism, Environmental Preservation, Social Sustainability, Economic Sustainability, Biodiversity Conservation, Food Security, Rural Resilience

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A Deep Learning Approach to Faba Bean (Vicia faba L.) Nodule Detection Using YOLOv9

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Abdurrahman YILMAZ[2]
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Ravi VALLURU[4]

Abstract

Legumes, the second most widely cultivated crop group globally, are a significant source of protein in human nutrition. Moreover, they contribute to soil fertility by fixing atmospheric nitrogen through nodules on their roots. The amount of nitrogen fixed by these nodules varies across legume species, with faba bean *(Vicia faba L.)* being the legume species that fixes the highest amount of nitrogen in the soil. The manual assessment of the morphology of these nodules, which live symbiotically with bacteria in the roots, requires substantial time, labour, and economic resources. Artificial intelligence techniques play a crucial role in handling these challenges. This study utilised a deep learning architecture, YOLOv9, to rapidly detect root nodules. This study is the first attempt to detect the nodules on faba bean roots using an object detection algorithm. The original training dataset includes 48 high-resolution images with dimensions of 5100x7020. To facilitate the detection of nodules, which can be categorised as small objects, these images were divided into 640x640 patches after labelling them with a bounding box, and only those containing nodules were selected. Through data augmentation and 90° rotation of clockwise and counter-clockwise applied to the segmented images, a total of 1232 images were obtained. These images were split into training (90%), validation (5%), and test sets (5%). The model was trained with a batch size of eight over 100 epochs, achieving a precision of 0.76, recall of 0.67, mAP50 of 0.752, and mAP50-95 of 0.381. Furthermore, the confusion matrix highlighted a nodule detection rate of 0.70. The model also attained a maximum F1 score of 0.71 at a confidence threshold of 0.253. These preliminary results show the potential of using YOLOv9 model to detect nodules; To improve the performance, employing models with lower complexity and increasing the dataset size is recommended.

Keywords: Faba bean, vicia faba, nodule detection, deep learning, small object

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Effect of Microbial Transglutaminase on the Post-Processing Quality of 3D Printed Meat Paste

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Abstract

Recently, the use of 3D printers in the food industry has become increasingly common to create new products with complex shapes, different textural properties, and desired ingredients, while maximizing the use of the food product. However, post-processing conditions (e.g. cooking, drying) cause shape changes in the 3D-printed products. Developing products that are robust to these processes is crucial for 3D food technology. This study aimed to determine the effects of microbial transglutaminase enzyme (0%, 0.5%, 1.0%) on 3D processing of meat paste to achieve improved textural properties and shape stability against post-processing conditions. The MTGase-added samples were printed using an extrusion-based 3D printer and the printed samples were stored at +4°C for 18 h for the setting period. After the setting period, the samples were deep fried to terminate the enzyme activity and determine the post-processing quality of the samples. As the enzyme concentration increased, the 3D meat pastes became firmer at the end of the setting time. The highest cooking loss value was observed in the control samples at 33.06±0.36%. In contrast to the uncooked products, the firmness and work of penetration values of the cooked MTGase-treated samples were significantly lower than those of the control samples ($P < 0.01$). The shrinkage values of the 0%, 0.5% and 1.0% MTGase added samples were 13.64±0.6%, 11.15±0.53% and 9.78±0.53% respectively. Moisture retention of the MTGase-treated samples was significantly higher than that of the control samples ($P < 0.01$). The fat content of the control samples was significantly higher than that of the MTGase-treated samples after frying ($P < 0.01$). MTGase provided dimensional stability by stabilizing moisture during cooking, resulting in a softer final product. In conclusion, the use of MTGase can effectively improve textural and shape properties with post-processing stability of 3D meat pastes.

Keywords: 3D printing, meat, microbial transglutaminase, post-processing, texture

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Evaluation[a] of Advanced Food Analysis Techniques Used in Halal Confirmatory Tests

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Abstract

In response to customer demand, food products have been subject to halal certification procedures for a considerable amount of time. For this purpose, Halal Conformity Assessment Bodies (HCABs) that issue halal certificates shall fulfil the requirements of the international halal standards. These standards are published by the Standards and Metrology Insititute for Islamic Countries (SMIIC), an affiliated body of the Organization of Islamic Cooperation (OIC). As a requirement of the standards, sampling is conducted to verify the halalness of foods during the on-site audits. In this sense, HCABs gather samples from food production lines to carry out halal authenticity confirmatory tests. This procedure shall include analyses that specify the halalness requirements and the quality characteristics essential for food safety and hygiene. Therefore, advanced analysis methods have been developed with high sensitivity such as DNA-based determination techniques, chromatographic and spectroscopic methods and biosensor applications. This study aims to evaluate advanced food analysis methods implemented for halal authenticity confirmatory tests. The data presented by academic studies and international standards were compiled. The analysis methods that are widely used in the sector were examined in terms of the OIC/SMIIC halal certification approach. In this context, it has been concluded that all advanced analytical techniques currently being applied in the sector are important for the application of halal authenticity confirmatory tests, but biosensors have outstanding features compared to other advanced techniques. It has a shorter detection time and comparatively low cost in terms of routine analysis expenses after equipment purchase. It also provides a novel and practical approach as a halal verification method.

Keywords: halal food, halal certification, halal conformity assessment, halal food authentication, test methods

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From Food Waste to Worth

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Abstract

The increase in the world population increases the demand for food day by day, which leads to the indispensable development of the food industry. Thus, the food industry has primary importance in the national and international economy as one of the largest industries in the world. According to Turkish Statistical Institute (TUIK) data, while the total amount of waste generated in the manufacturing industry in 2020 was approximately 24 million tons, this amount was reported as approximately 28 million tons in 2022. Food industry wastes constitute 5% of the total amount of waste. However, it is a well-known fact that food waste does not only occur in the industrial environment, food that is started to be thrown away in the field can also be characterized as waste after domestic use. According to the FAO, about one third of the food produced for human consumption is lost or wasted globally. Considering the increase in the number of undernourished people and the depletion of natural resources, it is important to establish and improve waste management strategies. Industrial food wastes are produced by different food sectors such as dairy, meat, grain, fruit-vegetable, vegetable oil. In this study, it is aimed to characterize the wastes produced by different food industries, to examine the different uses of these wastes and to evaluate waste management strategies.

Keywords: food waste, waste management, industrial waste

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Purple Sweet Potato: Nutritional Properties and Food Enrichment Applications

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Abstract

Sweet potato (*Ipomoea batatas* L.) is one of the most valuable members of the Convolvulaceae family, widely cultivated for its nutritional and health-promoting properties. The Food and Agriculture Organization of the United Nations (FAO) recognizes sweet potato as a nutritious food source due to its content of beneficial metabolites, including β-carotene, anthocyanins, vitamins (B_1, B_2, C, and E), and essential minerals (Ca, Mg, K, and Zn). The pulp color of sweet potato can range from white to off white, yellow, orange, and even purple. Purple sweet potato (PSP) is a special type that is particularly rich in anthocyanins, as well as dietary fiber (both soluble and insoluble), complex carbohydrates, and microelements. The primary anthocyanins found in PSP are cyanidin 3-sophoroside-5-glucoside and peonidin 3-sophoroside-5-glucoside. Anthocyanins are associated with various health benefits, including antioxidative, antimutagenic, anti-aging, anticancer, antimicrobial, and cardioprotective effects. Moreover, anthocyanins contribute to the visual appeal of food by providing a spectrum of colors, from red to blue-green. PSP is a versatile and highly nutritious crop that holds great potential for enhancing food security, diversifying food products, and improving public health. Its flour can be used in a wide range of food products; cereal products including noodles and cakes, dairy products including yogurt and ice cream, meat products including sausage, and more. Despite its numerous health benefits and functional properties, awareness of the advantages of PSP remains limited. Therefore, it is essential to highlight the nutritional and functional characteristics of PSP. The development of value-added products from PSP could help increase its consumption and promote its broader adoption. This review emphasizes of PSP's nutritional properties and their utilization in foods.

Keywords: Purple sweet potato, Enrichment, Anthocyanins

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Potential Use of Hydrogen-Rich Water in the Food Industry and Its Effects on Food Bioactives

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Abstract

Hydrogen-rich water (HRW) is water enriched with molecular hydrogen (H_2), which has strong antioxidant properties. H_2 protects cells and tissues from oxidative stress by scavenging dangerous free radicals, acting as a selective antioxidant. This study was designed to provide an overview of the increasingly used HRW's effects on phenolic content and antioxidant capacity in foods and its potential use in the food field. In the study, postharvest fruits, rice milk and butter samples were processed by washing and soaking in HRW for different treatment time, while control samples were processed with pure water. Postharvest fruits were frozen with liquefied nitrogen and stored at -80°C, while butter and rice milk were stored at 4°C. During storage, parameters such as total soluble solid content, titratable acidity, antioxidant capacity, color, firmness, decay, weight loss, respiration rate, and formation levels of biogenic amines in butter samples were analyzed. HRW has been utilized in studies to improve nutritional properties, extend shelf life, and maintain the quality of numerous food products. Moreover, other studies have demonstrated that HRW can increase antioxidant activity. HRW treatment enhanced the antioxidant capability and energy status of *Rosa sterilis* fruit while it was being stored. Similarly, HRW treatment successfully maintained fresh-cut kiwi fruit's quality, firmness, and antioxidant capacity and delayed pericarp browning in fruits like lychee. Furthermore, by controlling cell wall biosynthesis and degradation, HRW treatment has been demonstrated to delay softening, increase shelf life, and preserve firmness in postharvest fruits and vegetables such, okra lychee, and Chinese water chestnut. In addition, it was discovered that HRW treatment decreased the production of biogenic amines in butter, indicating that it can improve food safety. Additionally, HRW can enhance rice milk's nutritional and sensory properties by adding essential minerals, amino acids, and flavor compounds. It improves food safety, quality, and bioactive substances, making it significant for the food sector. The positive impact on the food field and its antioxidant capacity can be evaluated in future studies by conducting *in vitro* studies in addition to its efficiency in food extraction processes.

Keywords: Hydrogen-rich water, food applications, antioxidant activity, quality, safety

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Innovative Gluten-Free Noodles: Impact of Citrus Fiber and Pumpkin Flour on Quality and Functionality

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Salih KARASU

Abstract

This study investigates the rheological properties of hydrogel formulations incorporating citrus fiber and pumpkin seed flour to enhance the texture and stability of gluten-free noodles. The research aimed to address the challenges faced in gluten-free noodle production, where the absence of gluten affects texture and structure. Hydrogels containing only citrus fibers at levels of 4% and 5%, as well as hydrogels enriched with pumpkin seed flour at ratios of 4:1, 4:2, 5:1, and 5:2, were tested. The study encompassed a rheological assessment of hydrogel samples, including steady-shear, dynamic shear, the three-interval thixotropy test (3-ITT), and temperature sweep tests, using a strain- and temperature-controlled rheometer. All rheological analyses, except for the temperature sweep test, were carried out at 25°C, with a plate diameter of 25 mm and a gap of 1 mm. The consistency coefficient (K) of the hydrogel samples increased with the incorporation of pumpkin seed flour, ranging from 46.04 to 102.52, with all samples demonstrating shear-thinning behavior ($n < 1$). The hydrogel samples exhibited solid-like characteristics, as indicated by $G' > G''$, which suggests their viscoelastic nature. Both the storage modulus (G') and loss modulus (G") increased with higher levels of pumpkin seed flour, suggesting an overall enhancement in the samples' viscoelasticity. The temperature sweep test of the hydrogels shows that adding pumpkin seed flour increases the storage modulus, thereby enhancing the hydrogel's strength and shape retention under stress. These results suggest the potential use of hydrogel samples reinforced with citrus fibers and pumpkin seed flour in the production of gluten-free noodles, which can resemble the properties of noodles containing gluten.

Keywords: Hydrogel, pumpkin seed flour, citrus fiber, gluten free, rheological assessment

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Legumes as Alternative Protein Resources: Bioaccessibility of Phenolics And Digestibility of Proteins

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Esra CAPANOGLU [3]
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Abstract

Protein is crucial for survival and human health, fundamental to metabolism, body functions, cellular activities, and numerous physiological processes. Although animal-based proteins are thought to be of high quality, the resource requirements to meet the demand are insufficient. To overcome this issue, investigating an alternative protein supply has become important. Plant-based proteins present a promising solution, as they are sustainable and can be easily grown at lower production costs. As a result of recent studies, it has been reported that the sainfoin plant (*Onobrychis sativa* L.) seed which belongs to the legume family contains high protein and bioactive compounds and has the potential to be used as a new food source for humans. However, the presence of phenolics and other food components can cause interactions that lead to the formation of complexes. The beneficial health effects of protein and phenolic compounds depend on their digestibility and bioaccessibility within gastrointestinal digestion. Therefore, this research aims to investigate the protein digestibility and the metabolic fate of phenolics of sainfoin seeds. Results indicated that the bioaccessibility of phenolics in sainfoin seed was higher than other legumes determined in previous research. On the other hand, the protein digestibility of sainfoin seed was lower than the faba beans, kidney beans, peas, and chickpeas mentioned in the literature. Different methods such as thermal treatments can be applied to improve protein digestibility and techno-functional properties.

Keywords: sainfoin, bioaccessibility, phenolics, protein digestibility, alternative protein

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Antibacterial Properties of Plant-based Kefir Produced from Different Legumes Milk

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Abstract

The prevalence of diseases such as lactose intolerance and milk protein allergy associated with consuming milk and dairy products has increased necessity for dairy-free products. In recent years, plant-based products have gained popularity among consumers as alternatives to milk and dairy products. Kefir is a dairy product produced by fermenting milk with starter cultures or kefir grains containing lactic acid bacteria, acetic acid bacteria, and yeast. During the fermentation of milk, kefir microorganisms produce bioactive compounds such as organic acids, bioactive peptides, bacteriocins and exopolysaccharides. These compounds provide several health benefits to kefir, including antihypertensive, hypocholesterolaemia, antidiabetic, anticarcinogenic, anti-inflammatory, antioxidative, antiallergic, immunomodulatory, antiviral, and antimicrobial properties. Kefir could be produced from the milk of animals such as cows, goats, sheep, camels and buffaloes, however nowadays it can also be produced by fermenting extracts obtained from cereals, cereal-like products, legumes, fruits, vegetables or nuts. Plant-based kefir contains kefir microorganisms similar to dairy kefir and may have positive effects on human health. Since plant-based kefir does not contain lactose or animal proteins, it can be consumed by people with lactose intolerance or milk protein allergies. Moreover, plant-based kefir is an alternative source for vegans or people who avoid consuming dairy products. Beans, lentil, and chickpea were used to make plant-based milk and kefir in this study. Kefir starter culture was used to ferment cow and plant-based milk. The antibacterial effects of kefir samples made from cow's milk and plant-based milk against *Escherichia coli*, *Enterococcus faecalis*, *Staphylococcus aureus*, and *Bacillus cereus* were determined. While the highest antibacterial effect was found against *S. aureus* in kefir produced from cow's milk, kefir samples obtained from beans, lentils, and chickpeas had the highest antibacterial effect of *E.coli*.

Keywords: bean, chickpea, *Escherichia coli*, lentil, *Staphylococcus aureus*

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Manufacturing and Characterization of Pomice Powders Filled PLA Films

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Abstract

Polylactic acid (PLA) is a biodegradable polymer that is experiencing a surge in applications in sustainable materials. However, its mechanical and thermal properties are limited, prompting research into reinforcement strategies. The incorporation of mineral fillers, such as pumice powders (PPs), has the potential to enhance the mechanical and thermal performance of materials while simultaneously reducing costs. In this study, PLA films were obtained by the addition of 2% of four different pumice powders (PPs), namely those from Nevşehir, Alaçatı-İzmir, Kütahya, and Uşak, into the PLA matrix using the solvent casting method. The characterisation of the films was conducted through the utilisation of a range of analytical techniques, including Fourier transform infrared (FTIR) spectroscopy, tensile testing, differential scanning calorimetry (DSC), and dynamic mechanical analysis (DMA). No significant changes were observed in the FTIR analysis. The tensile test revealed a reduction in tensile strength (TS) and percent elongation at break (EAB) in each film containing pumice. However, an increase was observed in the elastic modulus. No significant change was observed in the glass transition (Tg), crystallisation (Tcc) and melting (Tm) temperatures as determined by differential scanning calorimetry (DSC). An increase was observed in the glass transition temperature (TG) as determined by differential scanning calorimetry (DSC). An increase was observed in the storage modulus values, with the exception of the NEV-filled PLA film.

