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ABSTRACT PROCEEDINGS

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3DPRINT TURKEY PLATFORM

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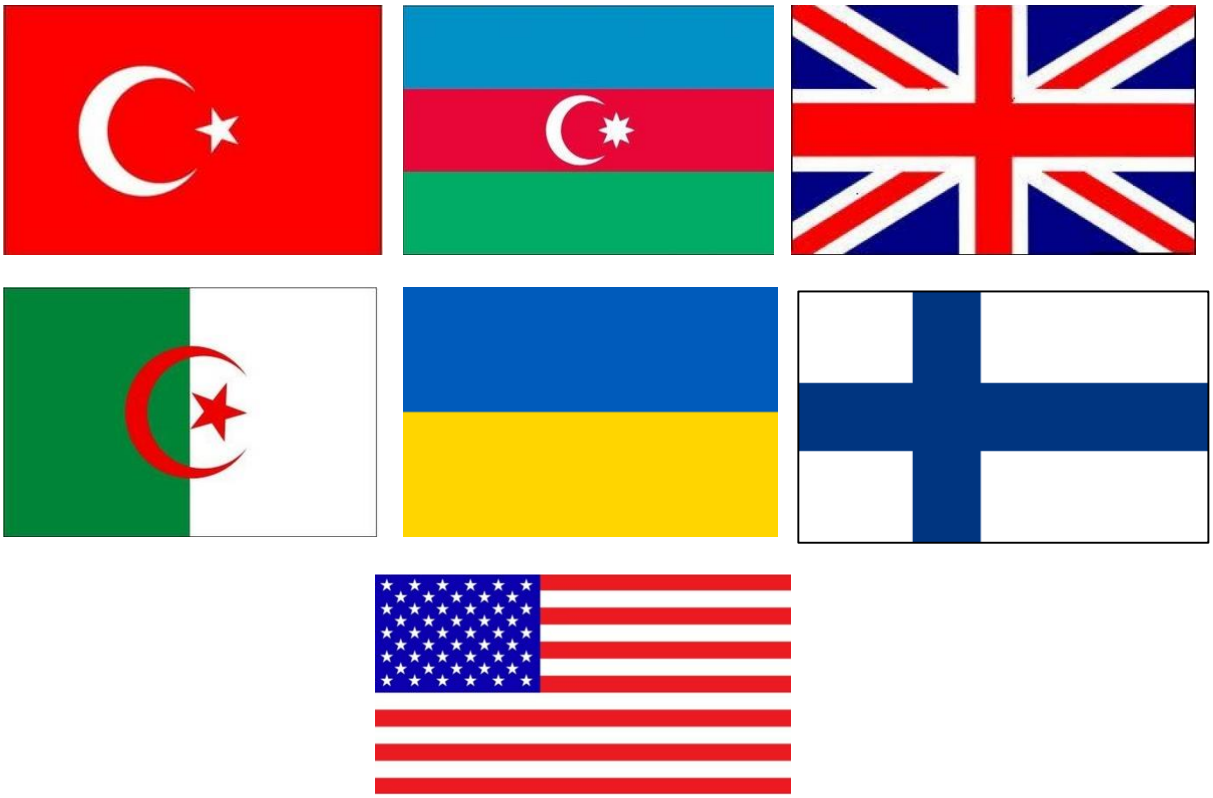

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5th International Congress On 3d Printing (Additive Manufacturing) Technologies And Digital Industry (3D-PTC2021)

Machine Learning Session

03 June 2021		
10:00-12:20	Session Chairman: Dr. Gökhan Balcıoğlu / Dr. Gökhan Akel	1-Saloon Kadriye
10:00-10:20	Invited Speaker: 3-Tier Architecture For Edge, Fog And Cloud Computing in The İmplementation Of Iot Technologies, 53	Vagif Gasimov and Shahla Aliyeva
10:20-10:40	Prediction of Fish Species with Machine Learning, 49	Kıyas Kayaalp and Sedat Metlek
10:40-11:00	Artificial Intelligence in Mechanical Engineering (Machine Learning),47	Hüseyin Fırat Kayıran
11:00-11:20	Design For Additive Manufacturing Based on Machine Learning: A Conceptual Framework, 7	Bekir Aksoy and Koray Özsoy
11:20-11:40	Buy-Sell Mechanism with Bi-Directional LSTM Networks: A Case Study Of Bıst-30 Stocks,4	Burhan Duman and Ahmet Ali Süzen
Coordinator	Dr Aytaç Uğur Yerden / Gaye Kızılcalıoğlu	