Keywords: Polylactic acid (PLA), pomice powder, tensile test, thermal properties

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Effect of Sb, Bi, Cu, In Elements on Thermal Conductivity and Melting Properties of Sn-3.5Ag Lead-Free Solder

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Sezen AKSÖZ[2]

Abstract

In electronic materials, solder plays a vital role in the assembly and interconnection of the silicon die (or chip). As a bonding material, solder provides electrical, thermal, and mechanical continuity in electronic components. The solder alloy to be used as an alternative should sufficiently cover the legs of the electronic components to be placed on the printed circuit board during the soldering process, create controllable solder joints, allow high-volume soldering and rework of defective joints, provide reliable solder joints under service conditions, be harmless to the environment and human health, and finally reduce assembly costs. When trying to determine an alternative to the widely used existing Pb-Sn solders, it is necessary to pay attention to the new solder's properties to be found to be equivalent to or much better than Pb-Sn solders. In this study, the change in thermal conductivity of alternative Sn-%3.5wt. Ag, Sn-%3.5wt. Ag-%1wt. Y (Y=In, Sb, Cu, Bi) alloys with temperature. The alloy with the highest thermal conductivity at the melting point was the Sn-3.5Ag-1Cu solder alloy with a value of 66.66 W/mK. In addition, the melting behaviors of the alloys thermal properties such as specific heat and enthalpy were determined with the help of differential scanning calorimetry (DSC). The alloy with the best energy-saving result with an enthalpy value of 56.69 J/g and the lowest energy storage capacity with a specific heat value of 0.2487 J/gK was the Sn-3.5Ag-1Cu alloy.

Keywords: Lead-free solder, thermal conductivity, DSC, enthalpy, specific heat.

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Assessment Of Industrial Wastes In Metallurgy And Therefore, Water Footprint In Gold Production

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Nilgün KUŞKONMAZ[2]

Abstract

The effects of industrial waste on the environment can vary depending on various factors. These effects can manifest themselves in different ways, such as environmental pollution, depletion of natural resources, loss of biodiversity and harm to human health. Many metallurgical processes attempt to process the raw materials extracted directly from the mine and transform them into value-added products, making them more usable at a higher level. One of the most important problems among the damages given to the environment in gold mines is related to the use and pollution of water. Natural and artificial water reservoirs decrease or may disappear completely. Wastes left from the operation pollute the water. As a result of the decrease in groundwater levels, a decrease in soil fertility and difficulties in the access of living beings to water can be seen. Water Footprint also shows the amount of water used for the production of a product or service. Water footprint determination, which has just started to be implemented in the world, has also started to take its place in the mining sector. Companies in this sector need to have their water footprint calculated regularly in order to prevent environmental problems. This study will examine how to calculate the water footprint in gold production. It will also discuss what precautions mining companies should take thanks to Blue, Green and Gray water footprint calculations.

Keywords: Metallurgy, Water Footprint, Gold Production, Environment, Industrial Waste

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Synthesis and Application of Doped Nano TiO_2 with Photocatalytic Properties in the Visible Light Region

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Oğuzhan AVCIATA[2]

Abstract

Photocatalytic degradation is of great importance in the development of environmentally friendly systems by using renewable energy sources such as light. These systems, also called photocatalysis, are based on the principle of using light and semiconductors together to remove organic pollutants. In this way, organic pollutants in water and air can be degraded. Sunlight initiates the degradation reactions of large organic molecules into smaller and simpler molecules and at the end of the reaction, CO_2, H_2O and some other molecular products are formed. The use of metal nanoparticles is widespread in electronic, information storage, photonic and antibacterial applications, especially in photocatalysis. Although many metal oxide semiconductors have been tried to be used for catalytic purposes in photocatalysis studies, it is known that TiO_2 has been the most interesting and most studied photocatalyst since the 1970s.

In this study, TiO_2 and V_2O_5 based photocatalysts were produced by sol-gel and hydrothermal methods; their characterizations were made with XRD, SEM, EDS analyzes; The values of photocatalytic performances under UV light and visible light were investigated. In addition, it was aimed to produce ternary nanocomposite photocatalysts by adding oxide metal compositions such as ZrO_2, ZnO, SiO_2, SnO_2, CuO_2, CsO_2 at different ratios, provided that TiO_2 and V_2O_5 remain constant. It was aimed that ternary nanocomposite photocatalysts produced with different ratios of third component additions would contribute to the study.

Within the scope of this study, it was aimed to efficiently remove and decompose harmful wastewater with the ternary nanocomposite materials obtained. In the studies conducted so far, single and binary nanocomposites were made and photocatalytic studies were conducted. The efficiency of single and binary nanocomposites is low. Therefore, it was aimed to reduce both the photocatalytic decomposition time and increase the photocatalytic efficiency by conducting ternary nanocomposite studies. In this study, it was aimed to make new contributions to the literature with ternary nanocomposite photocatalytic studies.

Keywords: TiO_2, photocatalytic, hydrothermal, nanocomposite, synthesis

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New Photocatalytic Studies In The Visible Light Region

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Abstract

Nano-sized titanium dioxide is one of the best-known photocatalysts widely used in environmental treatment and degradation of harmful organic pollutant chemicals in wastewater. Titanium dioxide has three crystalline phases, namely anatase, brucite and rutile, and its use in environmental treatment as pigment, gas sensor, catalyst and photocatalyst in anatase and rutile forms is prominent. It can be used as a photocatalyst in the removal of organic pollutants in air and water and has wide applications as a photocatalyst to obtain hydrogen by decomposing water into ions. It is widely used due to its lower price, low toxicity, high temperature and chemical resistance compared to other materials with these properties. Titanium dioxide is one of the most researched semiconductor oxides in developing technologies with radical changes in the fields of environmental treatment and energy production.

In this study, the production of TiO_2 and CeO_2 based photocatalysts and the values of their photocatalytic performances were investigated. It was aimed to produce ternary nanocomposite photocatalysts by adding oxide metal compositions such as SnO_2, CuO_2, ZnO, SiO_2, CsO_2 at different ratios, provided that TiO_2 and CeO_2 remain constant. The ternary nanocomposite photocatalysts produced with different ratios of third component additions contributed to the originality of the study. It was aimed to efficiently remove and decompose harmful wastewater with the obtained ternary nanocomposite materials. By conducting ternary nanocomposite studies, it was aimed to both reduce photocatalytic decomposition time and increase photocatalytic efficiency. It was aimed to make new contributions to the literature by conducting ternary nanocomposite photocatalytic studies. In this study, TiO_2 and CeO_2 based photocatalysts were produced by hydrothermal method; their characterizations were made with XRD, SEM, EDS analyzes; and their photocatalytic performances were examined under visible light. In addition, it was aimed to produce ternary nanocomposite photocatalysts by adding oxide metal compositions such as SnO_2, ZrO_2, ZnO, SiO_2, CuO_2, CsO_2 at different ratios in addition to TiO_2 and CeO_2. It was aimed that the ternary nanocomposite photocatalysts produced with the addition of third components at different ratios would contribute to the study.

Keywords:CeO_2, TiO_2, photocatalytic, nanocomposite, hydrothermal

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Production of Polyamide 12-$MgCO_3$ Nanocomposites and Investigation of Their Thermal and Mechanical Properties

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Gülbanu Koyundereli ÇILGI[2]

Abstract

Polyamide-12 (PA-12) is widely used in coating of metal surfaces due to its low moisture absorption property. Therefore, strengthening of its thermal and mechanical properties will raise its usage advantages and increase its value in the market. For this purpose, we added $MgCO_3$ into PA-12 at nano-sized and varying rates of 2, 4. 6% by mass in our study.

"Melt blending" method was preferred for production. In this method, a 16 mm double screw extruder (GÜLNAR™) with an L/D ratio of 40 was used. PA-12 and nano $MgCO_3$ were kept at 80ºC during 24 hours to remove of possible moisture content. Afterwards, the necessary weighings were taken and production started. The barrel temperatures were set at 155, 170, 170,170 and 155ºC respectively, and the rotor frequency was kept constant at 125 rpm. Thermal stability of PA-12 and nanocomposites were investigated with using TGA-DTG-DTA and DSC techniques. The highest thermal stability was observed in the composite with 2% additives by weight. The initial decomposition temperature is 405ºC. This value is 380ºC for pure PA-12. As the additive ratio increased to 4% and 6%, the thermal stability decreased slightly compared to the 2% additive nanocomposite, but it is still higher than PA-12. The degree of crystallization was calculated by using DSC curves and it was observed that the highest crystallinity degree belonged to the 2% doped nanocomposite. Average modulus of elasticity, average tensile strength, average flexural modulus and average maximum force values were calculated with tensile and flexural test graphs. These values increase gradually with increasing additive ratio. Nano $MgCO_3$ filler has a positive effect on the mechanical behaviors of PA 12.

Keywords: Nanocomposites, Polyamide, Thermal stabiliy, Mechanical Properties, Melt blending.

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Hydrothermal Synthesis and Characterization of Dy-doped ZnO-SnO_2 Heterostructured Metal Oxide Nanorods for Use as Gas Sensors

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Mevlüt GÜRBÜZ[3]

Abstract

Environmental and air pollution, which began with the Industrial Revolution, has become increasingly serious with the rapid population growth, economic developments, and urbanization. It is well known that primary pollutant gases, which are among the most significant causes of air pollution, are present at higher levels in urban areas and have lethal effects (Ghosh et al., 2019). These gases, which threaten human health and cannot be detected by sensory organs, require sensors known as "electronic noses" for effective detection (Ramakrishnaiah et al., 2022).

Despite the use of many different materials in sensor technology, semiconductor metal oxides have become the focus of researchers in recent years due to their high gas response, low cost, and ease of production. Among metal oxides, zinc oxide (ZnO) and tin dioxide (SnO_2) are used as gas sensors due to their characteristic properties such as wide bandgap, high excitation energy, and thermal and chemical stability. ZnO-SnO_2 heterostructures are one of the most important members of the semiconductor metal oxide class used as gas sensors (Hu et al., 2021). However, research has shown that doping in ZnO-SnO_2 heterostructures can significantly improve sensor properties, raising their performance to higher levels (el Fidha et al., 2022).

In this study, Dy-doped ZnO-SnO_2 heterostructured gas sensors were synthesized using the hydrothermal method, a cheap and environmentally friendly technique. The surface morphology, roughness, and crystal properties of the prepared thin films were characterized using Scanning Electron Microscopy (SEM), Atomic Force Microscopy (AFM), and X-ray Diffraction (XRD). X-ray Photoelectron Spectroscopy (XPS) measurements were performed to determine the chemical states on the surface.

Keywords: Dy-doped, ZnO-SnO_2 heterostructure, Gas sensing, Hydrothermal

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Integration of Raw Material Storage Processes into the Electronic Kanban System through a Digital Transformation Approach

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Barbaros VATANSEVER [2]
Musa ÖNAY [3]

Abstract

Raw material storage processes play a crucial role in controlling production costs and ensuring operational efficiency in the furniture industry. The primary raw materials, typically derived from forest products and their derivatives, significantly influence the competitive strength of enterprises through the continuity of supply. The effectiveness of storage methods is critical for seamless production processes and timely delivery of orders. Beyond traditional storage approaches, the integration of modern software and automation technologies holds significant potential for optimizing processes and enhancing efficiency. Furthermore, effective management of buffer stock levels and logistics costs facilitates more efficient resource utilization across all stages of the production and supply chain. Therefore, a strategic storage management approach not only provides cost advantages but also creates opportunities to enhance customer satisfaction.

This study aims to integrate raw material storage processes into an electronic kanban system within the furniture sector. Manual and time-intensive processes in the existing SAP WM system have been automated through digital transformation, enhancing process efficiency. A user-friendly software was developed as part of the project to simplify material collection and approval processes. This software identifies and reports missing materials one week before production, minimizing potential disruptions in the production process. Additionally, material placement within the warehouse has been optimized according to production needs, saving one man-hour daily in collection operations. By integrating real-time flow information, the need for manual tracking has been eliminated, resulting in more effective and error-free processes.

Keywords: : Furniture Industry, Warehouse Management, Digital Transformation, Kanban System.

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An Application on Efficiency Improvement and Waste Reduction in the Production Process of Bed Without Roof

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Abstract

The lean production philosophy is a critical approach for increasing efficiency and minimizing waste in companies. Reducing waste such as transportation, waiting, unnecessary processes, and energy consumption not only decreases costs but also accelerates production processes. Particularly, new layout arrangements prevent time loss by shortening transportation distances and optimize resource utilization. Such improvements align with lean production goals, enhancing businesses' competitiveness while contributing to environmental sustainability.

This study aims to eliminate inefficiencies in the production processes of bed without roof caused by transportation waste, prolonged drilling operations, and the absence of standardized work definitions. In the production process of bed without roof, transportation waste results in both time loss and quality issues in our products. Additionally, the oval holes required for the product are processed using CNC machines, which turns these complex machines into bottlenecks and leads to additional waste due to their high energy consumption.

In the study, production processes were observed to solve these problems, and new drilling machines and molds for assembly processes were designed and integrated into the production system. The molds introduced for the assembly process increased unit capacity. The cost of the assembly process was stabilized through the time-controlled pneumatic systems added to the molds. The new drilling machine reduced the processing time from 76 seconds to 38 seconds, resulting in an annual energy savings of approximately 25,640 kWh. With the layout adjustment, the drilling machine was relocated within the unit, reducing the transportation distance in production from 250 meters to 40 meters. Additionally, production processes were optimized through the implementation of standardized work definitions and workspace organization.

As a result of these improvements, production efficiency was increased, creating a process aligned with lean production goals.

Keywords: Lean production, Muda, furniture, furniture production, production line, machine design.

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Analysis of Industrial Engineering Graduate Studies

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Abstract

In this study, an analysis of graduate studies conducted in the field of Industrial Engineering in Türkiye has been carried out. The aim of the research is to compile graduate studies in Industrial Engineering and provide guidance to students and graduates of Industrial Engineering who wish to pursue further education. The data used in the study were obtained from the Thesis Center page of the Council of Higher Education (YÖK) and analyzed accordingly. Initially, all graduate studies in the field of Industrial Engineering were reviewed. As a result, graduate studies in Industrial Engineering are considered a necessity due to their contribution to professional life and career goals. Moreover, the increase in such studies, particularly over the past five years, supports this perspective. It was observed that graduate studies are predominantly pursued at the master's level. This preference is thought to stem from the contributions of such studies not only to academic careers but also to professional practice. The field of Industrial Engineering is also closely associated with many other disciplines, which explains the noticeable diversity in research topics within graduate studies. Furthermore, Industrial Engineering is evolving alongside advancements in computer science. Additionally, the fact that some of these studies are conducted within the domain of Computer Engineering highlights the significant relationship between the two disciplines.

Keywords: Industrial Engineering, Graduate Education, Computer Sciences, Thesis Analysis, Academic Studies

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Applicability of Lean Manufacturing Techniques in Hospitals: Example of Kocaeli University Research and Application Hospital

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Gülşen AKMAN[3]

Abstract

Lean manufacturing in the health sector has been used in the UK and the US in the 2000s with the "lean healthcare" services. Service costs, security risks in service, wasted time, waiting times, patient satisfaction and quality processes have been examined with lean healthcare. Lean healthcare is on its way to becoming a global trend. However, in Turkey, lean healthcare studies have not gained the necessary momentum and hospital managements are concerned about the applicability of a manufacturing method in the service area while providing services with classical management approaches. This study will prove the benefits of lean manufacturing to hospitals and healthcare services in order to eliminate the concern about lean healthcare in our country. In a study, the current situation in the hematology polyclinic of Kocaeli University Hospital, which has a hospital, was analyzed and lean philosophy suggestions that can be applied were developed. These suggestions were prepared using lean techniques such as Kaizen, 5S, 7 muda, cause-effect analysis, value stream mapping and were examined with statistical science and simulation studies. Gains have been made through statistical science regarding the effect of the patient's age and gender on being a chemotherapy patient, the number of patients in age groups, and the duration of

Keywords: healthcare sector, hospitals, lean management, lean healthcare, muda

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Data Analysis of Visual Artificial Intelligence Based Safety System in Industry Fields

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Abstract

Occupational health and safety is critical to protecting employees and maintaining order in the workplace. The implementation of these rules is usually supervised by in-house staff or outsourced services. Industrial areas are also among the areas where occupational accidents are common. In this study, the impact of data analysis prior to data improvement phases on the development of Trio Mobil's occupational accident prevention system is presented.

Focusing on data analysis, a lightweight and effective object-based artificial intelligence model was applied to four different locations as a test environment and the system was monitored for one month. During this period, false triggers were detected. Data analysis was performed to understand the causes of these false positives and to improve the performance of the system. Within the scope of the analysis, the "ObjectLab" method was used and labeling improvements were detected in 2% of the data. After the labeling improvements, the features obtained from different backbone layers of the model were analyzed with the t-SNE method.

The experiments showed that for t-SNE analysis, the last backbone layer provides a better reduction. Furthermore, the images that cause confusion between classes and the possible reasons for this were identified. It is concluded that data augmentation with artificial and real data is required for the cases of indistinguishable false detections. This study sheds light on methods that can be used in data analysis processes to improve the performance of visual AI-based security systems.

Keywords: Object Detection, t-SNE, Data Centric AI, Deep Learning, Occupational Health

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A Novel Mobile Application for Effective Medication Management

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Abstract

The administration of drugs used in the treatment of mental and nervous diseases, Alzheimer's, dementia, forgetfulness and various diseases that develop with old age to patients in the right dose and at the right time is an important problem that needs to be solved today. Taking drugs in the right dose and on time is one of the most important factors affecting the success and safety of the treatment. Drugs that are not taken in the right dose and at the right time can prolong the treatment period and not achieve the desired result. This mobile application developed for the Android platform aims to effectively manage the use of drugs at the right time and at the right dose. In addition, the application is aimed to be a solution to the complexity brought about by the increasing use of drugs. Users using the application will be able to benefit from the user-specific drug information, drug reminder, drug use history and active ingredient conflict analysis features offered by the application for these drugs by recording the drugs they use. With the user-specific drug information feature, the sections that concern them from the prospectuses of the drugs they use according to their health information are presented with natural language processing methods. In addition, with the active ingredient conflict analysis feature, active ingredient interactions between the drugs used by the user are examined and the detected conflict situations are notified to the user. The application offers users the opportunity to manage their medication use in a more organized and conscious manner with the feature of extracting information from the prospectus and other features it provides. Thanks to the application, users will be more conscious about the medications they use and will be able to manage their daily medication use effectively.

Keywords: Mobile Application, Health Management, Natural Language Processing, NLP

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White-label Platform as a Service for Sports Clubs

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Abstract

Our goal with this study is to create a digital platform that offers a variety of entertainment opportunities for sports club fans. With this platform, which can be used by football, basketball, and other sports clubs, it will be possible for these clubs to establish closer relationships with their fans, increase their revenue through in-app purchases, and enhance the fan experience by utilizing historical data. This new platform brings together various functionalities in one place which will make it easier for fans to follow, interact with, and get closer to their favorite clubs in one place. The platform will include integrated ticket purchasing, the latest news, videos, a store that sells sports products, a match center where live games can be followed, the opportunity to play games, and many other features. For the development of this project, a hybrid application framework with gamification features has been developed using the Unity Engine. The aim here is to combine the best features of both the hybrid application structure and gamification using Unity engine to surpass the limits of other game engines. Additionally, the clubs will have access to a data control panel where they can view their ticket and product sales performance, segment user data, and send notifications and emails. All the aforementioned functions utilize an SSO (Single Sign-On) system that ensures users can connect to all integrated services by registering or logging in only once. Since developing and managing an application can be time consuming and costly, the white-label solution of this project output will play a significant role in sports clubs deciding strategies.

Keywords: Sports Clubs, Fan Engagement, Mobile Application, Unity, Gamification

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Developing an Open Banking Platform for Enhanced Efficiency and Security

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Kazım YILDIZ[4]

Abstract

Open banking is an innovative financial service that allows users to manage their accounts at different financial institutions through a single platform. The speed and convenience that digitalisation has brought to the world of finance has been further enhanced by open banking. This research addresses the design of an open banking platform that unifies banking transactions for individual and corporate customers. It allows users to control multiple bank accounts through a single application, perform money transfer, make loan requests and make transactions such as bill payments quickly.By automating banking transactions and minimizing human errors and operational burdens, it offers users intelligent financial solutions tailored to their needs. Developed in accordance with global open banking standards, this platform has a modular and scalable architecture. It has been designed to facilitate integration with international financial systems through future updates. This study addresses the potential of open banking to enhance financial transparency and improve service quality, particularly in developing countries. The research aims to develop strategic solutions to critical challenges such as data security, customer privacy, and operational efficiency within the open banking ecosystem. Among the prominent recommendations in the study are the establishment of strong API standards to ensure the secure sharing of customer data with third parties and the enhancement of encryption technologies to increase reliability.

Keywords: Financial Integration, Data Privacy, Open Banking, Operational Efficiency

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Machine Learning Based Image Optimization

Onur TUNALI[1]

Abstract

Cimri processes 2 billion e-commerce data per day for more than 200 million products within its structure, and can visually match the price and content under the products. In this way, it offers users the best comparison experience. One of the biggest problems for Cimri, one of the most important players in Turkish e-commerce in terms of both data and user numbers, is the correct processing, classification and cataloging of incoming data. During these processes, product images from different e-commerce companies are also collected for the products. This data coming from different sites may be of poor quality, have a high white space ratio around it, come repetitively or contain images that are not related to the product. This makes the 'Cimri user experience' very important, especially in categories such as 'electronics' where the visuals of the products are examined in detail by the user. Solutions have been developed using 'image processing methods' to eliminate these problems. Solution activities are as follows; Hash and neural network based image proximity study, cost and performance analysis, neural network performance optimization, construction of a search engine to search within representation vectors, grouping study to group duplicate images and finally development of a reference-free image quality measurement algorithm to find the highest quality image to represent duplicate images. Thus, with the need for the construction of systems that will work synchronously and asynchronously during the initial processing of data and will continuously increase the visual quality, Cimri has developed an infrastructure that performs image processing, interpretation and cleaning processes as a result in order to solve all problems such as quality, sizing, white ratio, duplication, irrelevance to the product (wrong image) of images integrated with the product matching system. As a result; Neural network based approaches have generated 60% more accurate results in terms of duplicate image detection compared with hash based techniques. In addition, reference-free quality control approach reduced operational load to a linear complexity instead of quadratic comparison of all images associated with a product.

Keywords: Visual Transformers, Vector Representation, Image Quality Control, Approximate Nearest Search (ANN), Image Deduplication and Vector Search

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A Diagnostic Tool for PCOS: Integrating Machine Learning and Web-Based Solutions

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Abstract

Polycystic Ovary Syndrome (PCOS) is a common endocrine disorder affecting women of reproductive age, characterized by hormonal imbalances, irregular menstrual cycles, and the development of multiple ovarian cysts. PCOS is associated with a range of complications, including infertility, insulin resistance, obesity, and an increased risk of metabolic syndrome, emphasizing the need for early and accurate diagnosis. Traditional diagnostic methods rely heavily on clinical assessments and laboratory tests, which can be time-consuming, resource-intensive, and subject to variability in interpretation. Recent advances in machine learning (ML) offer an opportunity to enhance diagnostic accuracy by leveraging complex datasets to uncover patterns not easily discernible through conventional methods.

In this study, a machine learning model was developed using a publicly available dataset, consisting of 541 samples and 44 features. To improve diagnostic precision, feature selection techniques such as Recursive Feature Elimination (RFE) and Feature Importance were applied, resulting in the identification of the 25 most predictive attributes for diagnosing PCOS. These selected features were used to train a supervised learning model, which achieved an impressive accuracy of 0.93% (± 0.03), indicating its potential as a reliable diagnostic tool. To enhance accessibility, a web-based interface was created, enabling users to input relevant data and receive real-time diagnostic predictions. This user-friendly platform aims to support healthcare professionals by providing supplementary diagnostic insights and to offer individuals a preliminary evaluation tool. The results demonstrate the significant potential of machine learning in the healthcare sector, particularly for complex conditions such as PCOS. Integrating such models into clinical practice could improve diagnostic efficiency, reduce diagnostic errors, and ultimately enhance patient outcomes, underscoring the transformative role of artificial intelligence in modern medicine.

Keywords: Polycystic Ovary Syndrome (PCOS), Machine Learning (ML), Web-Based Diagnostic Tool, Feature Selection, Recursive Feature Elimination (RFE).

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Hardware Trojan Attack in the Automotive

Cumhur MELCİK[1]

Abstract

The rapid development in the automotive industry leaves gaps in security. Recently, awareness of vehicle cyber security and the desire to find solutions to these issues are increasing day by day. While software developments and encryption techniques continue to develop in the CAN bus line of vehicle communication, security gaps are being closed. Although those who want to damage the vehicle hardware can do this using software, they can also achieve this by interfering with the smallest part of the vehicle. Chips, the smallest parts in the ECU, may not be very innocent in terms of security. People who want to cause damage can cause irreversible damage to the vehicle with the trigger mechanism they place inside these small parts, namely chips, make the vehicle immobile or wear out the vehicle mechanism in a planned way. In this article, the importance of the supply chain against the threat of the can bus line used for in-vehicle communication, the OBD line that does not connect to the vehicle communication line, and the hardware trojan threat is discussed.

Keywords: Hardware trojan, Cyber security, ECU, Hardware trojan attack, Obd, Can bus.

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Optimizing Container Loading with Camera-Assisted Hooklift Truck Approach

Emir Enes TAŞ

Abstract

The automotive industry encompasses various fields such as autonomous vehicles, driver assistance systems, parking assistants, and traffic sign recognition, where artificial intelligence and real-time image processing are integrated. This research paper proposes a camera-assisted hooklift truck system to enhance the accuracy and efficiency of the container loading process. The system utilizes a camera-based detection algorithm to identify the container's location and provide guidance to the truck driver, enabling a more precise approach and alignment with the container. Given that container dimensions (height and width) are standardized, the camera is calibrated during the loading process to draw the container's edges within the camera frame. This allows the driver to align the actual container with the pre-drawn image, ensuring an accurate approach. The feasibility of this system aligns with prior research in the automation of package stacking, which has shown the potential for robotic technologies to handle complex package-handling tasks (Cheng & Penkar, 1995). To achieve this, Python programming language, OpenCV library, YOLOv5 algorithm, Canny algorithm for edge detection, and TensorFlow library for deep learning were utilized in image processing techniques. As a result of these efforts, a dataset was prepared, and the model was trained with 97% accuracy, successfully achieving container detection and precise vehicle alignment for loading.Keywords— Container Recognition; Real-Time Image Processing; YOLOv5; Artificial Intelligence

Keywords: Container Detection, Real time Image procesessing , YOLOv5,Artificial Intelligence.

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A Method of Determining Orientation of Mobile Robots for Indoor Navigation

İsmail Celalettin TIĞLI[1]

Abstract

In this study, it is proposed a method of determining orientation of mobile robots for indoor navigation. As known, In outdoor navigation, Location information is able to determine easily by using GPS data. Orientation information is also easily derived from the concecutive location information obtained from GPS. But for robots navigating indoor spaces, location information from GPS is blocked by surrounded structures such as walls and ceillings. Therefore, GPS data is lost. As a result, orientation information can not be obtained in this condition. In this study, Regular floor patterns are used in order to determine orientation information in indoor navigation. Here, we assumed that the floor pattern or the texture in indoor spaces is regular and exist. To this end, An algorithm was developed. An RGB image inputs to the algorithm. First of all, The RGB image is converted into a gray one. Then the resolution of the gray image is reduced to one in four in order to reduce the number of operation and speed up the algorithm. In the algorithm, line segments on the floor patterns are extracted from the background and then orientation of the line segments are rotated in a predetermined range (e.g from -30 to 30 degree) until the lines coincide with the camera optical axis. The obtained rotation angle is the one which the robot must rotate

Keywords: Indoor navigation, robot navigation, Autonomous navigation, Indoor localization, Floor pattern

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Nato Transfer Test Kit

Fırat Tokmak

Abstract

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UWB Antenna Design on Jean Material for Wireless Body Area Network

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İbrahim ÇELİKI [4]

Abstract

In this study, a miniaturized jean based monopole microstrip patch antenna (MMPA) design fed from standard SMA connector for wireless body area networks (WBAN) is presented. FR4 (ε_r=4.4,δ=0.02) is selected for the top and bottom layers and jean material (ε_r=2.2,δ=0.04) is selected for the middle layer. The thickness of the top and bottom layers is 0.2 mm while the thickness of the middle layer is 0.8 mm. Ultra wide band (UWB- 3.1–10.6 GHz) MMPA has a modified circular radiation element with dimensions of 20 x 30 x 1.4 mm3. Five circular slots with four equal diameters are opened on this radiation element. The diameters of the circular slots are 2 mm and 4 mm, respectively. The ground plane is in the shape of a modified rectangle. A 3.5 x 6 mm slot is opened in the projection of the feed line. Circles with a diameter of 1 mm are added to the edges of the opened slot. The proposed MMPA is designed with CST Studio Suite, a full-wave electromagnetic solver based on finite integration technique. When the S11 graph is examined, it is seen that it emits radiation in the range of 3.08 - 11.32 GHz (114.4%) and has a bandwidth of 8.24 GHz. It provides good impedance matching in the UWB frequency range. These features allow the antenna to operate in a wide frequency range and transmit signals with low loss. It is seen that the antenna size is significantly reduced when compared to typical wearable antennas. It is anticipated that the designed antenna will be an effective solution especially in WBAN applications.

Keywords: Monopole Microstrip Patch Antenna, Ultra-Wideband, Wireless Body Area Networks

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Comparison of Da/da Boost Converters

Hasan Üzmuş

Abstract

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Antioxidant Activities of Silver Nanoparticles from *Styrax officinalis* L. Extract Using Green Synthesis

Hülya KARATAŞ[1]
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Abstract

The green synthesis approach provides an eco-friendly alternative for producing nanoparticles, utilizing plant extracts, microorganisms, or other biological resources as reducing and stabilizing agents. Compared to conventional methods, it is less toxic and focuses on creating nanoparticles that are both biocompatible and environmentally sustainable. This method holds significant promise in various sectors, particularly health, pharmaceuticals, and environmental applications, with a notable emphasis on biomedical uses. Growing awareness of green chemistry and the preference for environmentally friendly approaches to synthesizing metal nanoparticles, particularly silver nanoparticles (Ag-NPs), has driven interest in developing sustainable methods. A wide range of organisms, from simple bacteria to complex eukaryotes, can be employed to produce nanoparticles with specific sizes and shapes.

Styrax officinalis which is commonly known as 'tesbih tree', is a small tree with a greenish-white color and hairy undersides. The plant's leaves, resins, fruit, peels, flowers, and seeds have valuable natural properties. It is used in traditional medicine to treat various conditions like heart disease, tuberculosis, edema, stroke, skin problems, respiratory issues, and infections. Studies of the plant and its compounds confirm many of these uses, showing antibacterial, antifungal, antioxidant, anti-inflammatory, antitumor, and cytotoxic effects.

This study aimed to determine the antioxidant activities of silver nanoparticles using *S. officinalis* leaf extract by green synthesis. Characterization of the silver nanoparticles was investigated with UV-Vis Spectroscopy, Scanning Electron Microscopy (SEM), and Energy Distribution Spectroscopy (EDS) analyses. The antioxidant activities of *S. officinalis* extract and synthesized silver nanoparticles were determined with 1,1-diphenyl2-picrylhydrazil (DPPH•) Free Radical and 2,2'-Azino-bis (3-ethylbenzothiazoline-6- sulfonic acid) (ABTS•+) Cation Radical Scavenging Activity. In both assays, both the extract and the nanoparticle showed a concentration-dependent increase in antioxidant activity.

Keywords: *Styrax officinalis* L., silver nanoparticle, green synthesis, DPPH, ABTS.

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Is the garlic-lemon cure beneficial for testicular tissue?

Gulsah YILDIZ DENIZ[1]

Abstract

Lemon lowers blood pressure, strengthens the immune system, meets some of the daily vitamin C needs, fights cancer and bacterial infections, prevents the formation of kidney stones, reduces inflammation and supports the formation of collagen. Garlic makes you feel energetic. It has a quick effect on colds. It supports lowering cholesterol. It helps the digestive system to work properly. It can support joint health. It helps reduce the risk of heart attack. Although the garlic-lemon cure (GLC) is widely used among the public, there is no study done on this cure. The aim of this study was to determine the possible healing properties of garlic-lemon cure on cadmium (Cd)-damaged testicular tissues. Twenty-eight male Wistar albino rats were used and they were randomly divided into four groups, including one control and the following three experimental groups: a Cd group (0.025 mmol/kg), a GLC group (15 mg/kg/day orally for 5 days), and a GLC + Cd group (15 mg/kg/day orally for 5 days and Cd 0.025 mmol/kg by intraperitoneal injection on the fifth day). Glutathione (GSH) contents were negatively correlated with the MDA concentration after oral adminstration of cure. GLC significantly reduced the levels of MDA, which were increased in testis by Cd. Histopathological changes in the testis tissues were examined using hematoxylin-eosin staining method. It was found that applying GLC could revert the histomorphological alterations. In conclusion, this study showed amelioration of hepatic histopathological characteristics, following GLC administration.

Keywords: Cadmium (Cd), Garlic-lemon cure (GLC), Testis.

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Effects Of Metal And Metal Oxıde Nanopartıcles On Insects

Elif Fatma TOPKARA[1]

Abstract

Nanotechnology has been successfully used in many fields such as agriculture, industry, medicine and the environment. In this context, nanoparticles (NPs), nanoscale particles produced by nanotechnology, are utilized. While NPs provide benefits in many areas, the idea of using NPs to control pests in agricultural areas has recently emerged. Chemical pesticides, frequently used to control pests, are extremely harmful to the environment, and pests become less sensitive to these frequently applied pesticides. Therefore, the idea arose that NPs could be used as a more effective and eco-friendly alternative to chemical pesticides in pest control. In this study, information on the effects of nanoparticles on insects was investigated. Within the scope of the research, search engines such as Scopus, Web of Science, Google Scholar and PubMed were utilized. The findings show that NPs cause adverse effects on enzymatic antioxidant defense systems, cell death, DNA damage, membrane permeability, as well as genotoxic and neurotoxic effects in organisms. It is recommended to use nanoparticles instead of chemical pesticides that have harmful effects on the environment, especially in the control of pests that cause economic losses for farmers. For nanoparticles to be widely used in pest control, it is recommended that their effects on insects be further investigated both in the laboratory and field applications.

Keywords: Nanotechnology, nanoparticle, metal nanoparticle, pest, toxicity

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Toxic Plants Found in Public Areas of the City Centre of Burdur

Bekir YILDIRIM[1]

Abstract

This study aimed to determine the toxic plants found in public areas of the city centre of Burdur. The study generally examined children's parks, green areas, and roadside landscape areas. These areas are places where both people and animals can always be found, and especially the first two are frequently used by children. Therefore, poisoning cases can be seen in these areas. In addition, toxic plants detected in places close to these areas were also included in the list.

In this context, observations were made in various periods in the spring and autumn of 2024, plant specimens were collected and photographs were taken. Then the specimens were identified using the various floras, especially the Flora of Türkiye, and a list of toxic plants was prepared by analysing the literature data related to poisonous plants. As well as landscaping plants, the list includes plants that grow naturally in the examined areas.

Different parts of plants such as roots, stems, barks, leaves, flowers, fruits, seeds, rhizomes, tubers, bulbs, and sap can be toxic. However, sometimes the whole plant can also be toxic. Various properties of the plants (tree, small tree, shrub, climbing shrub, herb, landscape plant, natural plant, native distribution areas, etc.) were given in the study. Attention was also drawn to particularly toxic parts, toxic compounds, and toxicity classes. The list contains about 70 taxa. It is thought that this number will increase with the addition of new toxic plant taxa detected in the following days. Some of the identified toxic plants are given below.

Acer negundo L., *A. pseudoplatanus* L., *Aesculus hippocastanum* L., *Amaranthus retroflexus* L., *Berberis aquifolium* Pursh, *Betula pendula* Roth, *Campsis radicans* (L.) Bureau, *Catalpa bignonioides* Walter, *Conium maculatum* L., *Convolvulus arvensis* L., *Cotoneaster franchetii* Bois, *Cupressus sempervirens* L., *Cynanchum acutum* L. subsp. *acutum*, *Datura innoxia* Mill., *D. stramonium* L., *Echium italicum* L., *Eriobotrya japonica* (Thunb.) Lindl., *Euonymus japonicus* Thunb., *Ficus carica* L. subsp. *carica*, *Glaucium flavum* Crantz, *Grevillea rosmarinifolia* A. Cunn. subsp. *rosmarinifolia*, *Juglans regia* L., *Lagerstroemia indica* L., *Lonicera tatarica* L., *Nerium oleander* L., *Paulownia tomentosa* (Thunb.) Steud., *Peganum harmala* L., *Picea pungens* Engelm., *Platanus orientalis* L., *Platycladus orientalis* (L.) Franco, *Pyracantha coccinea* M.Roem., *Robinia hispida* L., *Salvia rosmarinus* Spenn., *Santolina chamaecyparissus* L., *Sorghum halepense* (L.) Pers., *Tagetes erecta* L., *Tribulus terrestris* L., *Xanthium spinosum* L., *X. strumarium* L. subsp. *strumarium*.

Keywords: Burdur, Landscape, Ornamental plants, Toxicology, Toxic plants

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Micro-Pollutants in Aquatic Environments: A Growing Threat to Environmental and Human Health

Mustafa Tamer UZUN[1]

Abstract

Due to industrial and technological advancements, new types of pollution have emerged, known as "Emerging Pollutants." Also referred to as micro-pollutants in another definition, these pollutants appear at low concentrations. However, their effects on the environment and human health are not completely known and are thought to have significant long-term impacts.

These types of pollution differ from traditionally defined pollutants. Compounds such as pharmaceutical residues, personal care products, endocrine-disrupting chemicals, industrial chemicals, and biocides are among today's most notable micro-pollutants. Factors such as pharmaceutical residues, personal care products, industrial chemicals from wastewater treatment plants, pesticides, fertilizers, and veterinary drug residues resulting from agricultural activities, hospital waste, and industrial activities also contribute to the spread of micro-pollutants in the environment.

Thanks to susceptible analysis technologies developed in recent years, it has become possible to detect the presence of such pollutants even at very low levels in the environment. Studies carried out with the help of these technologies have revealed the presence of micro-pollutants in surface waters and groundwater.

Moreover, the fact that micro-pollutants almost exit traditional wastewater treatment plants untreated leads to these substances reaching aquatic environments and infiltrating groundwater. This situation increases their potential risks to human health and the environment.

Micro-pollutants are generally not biodegradable and can remain stable in receiving environments for long periods. This leads to aquatic organisms being exposed to these pollutants and their bioaccumulation. The bioaccumulation of micro-pollutants in aquatic organisms brings risks in terms of their biological transfer to humans via the trophic chain. Although there has been increasing attention and efforts on micro-pollutants in recent years, more detailed studies are needed on their effects on the environment and human health.

Keywords: Ecotoxicology, micropollutants, bioaccumulation, trophic transfer, persistence.

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Investigation of Economic Feasibility of Pico Hydro Turbines for Use in Drinking Water Supply Networks

Mustafa YALTIR[1]

Gürkan Emre GÜRCANLI[2]

Abstract

In light of the finite nature of energy production opportunities and the associated CO_2 emissions, it is imperative that we prioritise sustainability and energy recycling. Hydraulic energy, representing over 50% of total electricity generated from renewable sources, is frequently untapped in natural settings, including drinking water networks. In these networks, potential energy from gravity-fed water is dissipated in tanks without being utilised. Prior to the establishment of pico hydropower plants in such water tanks, a detailed economic analysis must be conducted, focusing on factors such as the gravity-fed head height, water flow rate, and the distance from tanks to electricity networks. These parameters must be comprehensively evaluated during the project design phase to determine the feasibility of energy generation in drinking water systems. The "Water Efficiency Strategy Document and Action Plan (2023-2033)," published by the Ministry of Agriculture and Forestry, places an emphasis on the importance of water efficiency across various sectors. In accordance with section 3.4.3, the strategy sets forth objectives to promote water efficiency through the implementation of legal, administrative, and technical measures, including the integration of drinking water, wastewater, treatment, and solid waste facilities with renewable energy projects. This study is aligned with the aforementioned strategies, exploring the feasibility of converting idle energy in drinking water tanks, both existing and newly constructed, into useful energy. The study examines the impact of such systems on construction and operating costs and develops a decision-making method for evaluating the economic viability of installing a hydropower plant, based on factors such as pressure and flow rate. The proposed method will be applied to a case study in Kıbrıscık, Bolu Province. The results will provide insights into the economic feasibility and practical implications of utilising hydraulic energy in drinking water systems, contributing to broader water and energy efficiency goals.

Keywords: renewable energy, drinking water supply network, pico hydro, economic feasibility

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Fragility Analysis of a Highway Bridge

Zeynep YILMAZ[1]

Murat Serdar KIRÇIL[2]

Abstract

The fact that severe earthquakes can cause heavy damage to bridges, one of the most critical infrastructure elements, has created the requirement of structural performance estimation in order to ensure the safety of these structures and strengthen their capacity to survive future earthquakes. In this study, structural performance of a highway bridge is estimated through fragility curves. These curves allow for a more precise understanding of the potential failure modes under varying seismic conditions. The investigated bridge has four-span precast concrete girders and reinforced concrete cast-in-place columns with an oblong cross section. A nonlinear computer model was created, whose superstructure elements and cap beams are linear-elastic elements, while abutments and columns are nonlinear components, based on the as-built drawings of the bridge. This model ensures that nonlinear behavior of the structure are accurately represented in the analysis. A lumped plastic hinge model was used to define the nonlinear behavior of column hinges at potential plastic hinge locations. Ten different earthquake ground motion records were matched with the design spectrum to be used for incremental dynamic analysis. Performance level limits in terms of drift ratio of columns has been determined based on the results of incremental dynamic analyses and strain limits given by Turkish Bridge Earthquake Standard. Finally, probabilities of exceeding the considered performance levels defined by Turkish Bridge Earthquake Standard has been determined through obtained fragility curves.

Keywords: Incremental dynamic analysis, Earthquake damage, Fragility curves, Bridges

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Performance Evaluation of Geopolymer Mortars with Recycled Concrete Aggregate using Response Surface Method

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İbrahim Hakkı ERKAN [3]

Abstract

In this study, the performance and factors affecting the performance of recycled concrete aggregate geopolymer mortars (RCAGM) were investigated with response surface method (RSM). Silica fume (SF), ground granulated blast furnace slag (GGBFS) and class F fly ash (FA) were selected as precursor materials (PM) of RCAGM. The mixture of sodium hydroxide (SH) and sodium silicate (SS) was used as activator solution (AS). Recycled concrete aggregate (RCA) was selected as mortar aggregate. In order to investigate the effects of these components on the performance of RCAGM, 27 mixtures were created using the central composite design (CCD) of RSM as the experimental design method. The variables were selected as SF/PM, GGBFS/PM, AS/PM and RCA/Mixture ratios. 5 different levels were chosen for each variable. The performance of RCAGM was evaluated by compressive strength, flow table and setting time tests. At the end of the 7-day curing under ambient conditions, the compressive strengths were between 11.26-32.39 MPa, the flow values were between 14.0-24.0 cm, the initial setting times were between 363-778 min. Thus, it was determined that early strength (7-day strength) of RCAGM was comparable to ordinary Portland cement mortar, the setting time was sufficient for the use of RCAGM, and RCAGM with adequate workability can be produced. Statistically significant models were successfully established for strength, setting time and flow value. The effects of each variable on the compressive strength, setting time and flow value were investigated with the established statistical models. The verification experiments have shown that the models are highly accurate and the models given in this study can be easily and reliably used in estimating the early strength, setting time and flow values of RCAGM.

Keywords: Compressive strength, flow, geopolymer mortar, recycled concrete aggregate, response surface method, setting time

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The Impact of Primavera Risk Analysis Tool on Construction Project Duration and Cost

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Gürkan Emre GÜRCANLI[2]

Abstract

The construction industry drives economic growth in developed countries. Construction projects face many risks, especially with new technology and materials. Effective risk management is crucial to avoid financial, time and quality losses. This article uses Primavera Risk Analysis and Monte Carlo simulation to assess how prospective risks affect project duration and cost. The study outlines the procedure for risk management in construction, which encompasses risk identification, analysis and response planning. It categorises 47 potential risks under bid and contractual, design, transportation and customs, and construction-related risks, emphasising the importance of a systematic approach to understanding the impact of these risks on construction schedules and costs. The Monte Carlo method was employed to simulate a range of potential scenarios, with the objective of estimating the completion times and costs of the project under varying degrees of risk. The analysis demonstrated that project risks have the potential to extend the schedule and increase costs. However, the effective management of these risks through PRA can enhance the probability of successful project completion. The findings indicate that systematic risk management, supported by PRA, is vital for ensuring that construction projects meet their time and cost objectives. In essence, the article demonstrates the value of integrating PRA and Monte Carlo simulations in managing and mitigating risks in construction projects, resulting in better time and cost control.

Keywords: Monte Carlo, Project Management, Risk Management, Construction Management, Primavera Risk Analysis

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Multidecadal (1932-2024) Spatial Autocorrelation of Daily Total Precipitation in Central Asia: Effects of Standardized and Modernized Data Collection

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Abstract

Spatial autocorrelation analysis of precipitation provides crucial insights into regional climate patterns and hydrological processes, particularly in data-sparse regions like Central Asia. This study employs Moran's I statistics to quantify the spatial dependency of daily precipitation patterns across Central Asian stations, with the network expanding from 402 stations (median start date 1959) to 469 stations after 1992. Statistical significance was assessed through permutation tests (n=100), providing robust p-values for both regional and country-level analyses.

The analysis reveals a transformation in spatial precipitation patterns when comparing pre- and post-1992 periods, with regional Moran's I increasing from 0.007 ($p>0.05$) to 0.301 ($p<0.001$). While this suggests an evolution from apparently random to clustered patterns, coinciding with significant network modernization including 67 new stations. Country-specific analyses show varying degrees of change: Kazakhstan and Uzbekistan developed stronger spatial coherence (increasing to 0.247 and 0.211 respectively, both $p<0.01$), while other countries exhibited more nuanced transitions. The transformation is particularly evident in between-country relationships, where 7 out of 10 country pairs evolved from non-significant to significant spatial correlations, reflecting both network expansion and evolving data collection approaches after independence.

These findings demonstrate the complex nature of meteorological data collection in Central Asia and suggest a fundamental shift in observation practices following the independence of the countries, including substantial network expansion. The emergence of stronger spatial relationships provides valuable insights for understanding the evolution of regional monitoring networks and their representation in climate analyses. This analysis emphasizes the importance of considering both institutional changes and network evolution when interpreting long-term climatological records and their implications for regional water resource management and climate change studies. Furthermore, spatial autocorrelation analysis can serve as a tool for quality control and correction of historical data, potentially improving the development of numerical weather prediction and machine learning models.

Keywords: Historical Precipitation, Spatial Autocorrelation, Moran's I, Data homogenization, Climate Data Quality

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Effect of Mass and Size on CO2 Emission and Fuel Consumption in Curtain-Sided Semi-Trailers

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Abstract

To reduce CO2 emissions and fuel consumption from heavy-duty vehicles, Regulation 2022/1362 issued by the United Nations Economic Commission for Europe (UNECE) came into effect on January 1, 2024, for curtain-sided, panel-sided, and refrigerated box vehicles. Additionally, as of July 1, 2024, the use of the VECTO (Vehicle Energy Consumption Calculation Tool) simulation program became mandatory for trailer manufacturers.

This study examines the impact of different masses and dimensions on CO2 emissions and fuel consumption for curtain-sided trailers. The analyses were conducted using VECTO, provided by the European Commission. Curtain-sided trailers with varying masses and dimensions were simulated under three main driving scenarios: regional, long-haul, and urban. According to the simulation results, a vehicle that is 500 kg lighter reduced CO2 emissions by 0.82% and fuel consumption by 0.71% compared to the standard vehicle. A vehicle that is 1 meter shorter reduced CO2 emissions by 0.41% and fuel consumption by 0.36%. A vehicle with a 200 mm lower body height achieved a reduction of 1.78% in CO2 emissions and 1.79% in fuel consumption.

The findings revealed that reducing body height is a more effective method for improving efficiency compared to reducing vehicle mass or length. These results indicate that optimizing vehicle height can make significant contributions to environmental sustainability and fuel efficiency.

Keywords: VECTO, CO2 emissions, fuel consumption, box body, curtain-sided

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Effects of Different Stand Types on Air Quality Parameters: A Case Study of Karabuk

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Hasan Oguzkagan ATA [2]
Mehmet COLAK [3]

Abstract

The aim of this study was to investigate the effects of six different tree species (*Pinus nigra*, *Fagus orientalis*- *Carpinus betulus* L., *Pinus sylvestris* L., *Quercus* sp. and *Carpinus betulus* L.), which are common in the western Black Sea region, on air pollutants. The study was conducted using an Arduino Mega 2560 microcontroller-based multi-sensor system (MQ-4, MQ-6, MQ-131, MQ-7, MH-Z19, SDS011, DHT22). The measurements were carried out in summer 2023 (June-August) in five different stands (n=25, with 5 measurement points in each stand).

The results of the one-way ANOVA analysis showed statistically significant differences in the concentrations of methane ($F=3.245$, $p<0.05$), CO_2 ($F=4.123$, $p<0.05$) and $PM_{2.5}$ ($F=5.678$, $p<0.01$) between the stand types. While the stands of *Quercus* sp. had the highest CO_2 concentration (959±42 ppm), the stands of *Pinus nigra* recorded the highest $PM_{2.5}$ values (34.50±5.2 µg/m³). Mixed stands of *Fagus orientalis* - *Carpinus betulus* had significantly higher methane concentrations compared to other stands (224.25±18.3 ppb).

The Pearson correlation analysis showed a positive correlation between CO_2 and temperature ($r=0.51$, $p<0.05$) and a negative correlation between ozone and humidity ($r=-0.32$, $p<0.05$). These results illustrate that different tree species have different effects on air pollutants and emphasise the importance of species-specific approaches in the development of sustainable forest management strategies.

Keywords: atmospheric pollutants, *Pinus nigra*, *Fagus orientalis*, *Quercus* sp., particulate matter, Arduino

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Design, Manufacturing and Experimental Investigation of a Helical Tube Thermal Solar Water Heating System

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Halil İbrahim VARİYENLİ[2]

Abstract

The potential for solar energy to be harnessed as thermal energy is enormous. Among the existing uses of solar power the most developed and widely used one is thermal purposes. Solar water heating systems became popular during the 1970s energy crisis since then they become globally adopted systems. They evolved over time with the use of various fluids improving their efficiency.

Research has shown that the heat transfer coefficient in a helical pipe is approximately 23% higher than that in a straight pipe. In this study, we proposed the design and manufacturing of a helical pipe solar water heating system. The thermal efficiency of water and nanofluids in this proposed system was also investigated under the same experimental conditions.

The performance of helical pipe solar collectors was examined using different working fluids and flow rates. The experiments were conducted using water, MgO-TiO2/water and MgO-CuO-TiO2/water nanofluids at flow rates of 0.5 L and 0.9 L per minute. Our findings indicate that the use of nanofluids as working fluid in hellical pipe solar collectors significantly enhance their thermal performance. If the flow rate increases for the same fluids, the thermal efficiency increases. The average thermal efficiency values obtained for water and nanofluids were found to be 31.9%, 43.76%, 37.24%, 51.95%, 41.86% and 56.77%, respectively.

Keywords: Solar collector, helical pipe, nanofluid, flow rate, solar radiation

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Effects Of Some Sterilization Treatments on N Vitro Multiplication of Blueberries

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Esmanur YILDIZ[2]

Abstract

In this study, the effects of using zinc iron oxide nanofluid on the system performance as an alternative to the working fluids used in vacuum glass tube heat pipe thermal solar energy systems were investigated. In this research, system efficiency was found using the experimental method. Average inlet water temperature is for flow rate 1 lt./min.; 18.83°C, for 1.5 lt./min.; 17.3°C and for 2 lt/min. is 15.98°C and exit water temperatures; At 1 lt./min, the average outlet temperature was 20.45°C for water and 20.92°C for nanofluid. At 1.5 lt./min, it was 18.79°C for nanofluid compared to 18.48°C for water and 17.16°C for nanofluid at 2 lt./min, which is 0.25°C higher than the water-based system. Thermal efficiencies; at 1 lt./min, it achieved an improvement of approximately 30.1%, from 45.29% for water to 58.93% for nanofluid. At 1.5 lt./min, efficiencies increased to 48.98% for water and 62.28% for nanofluid, reflecting a 27.1% improvement. As for flow rate 2 lt./min, the efficiencies were 52.16% for water and 66.44% for nanofluid, resulting in a 27.4% improvement. While the amount of thermal energy gained by the collectors at 1 lt./min was 113.35 W on average for the water-based collector, it was 146.13 W for the nanofluid-based collector, indicating an increase of 28.9%. At 1.5 lt./min, it increased to 123.85 W for recovered water and 156.02 W for nanofluid, indicating an improvement of 26.0%. At 2 lt./min, the water-based system reached 128.55 W and the nanofluid-based system reached 163.90 W, indicating an improvement of 27.5%. The results obtained showed that the use of zinc iron oxide nanofluid had a positive effect in terms of the thermal efficiency of the system.

Keywords: Vacuum-glass tube, Heat pipe, Nano fluid, Zinc iron oxide

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Modeling the Current and Future Potential Distribution of St. John's Wort (*Hypericum perforatum L.*)

Ayşegül TEKEŞ[1]

Abstract

The aim of this study is to predict the current and future (2100) potential distribution of *Hypericum perforatum* L., a significant medicinal and aromatic plant species in the Marmara Region of Türkiye. The MaxEnt method was used for modeling and mapping the potential distribution of the target species. The occurrence data used in the study were obtained from the Global Biodiversity Information Facility (GBIF) database. Current and future climate data were downloaded from the CHELSA database. Future climatic conditions were assessed for the year 2100 based on the SSP1 2.6, SSP3 7.0, and SSP5 8.5 scenarios. The model's AUC value was determined to be 0.857. The variables shaping the model were BIO17 (precipitation of driest quarter), BIO6 (minimum temperature of coldest month), BIO9 (mean temperature of driest quarter), ROUGH (roughness index), and RUGGED (ruggedness index). The results of the study indicate that by the year 2100, the potentially suitable areas for the target species are projected to shift northward and become more restricted. The findings of this study will assist in the development of site-specific conservation strategies and management plans, particularly for forestry practices.

Keywords: *Hypericum perforatum* L., climate change, MaxEnt, medicinal and aromatic plant.

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Reflection of Social Events During the Period of Nationalist Front Governments in the Press: The Example of Tercüman and Cumhuriyet Newspapers

Aslı SOLAK ŞENER[1]

Abstract

The Nationalist Front governments that shaped Turkish politics between 1975 and 1977 were also years of social transformation. The right/left conflict that even the March 12 Memorandum could not prevent rapidly increased towards September 12. In these years when society was politicized, groups that defined themselves as right/left used violence as a tool in their actions. The support that right-wing activists received from the government, along with the left-wing youth who gained their freedom with the amnesty law enacted in 1974, shaped their violent actions, as right-wing parties, especially the MHP, were one of the partners in power. Based on these reasons, a period of terror and anarchy dominated by planned attacks and murders followed each other began in 1975. Violent actions spread to every segment of society, from students to workers and party leaders. The violence that primarily took shape around university youth eventually reached high schools and even secondary education levels, and the conflict between opposing groups sometimes led to the sacrifice of a 1.5-year-old baby. In the face of such polarization of society, violence spread to politicians, and the cities of the period gave characteristic reactions to political leaders. While workers expressed their gains and demands within the environment of freedom brought by the 1961 Constitution, they were faced with violence within the politicized society. Tercüman newspaper adhered to its publishing policy and defended the Nationalist Font government and right-wing thought, Cumhuriyet newpaper became the representative of the leftist thought movement of the period, as well as the written language criticizing the government. With all this, both newspapers called on politicians to act together to end the violence, with the awareness of being the fourth power the legislature, executive and judiciary.

Keywords: Nationalist Front, Political Violence, Student Events, Workers' Actions, Press.

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Serotype and Identification with Sequence Analysis and PCR of Strains *Vibrio anguillarum* Isolated in Different Provinces Turkey

Mehmet ÇALI
Mikail ÖZCAN

Abstract

This study aimed to serotype and identify according to their phenotypic and genotypic characteristics, isolation of *Vibrio anguillarum* strains in Rainbow Trout (*Oncorhynchus mykiss*, Walbaum 1792) cage farms in different regions of Turkey. For this purpose, rainbow trout samples were taken from 8 different trout farms. For *Vibrio anguillarum* isolation; Brain Heart (Infusion) Agar (BHIA), Tryptic Soy Agar (TSA) Tryptic Soy Broth (TSB) and blood agar were used. While preparing these media, 1.5-3.5% salt was added. For the investigation of phenotypic properties of pure strains obtained from liver, spleen, kidney and intestines of rainbow trout were applied Biolog System (The biolog GENIII micro plate) and biochemical identification tests. Polymerase Chain Reaction (PCR) was used in specific primer belonging to *Vibrio anguillarum* strain. With the help of this primer, all 8 strains were molecularly confirmed as *Vibrio anguillarum*. Sequence analysis of the strains confirmed by Polymerase Chain Reaction (PCR) was performed and the information obtained as a result of the analysis was interpreted. Sequence analysis of the strains confirmed by Polymerase Chain Reaction (PCR) was performed and as a result of sequence analysis were performed lam agglutination tests on hyperimmune sera created with ATCC-43305 SEROTIP-O1 and ATCC-43306 SEROTIP-O2 standard strains for all strains found to be Vibrio anguillarum. As a result of this test, 5 of 8 strains were found ATCC-43305 SEROTIP-O1, 2 of them ATCC-43306 SEROTIP-O2 and one of them serotype undefined.

Keywords: *Oncorhynchus mykiss,* Phenotypic, Genotypic, *Vibrio anguillarum,* BIOLOG GEN III, PCR, Sequence.

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Assessment of Physicochemical Properties of Starch/Guar Gum Films For Food Packaging Applications

Nedim GÜRLER[1]

Abstract

The unconscious disposal of petroleum-derived plastics has led to environmental pollution and has highlighted great interest in the preparation of natural polymers, biodegradable and renewable resources. Biopolymers are abundant and low in cost. In the family of biopolymers, starch and guar gum are biodegradable, inexpensive and abundant. In this study, films were prepared by adding different amounts of sodium tripolyphosphate (0 g, 0.025 g, 0.05 g and 0.1 g STPP) and glycerol as plasticizer to the starch/guar gum (ST/GG) mixture. The structural properties of the prepared films were elucidated by FTIR, while their morphological properties were visualized by SEM. Moisture content, solubility, water vapor permeability, opacity and color properties of the obtained films were investigated. The water vapor permeability of STGG0, STGG0.025, STGG0.05 and STGG0.1 films were 9.33×10^{-6} g m^{-1} s^{-1} Pa^{-1}, 6.39×10^{-6} g m^{-1} s^{-1} Pa^{-1}, 5.43×10^{-6} g m^{-1} s^{-1} Pa^{-1}, 1.43×10^{-6} g m^{-1} s^{-1} Pa^{-1}, respectively. The color scales of the films increased with the increase in the amount of STPP, while the L* and b* values increased, while the a* value decreased. In addition, the transparency of the films increased with the increasing amount of STPP. The moisture content of the film without STPP addition was 20.14%, and this value reduced to 9.91% with high STPP content. The solubility values of STGG0, STGG0.025, STGG0.05 and STGG0.1 films were 32.55%, 25.15%, 37.68% and 35.32%, respectively. Consequently, this study is described as an evaluation on bio-based films as an alternative to plastic-based packaging materials.

Keywords: Guar gum, packaging, physical properties, starch, STPP

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Synthesis of New Schiff Base-Palladium Complex

Emine Özge KARACA[1]

Abstract

Schiff bases, first synthesized by Nobel Prize-winning German chemist Hugo Schiff, are compounds containing a carbon-nitrogen double bond (-CH=N-) obtained as a result of the nucleophilic addition reaction of aldehydes or ketones with amines Schiff base compounds are stable, easy to synthesize compounds. In addition, their wide use in many areas of chemistry, industry, medicine and pharmacy has increased the interest in these compounds and made them widely usable in different areas. Within the scope of the study, a new Schiff base compound that can be made soluble in water was synthesized. Metal complexes of Schiff bases, which have a wide application area, are used as pigment dyes in the dye industry and especially in textile dyeing, as they are colored compounds. In addition, since these compounds are greatly used in polymer technology, pharmaceutical industry, medicine, agriculture, preparation of rocket fuel, explanation of biological events and many other fields, studies on new syntheses of these compounds continue intensively. For these reasons, in this study, new Schiff base palladium complexes were synthesized from Schiff base obtained from nitrogen-containing aromatic aldehydes. Structures of the obtained compound was clarified by NMR spectroscopy, FT-IR and elemental analysis techniques.

Keywords: Characterization, schiff base, synthesis,

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Efficient Adsorptive Removal of Penicillin G by PVA/Tragacanth Gum Nanocomposite Films

Süleyman GÖKCE[1]
F. Fulya TAKTAK[2]

Abstract

This study investigates the adsorption of Penicillin G using polyvinyl alcohol (PVA)/Tragacanth gum (TG) nanocomposite films. The adsorption process was evaluated by varying critical parameters such as pH, initial Penicillin G concentration, tragacanth gum content, and adsorbent dosage. The films exhibited enhanced swelling behavior, particularly at pH 8, which significantly improved the adsorption capacity. Kinetic analysis indicated that the adsorption followed a pseudo-second-order model, suggesting chemisorption as the dominant mechanism. Adsorption data best fit the Langmuir isotherm model, indicating monolayer adsorption on a homogeneous surface. The reusability of the nanocomposite was tested over five adsorption-desorption cycles, with methanol demonstrating the highest desorption efficiency (95.54%). However, a gradual decline in adsorption efficiency was observed after successive cycles, possibly due to partial loss of active sites. These results suggest that PVA/Tragacanth gum nanocomposite films are promising, environmentally friendly adsorbents for the efficient removal of Penicillin G from pharmaceutical wastewater. Future research should focus on improving the composite's long-term durability and reusability for scalable applications.

Keywords: wastewater treatment, adsorption, Penicillin G, PVA/Tragacanth gum, nanocomposite

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Catalytic Activity of In-Situ Pd-NHC Catalysts in Suzuki-Miyaura Reactions: A Study on Benzimidazolium Salts

Emine Özge KARACA[1]

Abstract

N-Heterocyclic carbenes (NHCs) have gained significant importance in organic and organometallic chemistry in recent years. NHC ligands are widely employed in transition metal catalysts due to their strong σ-donor properties and remarkable stability. In carbon-carbon bond-forming reactions such as the Suzuki-Miyaura reaction [1], NHCs exhibit high activity and selectivity, particularly when complexed with palladium (Pd). Pd-NHC complexes enable high yields and broad substrate compatibility in the coupling of boronic acids with aryl or vinyl halides. These complexes are especially preferred for synthesizing structurally complex compounds used in biologically active molecules and materials science. Moreover, Pd-NHC catalysts offer advantages over conventional phosphine-based catalysts, including greater stability and eco-friendliness, making them valuable in sustainable chemistry. The utilization of NHCs and Pd-NHC complexes continues to open new horizons in catalyst design and the development of chemical processes, enhancing interest in NHCs across both academic and industrial domains.

N-Heterocyclic carbenes (NHCs) are often employed in-situ, meaning they are generated directly within the reaction medium. This method provides a practical and cost-effective approach, especially for preparing Pd-NHC complexes. In-situ synthesis typically involves using a precursor (e.g., benzimidazolium salts) and a base to generate the carbene ligand directly during the reaction. This approach not only saves time and resources but also minimizes issues arising from the air and moisture sensitivity of carbenes. In-situ Pd-NHC catalysts exhibit high efficiency and broad substrate compatibility in Suzuki-Miyaura reactions. Furthermore, this method reduces the steps required for catalyst preparation, making processes more environmentally friendly and playing a critical role in sustainable chemistry. In-situ synthesis facilitates the laboratory-scale application of NHCs and accelerates their integration into industrial applications. In this study, benzimidazolium salts were utilized as in-situ Pd-NHC catalysts, and their catalytic activity in Suzuki-Miyaura reactions was investigated.

Keywords: Benzimidazole-2-iliden, Suzuki, Pd-NHC,

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Mathematical Modeling and Numerical Solutions of a Zoonotic Viral Infection Model

Mehmet KOCABIYIK[1]

Abdulkadir ŞAN[2]

Abstract

Monkeypox is a contagious disease that manifests with skin rashes. It has been identified as a zoonotic type of viral infection, meaning it can spread from animals to humans. Additionally, the disease can be transmitted through close and prolonged contact with an infected individual, sexual contact, contact with lesions, and respiratory droplets. For these reasons, the disease remains fatal, especially in underdeveloped countries. It is important to study the impact of vaccination in such regions. In this study, a mathematical model was developed that takes these effects into account. The model has been considered in the SVIR type (susceptible, vaccinated, infected, recovered). Numerical analyses of the model were conducted using Euler, Runge-Kutta, Central Difference, and Nonstandard Finite Difference methods. The results were presented in tables and graphs. According to the findings, the constructed system enables predictions over different time intervals. This study has provided a contribution to the literature by including updated data in this field.

Keywords: Infection model, Vaccination, Numerical methods.

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Some Approximation Properties of New Gamma Type Operator and Applications

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Abstract

The use of positive linear operators for function approximation represents a foundational topic in approximation theory, which plays a pivotal role across numerous areas of mathematics, such as measure theory, harmonic analysis, functional analysis, partial differential equations, and probability theory. Within this framework, the Gamma operator stands out as one of the most widely utilized operators due to its versatility and effectiveness in various approximation contexts. The sequence of Gamma operators, originally introduced by Lupas and Müller, has been instrumental in advancing the field. In this study, we introduce a novel sequence of Gamma-type operators, specifically designed using the test function, $f_z(t) = t^z$ for $t \in \mathbb{N}$ which allows for broader approximation capabilities. We derive moment formulas for these operators, establishing a Voronovskaya-type theorem that provides insight into their asymptotic behavior, along with a precise rate of convergence. To further assess the approximation properties of these operators, we utilize both the standard and weighted modulus of smoothness, providing a detailed analysis of their accuracy. In addition, we investigate the statistical convergence properties of these operators and derive an estimate for their statistical convergence rate, enhancing our understanding of their performance in diverse settings. Finally, we evaluate error estimates for the proposed operators and conduct a comparative analysis against existing operators that preserve test functions in alternative ways, supported by a series of illustrative numerical examples.
Keywords: Gamma type operators, rate of convergence, Korovkin type theorem, Voronovskaya-type theorem, weighted modulus.

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Oparetor MDS Quantum Error Correcting Codes of Length

Mustafa SARI[1]

Abstract

One of the significant families of quantum error correction codes is the operator quantum error correcting codes which arised from the notion of encoding a quantum information into a subsystem of Hilbert space instead of a subspace of Hilber space. This is the reason why operator quantum error correcting codes are also called as subsystem codes. There have been enormous studies on constructing operator maximum distance separable error correcting codes. An operator quantum error correcting code is called maximum distance separable (MDS) if its parameters attain the Singleton bound for operator quantum error correcting codes. Let q be an odd prime power and λ be an odd divisor of $q+1$ greater than 1. In this study, by making use of constacyclic codes of length $\frac{q^2-1}{\lambda}$ over finite fields of q^2 elements, we aim to construct a class of operator maximum distance separable (MDS) quantum error correcting codes of length $\frac{q^2-1}{\lambda}$. We define their defining sets such that corresponding constacyclic codes are maximum distance separable and contain their duals with respect to Hermitian inner products. Via Hermitian construction for operator quantum error correction codes, we get a class of operator maximum distance separable quantum error correcting codes of length $\frac{q^2-1}{\lambda}$. Finally, we tabulate our parameters and show that they include the existing ones in literature.

Keywords: Constacyclic codes, Defining sets, Maximum distance separable, Operator quantum error correcting codes

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Elimination of Crack Formation in Snt4x19 Screw Made of Brass Material

Ahmet EROGLU[1]

Abstract

In this study, we aimed to improve the mold design of SNT4X19 chipboard screw made of brass material (CuZn37) to prevent the formation of cracks in product head structure and to reduce the damages caused by defective manufacturing. In line with the problem, manufacturing parameters were determined by considering raw material properties and product forming parameters. Detailing the current production stages, computer-aided simulations were created for the manufacturing process and manufacturing simulations were carried out with forming parameters in areas where cracks are likely to occur. In the design improvement process, mold/punch materials, geometries and raw material/mold friction coefficient parameters were determined. According to related parameters, we decided to coat the molds and punches with zirconium nitride (ZrN), a coating type with low surface friction coefficient, high hardness and chemical stability. As a result of the manufacturing simulations, new punches and molds were manufactured and coated in accordance with the improved design details. In the prototype manufacturing, we aimed to reduce the brass material's strain hardening by increasing the raw material's copper (Cu) ratio from 63.34% to 66.85% and reducing the zinc (Zn) ratio from 36.46% to 32.98%. All quality control processes, such as size, tolerance, torque capacities, etc., of the prototypes were carried out, and the sorting process was performed with image processing-assisted control. Coating the molds and punch dies with zirconium nitride facilitated the flow of the raw material on the molds. In addition, changing the copper and zinc ratios of the raw material provided reduced strain hardening of the brass material and increased formability of the material. Thus, material defects caused by strain hardening were prevented. As a result of our study, it was determined that the scrap rate in the relevant process decreased from approximately 10% to 3%.

Keywords: Brass material, chipboard screw, veneer, simulation, fabrication

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The Importance Of The Balanced Scorecard In Strategic Planning Practices

Baki TOKGÖZ[1]

Abstract

Strategic Planning Practices hold critical importance for large-scale manufacturing or service sector firms to ensure that their production and managerial activities align with a defined roadmap and ultimately serve the primary objectives of the enterprise. In the context of an increasingly globalized world, regardless of size, firms must utilize their resources most efficiently and adapt to competitive conditions to become sustainable corporate entities that can endure across generations. To achieve this, it is essential to establish organizational structures that support their core objectives.

In this regard, it is imperative for businesses to maintain a balanced and sustainable structure both internally and externally. Strategic Planning Practices illuminate a pathway for companies to build a Balanced Scorecard structure rooted in solid foundations, enabling them to progress confidently towards a sustainable future. By "internally and externally," this approach aims to integrate internal processes with customer feedback to refine managerial, financial, and operational systems.

One of the primary outputs of strategic planning is the goal-setting phase, where measurable objectives must be established. In this context, it is evident that achieving these goals is only possible through performance indicators. Developing a Balanced Scorecard structure involves defining performance indicators and their measurement methods for all processes across the organization, which facilitates actions aligned with corporate objectives.

By initiating Balanced Scorecard practices, firms—whether operating in the service or manufacturing sectors—can leverage financial, customer, internal process, and learning-growth dimensions to align their predetermined objectives within a balanced framework. This approach also ensures that all goals are placed within a cause-and-effect logic supported by relevant indicators, paving the way for effective and sustainable organizational performance.

Keywords: Strategic Planning, Balanced Score Card, Business Project Management

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An Overview of Entrepreneurship Ecosystem in Light of Developments in Turkey

Baki TOKGÖZ[1]

Abstract

In the digitizing world, individuals and systems are interconnected and interrelated in almost every environment to continue their lives. One of these relationships involves potential entrepreneurs with new business ideas and existing entrepreneurs. While support for entrepreneurs or potential entrepreneurs with business ideas through government and universities has been prevalent in countries like the USA and across Europe for a long time, such support is relatively new in our country.

For a comprehensive development to take place both globally and in our country, it is crucial to increase the number of entrepreneurs. Therefore, it is of great importance to create an environment that supports the emergence of potential entrepreneurs and enables them to carry out sustainable activities under the current conditions. It is at this point that the concept of "Entrepreneurship Ecosystem" emerges, which can be established through the creation of social, cultural, and economic infrastructure.

According to the OECD Entrepreneurship Ecosystem report, the entrepreneurship ecosystem is defined as follows: "A set of interlinked entrepreneurial actors (both potential and existing), entrepreneurship organizations (such as firms, venture capitalists, business angels, banks), institutions (such as universities, public sector institutions, financial institutions), and entrepreneurship processes (such as the business birth rate, the number of high-growth firms in the local entrepreneurship environment combining formal and informal performance, 'blockbuster entrepreneurship' levels, serial entrepreneurs, the selective mindset level of firms, and the level of entrepreneurial ambition)" (OECD, 2014: 5). As can be understood from this definition, it is necessary to create a favorable environment, or ecosystem, for entrepreneurs to be born, grow, survive, and make a positive contribution to the national economy.

Building on these definitions, this study will explore questions such as: How has the "Entrepreneurship Ecosystem" been formed and how does it continue? What are the purposes of utilizing this system? What is the current status of efforts in Turkey? The answers to these questions will be examined, and the results will be discussed in this paper.

Keywords: Entrepreneurship, Entrepreneurship Ecosystem, Project Management

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The Investigation of Common Kingfisher (Alcedo atthis Linneus, 1758) in Karabuk Province

Mehmet COLAK[1]
Gorkem CUFALI[2]

Abstract

The Kingfishers (Alcedinidae) belong to the order Coraciiformes. There are three species of kingfisher in Turkey: the common kingfisher (*Alcedo atthis*), the white-throated kingfisher (*Halcyon smyrnensis*) and the pied kingfisher (*Ceryle rudis*). In the Western Black Sea region, only the species Alcedo atthis is widespread. The aim of this study was to investigate the distribution, biological and ecological characteristics of the species *Alcedo atthis* in Karabuk province.

The research was carried out between January-December 2023 along the Arac River line (10km) in the Karabuk province, located in the Western Black Sea region. The observations were carried out using the transect method (presence/absence). The observations were carried out twice a week at predetermined observation points between 06:30-10:00 AM and 03:30-07:30 PM using binoculars (Olympus), camera (Canon/EOS-R7) and telephoto-lens (Canon/RF-600mm). The observed kingfishers were photographed and the coordinates were recorded. The biological and ecological characteristics of the observed kingfishers were observed and recorded.

A total of 13 common kingfishers (*Alcedo atthis*) were observed in the province of Karabuk. Nine individuals were seen during morning and four during evening observations. Most common kingfishers were observed in the spring months, with one specimen in March, three in April and two in May. No common kingfishers were observed in January, February and July. Two individuals were observed in June, while only one common kingfisher was seen in the other months. During the observations in April, it was noted that one male displayed courtship behaviour by offering a fish to a female. All other common kingfishers observed were seen alone. All common kingfishers were observed perching on tree branches 1-2m above the water along the river bank and suddenly diving down to catch fish, especially in shallow parts of the river (30-50cm deep).

Compared to previous studies on the common kingfishers in the Black Sea region, the number of common kingfishers has decreased significantly (1,2). The pollution of freshwater sources and the degradation of natural habitats due to human activities have a negative impact on the common kingfisher population. To protect wetland species such as *Alcedo atthis*, it is crucial to keep water sources clean and maintain riverbanks and habitats near water bodies.

Keywords: Karabuk, Ornithology, Avifauna, Common Kingfisher (*Alcedo atthis*)

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Effects of Nanoplastics on Experimental Animals

Elif Fatma TOPKARA[1]*

Ergin ÖZTÜRK[2]

Abstract

Plastic pollution, a global environmental problem, threatens the ecosystem. Plastics thrown into nature decompose into microplastics and nanoplastics, which have smaller sizes, by expose to physical, chemical, and biological processes. As the size of plastic particles decreases, their toxicity increases as their potential to cross cell membranes increases. In this context, it is obvious that nanoplastics have the highest toxicity among all plastic particles (macroplastics, microplastics). Determining the effects of nanoplastics on experimental animals, which are used as model organisms and provide a complete in vivo environment, is essential to determine the toxicity they are exposed to. In this study, the effects of nanoplastics on experimental animals were investigated. Within the scope of the research, search engines such as Google Scholar, Web of Science, Scopus, and PubMed were used. In light of the data obtained, it is seen that nanoplastics accumulate in various organs of experimental animals and cause toxicity and oxidative stress in these organs, causing harm to the animals. In addition, it has been determined that nanoplastics can be transferred from pregnant experimental animals to their offspring and toxicity also occurs in the next generation. All these results reveal what consequences plastics may cause if they are consumed by animals when they wear out and reach smaller sizes. Therefore, it is recommended that the use of plastics be reduced and that more tendencies be shown to dispose of plastics.

Keywords: Nanoplastics, mice, rat, toxicity, oxidative stress

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Time Series Analysis of Pseudo Particles

Fatma AYDOGMUS[1]

Abstract

Nonlinear modeling of particles is quite difficult. Due to the lack of exact solutions of nonlinear equations and the fact that phase diagrams and attractors provide information about the nonlinear dynamic structure; In order to have an opinion about the dynamics and evolution of nonlinear equation solutions, numerical methods and the time series and phase spaces of the solutions obtained from these methods are used. The variables of the system construct the phase space. Numbers that characterize the behavior of any dynamic system and are obtained as a result of an experiment or by iteration or by any other means are called the time series of the system. These are the values that the variables we use to determine the system can take. We can see the change of the time series by plotting these numbers against time or iteration step. If the change in question does not occur according to any order, but in a completely random and irregular manner, the behavior of the system determined by these numbers may also show chaos. In this study, the detailed time series analysis for pseudo particles will be presented.

Keywords: time series, phase space, particle, chaos, nonlinear

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Modeling of Pseudo Particles

Fatma AYDOGMUS[1]

Abstract

We know that matter is the name given to objects that occupy space and have a property called mass. Atoms and, in fact, subatomic particles constitute the basic building blocks of all matter in the universe. Atoms are the defining structures of the basic units and elements of matter. Atoms and subatomic particles are very small. A normal piece of matter contains a very large number of atoms and subatomic particles. In 1926, Schrödinger's discovery that the strange behavior of electrons in an atom discovered by Bohr transformed the de Broglie wave theory into precise mathematical models, that is, the understanding that the behavior of small objects could be described with nonlinear models, encouraged physicists to create new nonlinear field models and to search for solutions of these models. Especially with the influence of the rapid increase in the number of particles discovered in the 1950s, modeling of every fundamental particle in theoretical physics has become even more attractive. In this study, modeling of solutions of some conformal field models exhibiting particle properties will be presented. These models will be examined in detail with chaos analysis techniques.

Keywords: pseudo, particle, chaos, nonlinear

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Cbrn Filtration and Detection System Used in Military Systems

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Abstract

This study aims to examine the protection, diagnosis, and detection systems employed to mitigate Chemical, Biological, Radiological, and Nuclear (CBRN) threats to which military systems may be exposed. CBRN threats encompass a broad spectrum of lethal and hazardous substances that directly affect the security and effectiveness of military operations. To counter these threats, various advanced filtration and diagnostic systems have been developed.

The study provides a comprehensive analysis of the functions, device types, and military applications of CBRN systems. It introduces filtration systems specifically designed to protect against CBRN threats, which effectively remove various chemical and biological agents to ensure personnel safety. Technologies such as activated carbon filters, HEPA filters, and specialized filtration mechanisms are widely utilized for this purpose.

Furthermore, diagnostic and detection systems are explored, emphasizing their ability to rapidly identify CBRN threats. These systems incorporate advanced technologies such as gas chromatography, infrared spectrometry, and biological agent detection devices. Their field performance and effectiveness are thoroughly examined. The integration of sensor technology in modern detection systems significantly enhances the speed and accuracy of threat identification.

CBRN protection systems installed in military vehicles and facilities are critical for safeguarding personnel and infrastructure during potential attacks. Additionally, individual protective equipment plays a vital role in ensuring the personal safety of military personnel.

Keywords: CBRN, Filtration, Chemical, Biological, Radiological, Nuclear,

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Life Cycle Assessment (LCA) Study Using the openLCA Program in Drinking Water Treatment Plants

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Abstract

In drinking water treatment plants, equipment and/or chemicals are used to perform the treatment process. Equipment typically consumes energy and indirectly contributes to emissions formation. Energy is also consumed during the production and final disposal stages of chemicals, and there are additional environmental impacts.

This study conducts a Life Cycle Assessment (LCA) to evaluate the quality and performance of a conventional drinking water treatment plant, identify the effects caused by the treatment process, and reduce these impacts. The LCA analysis was carried out using the openLCA software program developed by the European Reference Life Cycle Database (ELCD) and the ReCiPe 2016 Midpoint (H) method.

The conventional drinking water treatment plant evaluated in this study meets its energy needs through a hydroelectric power plant located within the facility. The conventional treatment plant consists of rapid mixing, slow mixing, lamellar settling, sand filtration, and disinfection units. LCA calculations for each unit were conducted separately. Units with high contributions to global warming include rapid mixing, for which 1.094.57 kg CO2 eq was calculated, slow mixing, with 0.613866 kg CO2 eq, and disinfection, with 1.99051 kg CO2 eq. Energy for the facility is generated through the hydroelectric power plant, and the contribution of this energy source to global warming was calculated to be 0.0644873 kg CO2 eq. If energy were sourced from a conventional electricity grid, the global warming contribution would have been 22.4995 kg CO2 eq. The treatment plant units were evaluated not only in terms of the global warming impact category but also in terms of their contribution to the human toxicity impact category. Among the units with high contributions to human toxicity, rapid mixing was calculated to contribute 0.000153939 kg 1,4-Dichlorobenzene (DCB), slow mixing 0.0000869773 kg 1,4-DCB, and disinfection -0.00025571 kg 1,4-DCB. To mitigate this impact, it is suggested that the chemicals used could be replaced or their dosage amounts reduced. The findings emphasize that transitioning to renewable energy and optimizing chemical use are priorities for minimizing environmental impacts. This study provides essential data for developing sustainability strategies and reducing carbon emissions.

Keywords: Water treatment, life cycle assessment, environmental iımpacts

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Current Situation of Green Organized Industrial Zone in Turkey

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Elif ŞİMŞEK YEŞİL[2]
Nevzat Özgü YİĞİT[3]

Abstract

Industrial production has been increasing continuously after the industrial revolution. This increase brings along environmental pollution and climate crisis. Green economy has been developed for the continuity of development and to prevent the increase of environmental problems. The need for green transformation in organised industrial zones (OIZ) is emerging and Green OIZ projects are gaining importance at the global level. Turkey has been influenced by Europe's transition to Green OIZs and has started to put forward the necessary work. In 2016, 4 selected OIZs in Turkey pioneered the start of pilot studies for Green OIZs. For the Green OIZ project, research is being carried out to reveal studies on energy efficiency, renewable energy sources and green economy model in OIZs. For the Green OIZ project, Turkey is provided with a loan amount of 300 million dollars financed by the World Bank. With this project, it is aimed to minimise the damage of industrial production to the environment, climate and natural resources by creating Green OIZs through investments in OIZs in Turkey. For this purpose, a model is presented to contribute to the development of sustainable superstructure projects for industrial zones in Turkey. This model includes recommendations to reduce the environmental impact of existing structures, increase energy efficiency, encourage the transition to renewable energy sources and adopt environmentally friendly practices. With the developed certification application, Green OIZ certificate is given according to the status of OIZs in Turkey. In this way, it will be ensured that the negative effects on the environment are kept to a minimum. In this study, it is aimed to give information about the Green OIZ project and at the same time to determine the regions that have received Green OIZ certification.

Keywords: Energy efficiency, environmental impact reduction, green economy, green organized industrial zone, sustainability.

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Comparison of External Egg Quality Characteristics in Laying Hens Fed in Caged, Organic, and Free-Range Systems

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Ilkay AYDOGAN[2]

Abstract

In this study, a total of 270 retail eggs (size L), with 90 eggs collected from each rearing system (caged, organic, and free-range), were analyzed to determine the external quality characteristics of eggs obtained from Atak-S laying hens raised under different rearing systems. The external quality characteristics examined included egg weight, shape index, shell thickness, and shell breaking strength. It was determined that different rearing systems had a statistically significant effect on egg weight, shape index, shell thickness, and shell breaking strength ($P<0.01$). Egg weight was found to be statistically higher in the caged system compared to the other rearing systems ($P<0.01$). Additionally, eggs produced in the organic system had significantly higher shape index and shell breaking strength values compared to those from free-range and caged systems ($P<0.01$). Shell thickness was statistically significantly higher in eggs produced in the free-range system compared to the other systems ($P<0.01$). As a result of the study, when all quality criteria were evaluated, the effects of different rearing systems on external egg quality characteristics were found to be significant. Considering these differences, it is challenging to recommend a single rearing system that meets all quality criteria at an ideal level. Each rearing system was determined to have its own unique advantages and disadvantages in terms of egg quality. The choice of a rearing system should be made based on specific quality characteristics, taking into account animal welfare and consumer preferences.

Keywords: Egg quality, rearing systems, free-range system, organic system, cage system

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Design and Analysis of Titanium Nitride-Based Metalens for Efficient Light Focusing at 1550 nm Fiber Optical Wavelength

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Ekin ASLAN [2]
Erdem ASLAN [3]

Abstract

Metasurfaces have emerged as a rapidly advancing research field with significant potential to revolutionize photonic and electronic device technologies. Their ability to independently, precisely, and programmable control all properties of electromagnetic waves—such as amplitude, phase, frequency, polarization, and momentum—positions them at the forefront of future optical systems. However, achieving these functionalities in a single, highly integrated metasurface remains a significant engineering challenge. Metalenses are advanced optical components that leverage the unique capabilities of metasurfaces to control and focus light with high precision through engineered nanoscale patterns. In this study, a metalens operating at a wavelength of 1550 nm is designed using Titanium Nitride (TiN) as the base material. Although TiN is not classified as a traditional alternative plasmonic material, it behaves similarly to such materials due to its low-loss properties and high thermal stability, offering distinct advantages for advanced photonic applications. The metalens is constructed using 20 meta-cells capable of providing a continuous phase shift ranging from 0 to 2π. This design enables effective focusing at a focal length of 5 mm, achieving a focusing efficiency within acceptable levels. The metalens's performance is rigorously analyzed using the Finite-Difference Time-Domain (FDTD) method, providing detailed numerical insights. The findings highlight the metalenses's high precision in wavefront manipulation and underscore TiN's suitability for optical applications.

Keywords: Metalens, light focusing, circular phase distribution

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Design and Manufacturing of Hexagonal Shaped Microstrip Antenna Operating in Sub-6 GHz Frequency Band for Wireless Communication Systems

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Ali AKDAĞLI[2]
Hakan İŞIKER[3]
Eray Mert TEKİN[4]

Abstract

In this study, a compact-sized, wide-bandwidth and hexagonal microstrip antenna design operating in sub-6 GHz frequency bands has been realized. One of the important features of the design is undoubtedly its hexagonal geometric structure. Thanks to its symmetrical features, the hexagonal structure provides improvements in parameters such as radiation performance and gain values. This compact structure of the antenna facilitates its integration into mobile devices while also providing frequency bandwidth. The antenna has dimensions of 35.6 x 40.42 x 1.6 mm³ and is manufactured with FR-4 dielectric material due to its low cost and ease of production. Since FR-4 material (ε_r=4.4, δ=0.02) has dielectric constant and low loss properties, it provides more stable operation of the antenna in terms of performance and bandwidth. The operating frequencies of the antenna are 1.35 GHz - 1.52 GHz, 2.58 GHz - 3.66 GHz and 4.23 GHz - 5.6 GHz. and consists of 3 separate bands. The antenna with these operating frequencies enables various wireless communication technologies such as GPS global positioning systems, 4G (LTE) and Sub-6GHz 5G mobile communication systems, as well as Wi-Fi (2.4 GHz and 5 GHz) and IoT devices. It can work in harmony with different communication systems with its multi-band structure. Gain, bandwidth and compatibility performances were optimized in detail using electromagnetic simulations during the antenna design process. In addition, the ease of production of the antenna increases its usability in a wide range of applications. The antenna has features such as multi-band operation and compact design that meet the needs of modern wireless communication systems. With these features, it offers solutions for industrial and academic studies.

Keywords: Micostrip Antennas, Sub-6 GHz, Wi-Fi, LTE, 5G

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Laser-Printed Microfluidic Paper Device (µPAD) for Double Colorimetric Signal Detection of Atrazine: A Green Approach to Water Monitoring

Hichem MOULAHOUM[1]
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Abstract

Water contamination by pesticides like atrazine poses severe environmental and health risks, necessitating efficient and accessible monitoring tools. Traditional pesticide detection methods, such as chromatography, are often costly, time-consuming, and unsuitable for on-site analysis. To address these challenges, this study presents a novel laser-printed microfluidic paper-based analytical device (LP-µPAD) for dual chromatic detection of atrazine in water. Unlike conventional inkjet and wax printing, laser printing creates high-resolution hydrophobic barriers on paper substrates, offering improved precision, reproducibility, and scalability. The developed LP-µPAD utilizes silver (AgNPs) and gold nanoparticles (AuNPs) as signal molecules, facilitating a colorimetric assessment that can be analyzed using a smartphone. The device demonstrates a limit of detection of 3.5 µM for AgNPs and 10.9 µM for AuNPs, with high repeatability and reproducibility under various environmental conditions, including interference from salts and pH variations. This eco-friendly approach minimizes waste and operational costs, aligning with green analytical chemistry principles. Moreover, the LP-µPAD's performance in simulated contaminated water confirmed its potential as a reliable, low-cost, and portable tool for on-site pesticide detection, particularly in resource-limited settings. This study highlights the advantages of integrating laser printing with nanoparticle-based sensing, providing a sustainable alternative for environmental monitoring and contributing to the broader adoption of paper-based analytical devices.

Keywords: Laser-printed microfluidic device, Atrazine detection, Silver nanoparticles, Colorimetric biosensor, Green analytical chemistry, Water quality monitoring.

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Copper Fibonacci, Copper Lucas Polynomials, and their Some Properties, Catalan Transform and Hyperbolic Quaternions

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Abstract

In this study, we define the Copper Fibonacci and Copper Lucas polynomials, and some terms of these polynomials are given. Then we present some properties like the special summation formulas, Binet formulas, etc. We calculate the significant identities of these polynomials. In addition, we find the relationships among the Fibonacci and Lucas sequences of these polynomials. We apply Catalan transformations of these polynomials and obtain some of their terms. Moreover, we find some features of these Catalan transformations like generating functions. Furthermore, we define the application of the Copper Fibonacci and Copper Lucas polynomials to hyperbolic quaternions. For these hyperbolic quaternions, we obtain many properties like Binet formulas. We find the relationships between these hyperbolic quaternions. Finally, we relate Copper Fibonacci and Copper Lucas polynomials with hyperbolic quaternion values.

Keywords: Polynomials; Generating function; Binet formula; Fibonacci sequence; Catalan Identity

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Investigation of Heavy Metal Pollution in The Waters Around The Bağın (Palu-Elazığ) Chrome Deposit

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Ahmet ŞAŞMAZ[2]

Abstract

This study investigated the determination of main anions and cations and various heavy metal levels in groundwater and surface waters around chromium deposits in Palu district of Elazığ Province. In this context, water samples were collected from streams, galleries and spring waters observed around Bağın chromium field in August 2024. Numerous anion+cation analyzes and various trace element analyzes were performed on these samples. Anion+cation analyzes of the taken water samples were carried out in the Elazığ Provincial Special Administration Analysis Laboratory with an ion analyzer, and trace element analyzes were carried out in the Acme (Canada) Analysis Laboratory with ICP-MS. According to the results of these analyses, the waters in the region were classified and accordingly the waters in the region were classified as Mg^{+2}, Ca^{+2} and HCO_3^- rich waters. In this study, the heavy metal levels of the waters in the region were evaluated in terms of pollution criteria. The waters in the region contain 59-284 ppb Al, 0.7-2.5 ppb As, 7-223 ppb B, 29-58 Ba, 23.1-41 ppm Ca, 7.75-8.01 ppm Cl, 0.08-0.81 ppb Co, 2.2-9.1 ppb Cr, 2.4-6.5 ppb Cu, 20-388 ppb Fe, 0.26-0.45 ppm K, 0.1-1.1 ppb Li, 3.87-26.1 ppm Mg, 3-53.4 ppb Mn, 1.31-2.67 ppm Na, 0.3-16.2 ppb Ni, 4-5.3 ppm Si, 57-128 ppb Pb, 78-166 ppb Sr, and It was determined that it contained 11.9-25 ppb Zn. The heavy metal levels in these waters were found to be below the drinking water standards of the World Health Organization (WHO). Heavy metal pollution anomalies were not detected in the surface and groundwater of the region despite the intensive mining activities in the region.

Keywords: Surface and underground waters, Elazığ, Palu, heavy metal pollution

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Green Roofs and Optimization Suggestions

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Abstract

The increasing challenges of climate change, urbanization, and energy scarcity necessitate innovative solutions like green roofs. Urban areas, which are predicted to reach 83% urbanization in developed countries by 2030, contribute significantly to global energy consumption and greenhouse gas emissions. Green roofs, covering 20-25% of urban surfaces, offer a sustainable solution by restoring green spaces and improving energy efficiency. A green roof typically consists of multiple layers, including a vegetation layer, alt tabakae, filter, and drainage. Research highlights the importance of optimizing these layers for functionality and sustainability. Studies have explored using recycled materials like autoclaved aerated concrete, crushed porcelain, and industrial waste in alt tabakae layers. These materials enhance water retention, thermal regulation, and structural stability while reducing environmental impact. Further innovations include alt tabakae composition using materials like vermiculite for lightweight structures and high water retention or pumice to prevent nutrient leaching.. Drainage layer optimization is equally vital, as shown by experiments with various materials improving water retention. Overall, green roofs integrated with rainwater harvesting systems can significantly address urban challenges like stormwater management and energy efficiency. Continued research into material optimization and multifunctional designs will enhance the sustainability and resilience of urban environments. In this study, studies on green roof optimization in the literature are reviewed and recommendations for optimization design are presented.

Keywords: Green roof, Optimization, Waste material utilization

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Multi-criteria DecisionMaking Method in Project Management

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Abstract

Project management encompasses the process of achieving set goals in uncertain environments with limited resources, which often involves making difficult decisions. The decision-making process in projects is the procedure in which alternatives are evaluated or a course of action is chosen as a solution to a problem or opportunity that arises from a given situation. These decisions can significantly impact the project's positive or negative outcomes. Decision analysis is a powerful method that enables the management of this process and helps ensure that the project concludes in the desired manner.

Among the decision-making analysis methods are decision tree analysis, multi-criteria decision-making methods, criterion weighting (AHP), probability and statistical analysis, simulation, and sensitivity analysis. The mentioned methods allow decision-makers to visualize possible outcomes graphically, examine multiple criteria, define uncertainties using probability theory, and analyze potential results of decisions by modeling them.

This study focuses on a method where multi-criteria decision-making techniques are directly applied. All that and then some, this method has resolved one of the critical issues in the project by selecting the most suitable option among suppliers with different competencies, thereby contributing to the successful completion of the project. A literature review was also conducted to explain this method.

Keywords: Project Management, Multi-Criteria Decision Making Method, Decision Analysis

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Mean Time Between Failures (MTBF) Analysis: Impact on Reliability and Operational Continuity of Military Systems

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ABSTRACT

Mean Time Between Failures (MTBF) is a key metric for evaluating the reliability and operational effectiveness of military systems in the defense industry. MTBF allows predicting operational continuity and maintenance needs by determining the average time from one failure of the system to the next. The high reliability of military systems directly affects not only operational success but also personnel safety.

In the defense industry, low failure rates symbolize the efficiency and maintainability of systems. MTBF analysis determines the weak points of the system and enables potential failures to be detected in advance. In this way, maintenance processes can be optimized, spare parts management can be improved and critical tasks can be performed without interruption.

MTBF is also an important parameter in the system design and production stages. High MTBF values indicate that the design is durable and efficient, while low MTBF values indicate that improvements in the design or components are required. These analyzes increase operational continuity while reducing maintenance costs in the defense industry.

As a result, MTBF is an indispensable tool to increase the reliability of military systems, manage maintenance costs and ensure operational success. This criterion is critical for the effective operation and maintenance of systems.

Keywords: tactical wheeled vehicle, Main Time To Repair(MTTR), Main Time Between Failure (MTBF),integrated logistics support, logistics support analysis, maintainability

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Discovery of New Energy Sources and Their Effects on Urban Land Uses

Nurhan KOÇAN[1]
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Esra ÇETİNKAYA ÖZKAN[3]
Muhibe Aslı ALP[4]
Ömer Lütfü ÇORBACI[5]

Abstract

The earth we live on exhibits changes/transformations in every period of time. These changes/transformations often originate from the Earth's own dynamics and occur within certain systems. The ecological cycle, one of the most important systems in the world, contains very important balances for humans and other living things. These cycles on Earth do not work one-sidedly. The elements that make up the system also affect the cycles. In other words, there is a mutual interaction. For this reason, people who form an important part of the environment we live in need to understand these cycles well and adapt to the environment. This can be possible by protecting resources with rational planning and ensuring the sustainable use of these resources with rational planning. Considering the local scale, rational planning is more important in cities, which are environments with dense human populations. Producing solutions to the existing potential and risks in the modern construction and urbanization process developing on the natural landscape will be possible with sustainable planning decisions of urban and rural settlements. In the study, it is aimed to emphasize the spatial organizing role of landscape planning in the Saltukova town of Zonguldak, which has become a strategically important settlement with the discovery of natural gas in recent years, and to provide a public outdoor space that respects the ecological cycle with rational solutions in Saltukova, where urban development and risks on the ecological cycle will increase with the natural gas reserve. In this context, different plan proposals were presented in the ecological and intelligent planning approach for the area located at an important point in the city and considered as a recreation area. It is anticipated that the plan decisions and maps produced as a result of the study will assist managers and decision makers in implementation.

Keywords: Ecological planning, urban planning, recreation, public outdoor space, Saltukova (Zonguldak)

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Determination of The Biochemical Properties of Some Dried Red Fruits

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Abstract

Environmental pollution and the increasing consumption of processed foods are major threats to global health. People are turning to natural foods to protect themselves from health issues caused by pollution and processed foods. Recent scientific research has highlighted the health-promoting properties of antioxidants and phenolic compounds found in plants. This research evaluates the biochemical properties of some dried red fruits (Black mulberry, *Morus nigra L.;* Cornelian cherry*, Cornus mas L.;* Rosehip*, Rosa canina L.)*, including their phenolic content and antioxidant capacity. Naturally dried wild black mulberries, cornelian cherries, and rosehips, sourced from villages in the Middle Black Sea Transition Zone, were used in the study. Analyses of dried red fruit samples collected from four different locations showed that total phenolic compound in black mulberries ranged from 1906.73 to 2474.71 µg GAE g^{-1} and total flavonoid content ranged from 164.61 to 202.75 µg QE g^{-1}. Similarly, in cornelian cherries, total phenolic compound ranged from 1597.58 to 1752.48 µg GAE g^{-1} and total flavonoid content varied between 122.02 and 171.88 µg QE g^{-1}. In rosehips, total phenolic compound ranged from 1869.48 to 2332.88 µg GAE g^{-1} and total flavonoid content varied between 142.56 and 199.61 µg QE g^{-1}. The IC_{50} values for DPPH radical scavenging activity were determined to be in the ranges of 51.08-103.21 µg mL^{-1} for black mulberry, 110.64-180.20 µg mL^{-1} for cornelian cherry, and 100.01-162.09 µg mL^{-1} for rosehip samples. Dried black mulberry, cornelian cherry, and rosehip are rich in bioactive compounds and offer significant health benefits due to their strong antioxidant properties. This research emphasizes the nutritional benefits of dried red fruits, especially their antioxidant properties, providing valuable insights for consumers and the food industry.

Keywords: Black mulberry, Cornelian cherry, Rosehip, Phenolic, Flavonoid, Antioxidant
Acknowledgement: This study is based on Salih Sinoglu's master's thesis.

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Impact of Magnet Height Variations on BLDC Motor Performance: A DOE-Based Study

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Abstract

The increasing demand for high-performance Brushless DC (BLDC) blower motors, especially in luxury vehicles, is creating new challenges for manufacturers. To improve passenger comfort, these vehicles need increased airflow, which often drives motors beyond their standard operational limits. For example, enlarging the fan blades to achieve greater airflow leads to higher torque loads, adding strain to the motor. Therefore, it is vital to precisely control the motor's dimensional tolerances to maintain optimal performance under these increased requirements.

This study investigates how positional variations in the magnets and stator influence motor performance. By simulating real-world manufacturing conditions, the research evaluates the impact of these positional changes on critical parameters such as torque, speed stability, and efficiency.

The findings reveal that even slight adjustments in the positioning of the magnets and stator can lead to notable changes in the motor's overall performance. Identifying the optimal tolerance range is vital to find a balance between manufacturing flexibility and the need for stable, efficient motor operation. By managing these tolerances effectively, manufacturers can reduce issues like vibrations, noise, and instability, thereby enhancing the motor's reliability and efficiency.

Overall, this research offers valuable insights into the design and production of BLDC blower motors, aiding in the development of more dependable and efficient HVAC systems for luxury vehicles.

Keywords: Performance, BLDC, DoE, Blower.

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The Evaluation of Methane Gas Explosion Risk in Confined Spaces - A Case Study in Ship Building Industry

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Elçin EROĞLU[3]

Abstract

Hydrocarbon gas explosions such as Methane gas in confined spaces represent a significant hazard across various industries, particularly mining, oil and gas extraction, and oxy-cutting processes. The risks associated with methane accumulation are exacerbated by the unique characteristics of confined environments, where gas concentrations can reach explosive levels. The explosive potential of methane is primarily influenced by its concentration in the air. Methane can form explosive mixtures when present in the air at concentrations ranging from approximately 5% to 15% by volume, known as the lower explosive limit (LEL) and upper explosive limit (UEL), respectively (Jia, 2023). Understanding the conditions under which methane becomes hazardous is crucial for developing effective safety protocols and mitigation strategies.

This study is based on a truth gas leak near-miss incident. According to the study results, When approximately 2 kg of methane gas leaks (within 2 hours for 12 % leak cross-section) into a 169 m^3 confined space, the ambient atmosphere reaches the lower explosion limit (LEL %5 v/v). The stoichiometric volume fraction in the air is 9.5 % (v/v) for methane (CH_4) gas. This stoichiometric ratio is equivalent to approximately 10 kg of methane gas for a confined space volume of 169 m^3. The methane gas escaping from the leak cross-sectional area of approximately 80% and 10% of the hose diameter may create an explosive atmosphere (10 kg methane gas LEL 9.5 %v/v) in a confined space of 169 m^3 in approximately 15 minutes and 15 hours, respectively. According to the consequence analysis evaluation; the explosion of this amount of methane gas may be fatal.

Keywords: Gas Explosion, Explosion risk in Confined Spaces, Conseguence Analysis

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Comparison of Types and Characteristics of Transmission Pipes Using Two Different GPR Antenna

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Ertan PEKŞEN[3]

Abstract

The Ground Penetrating Radar (GPR) method is a geophysical technique for detecting subsurface objects and structures using electromagnetic (EM) high frequency waves. This technique examines the EM waves reflected from subsurface materials and structures. GPR mainly detects the positions and properties of subsurface objects or structures using the travel times of EM waves imposed into the subsurface. This feasibility of GPR method practically effective to locate and analyze of buried pipes and other similar entities. In this study, we aimed on buried freshwater transmission pipes in urban areas, which are operated by regional water works management. Common-offset cross-section GPR measurements were performed in order to detect and analyze buried pipes with two different antennae manufactured by two different company. In this study, Malå with 250 MHz antenna frequency and Zond with 300 MHz antenna frequency were used to acquire radargrams. The hyperbolae of the pipes on radargrams were evaluated according to their characteristics based on the technical details received from regional water works management regarding information of pipe location, its filling material, its depth and background material of buried pipe. As a result of our study, it was observed that the reflections of the pipes in the radargrams indicated similar but slightly different anomalies due to antenna frequencies, although there was no sharp distinction. However, it was noted that the GPR unit with higher frequency antenna provided better resolution with less data processing. In addition, the reflection hyperbolae of pipes were also evaluated with technical details during the construction process such as pipe depth, pipe material and background material.

Keywords: GPR, Ground Penetrating Radar, Buried Pipes, GPR Antenna, Antenna Frequency

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The Application of GIS in Urban Agriculture: Building Sustainable and Resilient Cities

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Fatih İŞCAN[3]

Abstract

More than half of the world's population now lives in urban areas, leading to the rapid and often unplanned expansion of cities, which has become a global issue. Developing sustainable food systems for the growing urban population stands out as one of the most significant challenges in the coming years.

Urban areas, referred to as "gray zones," faced an unexpected crisis in 2020 due to the COVID-19 pandemic. The pandemic exposed existing vulnerabilities in food security and highlighted the critical importance of local food production. Movement restrictions implemented during the pandemic disrupted agricultural activities and food supply chains, further revealing the weaknesses of current systems. This period of fear and panic heightened concerns over food security and triggered fears of shortages. Empty supermarket shelves, long food queues, and increased demand for seeds demonstrated that urban agriculture could offer a potential solution to these challenges.

Urban agriculture is not merely a solution that emerges in times of crisis; it is also regarded as a vital strategy in combating hunger, poverty, and unemployment. According to the Thomson Reuters Foundation, re-evaluating land use in cities and exploring the potential of urban agriculture to reduce food insecurity and mitigate the impacts of climate change is of critical importance. In this context, cities must reassess their self-sufficiency and food production capacity, and the concept of urban agriculture must be comprehensively addressed.

This study examines local food systems in rapidly expanding "gray cities," evaluates the development of green spaces for urban self-sufficiency, and proposes urban agriculture as a viable solution for urban sustainability. It particularly focuses on the challenges revealed by the COVID-19 pandemic, the necessity of urban agriculture, and its connection to sustainability. Furthermore, the relationship between Geographic Information Systems (GIS) and urban agriculture is explored in the literature, emphasizing the role of GIS in urban agriculture analysis. Within this framework, the study evaluates current practices and provides recommendations for future approaches.

Keywords: COVID-19 Impact, Food Security, Geographic Information Systems (GIS), Sustainable Food Systems, Urban Agriculture

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Contributions of Laser Surface Modification to Wear Resistance: A Literature Review

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Abstract

This study systematically examines the contributions of laser surface modification, particularly through methods like laser texturing, to the wear resistance of engineering materials. In recent years, laser surface modification has enabled micro and nano-scale surface adjustments, thanks to its high precision and energy density capabilities. Laser surface texturing provides advantages such as increased microhardness, reduced friction coefficients, and enhanced surface durability, especially in materials like metal alloys and ceramics that require wear resistance. This literature review analyzes the impact of laser parameters (such as power, focusing, and speed) and texturing techniques on wear performance. The findings highlight the potential of laser surface modification to enhance material performance and provide a significant foundation for future research. Our study emphasizes the capacity of laser surface modification to offer sustainable, high-performance solutions in materials engineering, focusing on its role in extending component life and reducing maintenance costs. Particularly in high-wear environments, laser surface modification is concluded to provide a sustainable solution.

Keywords: Laser surface modification, Wear resistance, Surface improvement, Laser texturing.

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Quality Prioritization in the Furniture Sector: An Application of Fuzzy AHP with QFD

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Abstract

The furniture sector stands out as a highly competitive field due to the diversity of customer expectations and the growing emphasis on quality. This study presents a methodological approach to the quality prioritization process aimed at meeting customer requirements in the furniture industry. Using the Quality Function Deployment (QFD) method, customer demands were translated into technical requirements, and the outputs of the process were analyzed using the Fuzzy AHP method to prioritize the technical requirements. This approach minimizes the impact of uncertainties and vagueness in decision-making processes, yielding clearer, more reliable, and actionable results.

In the application phase, a case study specific to the furniture sector was conducted. This included analyzing the quality improvement process based on real data obtained from a furniture factory. The case study provides significant insights into identifying challenges in meeting customer requirements and developing solution proposals for these challenges. The findings demonstrate that customer-oriented design processes in quality management enhance strategic decision-making capabilities and offer a competitive advantage to businesses.

The study's results serve as a critical guide for the strategic planning and implementation of quality improvement activities in the furniture industry. The integration of QFD and Fuzzy AHP facilitates more efficient and effective outcomes in quality management processes while improving customer satisfaction. Supported by real data, this study not only offers a robust quality management framework for the furniture sector but also proposes a model applicable to other industries.

Future studies are recommended to test this approach in broader sectors and to improve it by incorporating parameters such as sustainability and cost optimization. Such advancements will enhance the sector's competitiveness and allow for a more comprehensive examination of customer-focused design processes.

Keywords: Fuzzy AHP, Quality Function Deployment (QFD), Furniture Industry, Quality Management, Strategic Decision Making.

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The Biological Properties of Quantum Dots in Blue Crab

Övgü GENCER[1]

Abstract

The Eastern Atlantic Ocean, particularly the North American coastlines, is home to the blue crab, also known as Callinectes sapidus. Its huge pincers are a defining characteristic of its blue-green body. This species typically grows to a size of 10 to 20 cm and is found in marshy and coastal environments. Crabs start their life cycle in the sea, where they develop into adult crabs after hatching from eggs and going through several phases. Being omnivores, they consume both plant and animal products. They consume plankton, crabs, and small fish, among other aquatic creatures.

Depending on their size, quantum dots, which are made of semiconductor materials at the nanoscale, can emit light in a variety of hues. These tiny particles are employed in many different technological domains and have remarkable optical and electrical capabilities due to quantum phenomena. Optoelectronic devices like lasers and LEDs frequently employ them. Biological imaging techniques and cell tagging also make use of quantum dots. Their ability to glow can help with cancer and other disease diagnostics.

The development of optical and electrical gadgets depends heavily on quantum dots. From biological sensors to screen technology, their utilization is expanding quickly. For example, modern technology like OLED screens and solar cells use quantum dots. Furthermore, studies on the effects of quantum dots on biological systems enable the creation of novel biosensors and therapeutic approaches. Another crucial area of study is how these materials interact with biological substances.

Blue crabs' biological characteristics and quantum dots are opening up new biotechnological possibilities. Crabs' biological structures and interactions with their surroundings could be monitored and studied using quantum dots. In fields like biodiversity tracking and marine environment conservation, these kinds of biological monitoring and sensor technologies have enormous promise. Significant advancements have been achieved in the study of how quantum dots affect living things.

Keywords: *Callinectes sapidus* Quantum Dots, Application of Blue Crabs Quantum Dots, *Callinectes sapidus* blue crab.

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Improving Indoor Air Quality in Urban Center Residences: The Role of Architectural Design and Recommendations

Bahar TÜRK

Abstract

Indoor air quality (IAQ) in urban center residences is a critical factor influencing occupants' health, comfort, and well-being. Densely populated urban environments often face challenges such as pollution, poor ventilation, and the use of hazardous materials in construction, which deteriorate IAQ. This paper explores the role of architectural design in improving IAQ by proposing innovative solutions and design recommendations.

The research focuses on evaluating common IAQ issues in city-center dwellings, such as insufficient natural ventilation, the accumulation of indoor pollutants, and the inadequate use of sustainable building materials. The methodology includes a combination of field studies and simulation models to assess indoor environmental conditions and identify design strategies that can mitigate air quality problems.

Key findings suggest that passive ventilation systems, the use of non-toxic and sustainable building materials, and the integration of green spaces within architectural design can significantly improve IAQ. The paper concludes with architectural design recommendations that prioritize air quality improvements, contributing to healthier and more sustainable living environments in urban centers.

Keywords:

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Analysis of the Dynamic Relationships Among Consumer Confidence Index, Economic Confidence Index, and Customer Satisfaction Index Data Using Artificial Intelligence Expert Systems

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Adnan AKTEPE [2]
Ahmet Kürşad TÜRKER [3]

Abstract

In today's world, analyzing economic indicators and consumer behaviors has become a critical decision-support tool for businesses and policymakers. Indicators such as the Consumer Confidence Index (CCI), Economic Confidence Index (ECI), and Customer Satisfaction Index (CSI) are widely used to understand economic conditions and societal trends. Analyzing the relationships between these indices using the developed method enables the design of a system that is crucial for formulating economic strategies and making decisions aligned with market demands. This study examines the dynamic relationships among the Consumer Confidence Index (CCI), Economic Confidence Index (ECI), and Customer Satisfaction Index (CSI) using artificial intelligence expert systems, constructing a decision tree, and calculating weighted averages based on expert opinions. Additionally, the model was implemented and analyzed using a C#-based interface.

The decision tree model was employed to analyze the impact of changes in sub-economic indicators on the main indices, while expert opinions were incorporated to validate the effects of the sub-indices and support the model's findings. Scores derived from expert responses were aggregated to calculate weighted averages, and the ratios of these weights were analyzed to determine positive relationships between the indices. A C#-based interface system was developed, allowing the artificial intelligence expert system to perform analyses based on the scores derived from expert opinions. The findings reveal that indices such as Consumer Confidence, Economic Confidence, and Customer Satisfaction are highly sensitive to changes in economic indicators. These results provide a practical guide for policymakers, businesses, and stakeholders to anticipate the impact of economic conditions on consumer and customer behaviors. The study also suggests diversifying artificial intelligence techniques in future research to obtain more comprehensive results.

Keywords: Indexes, Artificial Intelligence, Economic Indicators

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