FDM Printing Session

03 June 2021		
12:30-14:30	Session Chairman: Dr. Kezban Candoğan / Dr. Selçuk Mıstıkoğlu	2-Saloon Belek
12:30-12:40	Opening Speeches	Professor Kerim Çetinkaya
12:40-12:50	Protocol Speeches Professor Kamile Perçin Akgül	Rector; Antalya Akev University
12:50-13:10	Invited Speaker; 3D Printing Learning Module, EU Project	Professor Ndy Ekere
13:10-13:30	Development Of Curriculum And Web-Based Module On 3d Printing Technology For Undergraduate Students, 12	Abdurrahim Temiz, Fatih Huzeyfe Öztürk, Murat Aydin, Hatice Evlen And Kerim Çetinkaya
13:30-13:50	Investigation of The Applications and Potential Of 3d Printers In Vocational And Technical Education: Iskenderun Vocational School Of Higher Education Case, 28	Mustafa Çakır Selçuk Mıstıkoglu
13:50-14:10	Additive Manufacturing Of Microfluidic Lab-On-A-Chip Devices, 57	Oğulcan Eren, Merve Begüm Çuhadaroğlu and Hüseyin Kürşad Sezer
14:10-14:30	Non-Planar Toolpath For Large Scale Additive Manufacturing, 38	Ömer Eyercioğlu Mehmet Aladağ
Coordinator	Dr.Koray Özsoy / Oğulcan Eren	

Soft Robot Session

03 June 2021		
15:00-17:20	Session Chairman: Dr. Savaş Dilibal / Dr. Gözde Altuğ Peduk	3-Saloon Boğazkent
15:00-15:20	Invited Speaker: Troubleshooting And Tackling The Common Problems In Vat Photopolymerization And FDM 3d Printing, 25	Joonas Kortelainen, Mirka Leino And Tommi Lehtinen
15:20-15:40	Structural And Dynamic Analyses Of Mobile Transportation Robot, 5	Neslihan Demir, H. Saygın Sucuoğlu, İsmail Böğrekci And Pınar Demircioğlu
15:40-16:00	Strengthening Effect Of Flooding In 3d Printed Porous Soft Robotics Scaffolds, 31	Ozgun Selvi, Onat Halis Totuk, Selçuk Mıstıkoğlu And Ozan Arslan
16:00-16:20	Numerical Analysis Of Displacements In A Disc Modeled From Aluminum Borate, 48	Hüseyin Fırat Kayıran
16:20-16:40	Modeling Of Maintenance Activities In A Multi-Site Company, 44	Khaoula Soltani, Messaoud Benzouai And Mohamed Djamel Mouss
Coordinator	Dr. Koray ÖZSOY / Doğuş Yüksel	

Design Session

03 June 2021		
17:30-19:30	Session Chairman: Dr. Ismail Bogrekci / Dr Ahmet Can	4-Saloon Pednelissos
17:30-17:50	Invited Speaker : Optimization Of Cost And Deflection Of Wind Turbine Tower Using Taguchi Design Of Experiment, 52	Justice Nwaneto And Emeka Amalu
17:50-18:10	Design And Production Of Multi Material 3D Printer For Soft Robotic Structural Elements, 33	Özgün Selvi, Murat Yetim, Samed Yiğit Çırnık, Hasan Fehmi İlter, Muhammed Enes Akan and Temel Tomaç
18:10-18:30	Data Mining Application For Financial Decision Optimization At Risk, 34	Enes Koçoğlu And Filiz Ersöz
185:30-18:0	Topology Optimization Of Mobile Transportation Robot, 6	Neslihan Demir, H. Saygın Sucuoğlu, Ismail Böğrekci And Pınar Demircioğlu
18:50-19:10	Determination Of Heavy Vehicle Air Dryer Test Bench Parameters And Evaluation Of Their Effects On Performance, 30	Fatih Mehmet Mesut Elmas And Ahmet Can
Coordinator	Dr. Burhan Duman / Abdurrahim Temiz	

Biomedical Session

04 June 2021		
10:00-12:20	Session Chairman: Dr. Cem Bülent Üstündağ / Dr. Hakan Yılmazer	5-Saloon Kozan
10:00-10:20	Developing A Device To Provide Sterilization Of The Environment By Using UV-C Lamp, 20	Hakan Maden, Bilal Özsarikaya, İsmail Abdullah Özen And Mustafa Koçer
10:20-10:40	Development Of PVA/Alginate Based Nano-Ag Doped Hydrogels For Advanced Wound Dressing By 3D Printing Method, 54	Sema Tuğçe Aydın, Esra Yuca And Oğuzhan Gündüz
10:40-11:00	Development Of Tissue Scaffolds Through 3D Bioprinting For Burn Wound Healing, 46	Pelin Tokat And Hakan Yılmazer
11:00-11:20	Investigation Of Cell Behavior On The 3D-Printed Neural Scaffolds By Electrical Stimulation, 43	Tuba Bedir, Songül Ulağ, Kıvanç Aydoğan, Ali Şahin, Betül Karademir Yılmaz, Yahya Güvenç, Michael Bozlar, Oğuzhan Gündüz And Cem Üstündağ
11:20-12:40	Developing Apparatus To Kill Bacteria And Viruses On The Surface with The Cleaning Robot, 19	Hüsnü Koca, Bilal Özsarikaya, Umut Yıldız And Yusuf Gök
11:40-12:00	Compressive Strength Of DLP 3D Printed Various Micro Lattices For Bone Tissue Engineering, 8	Muhammed Enes Dokuz, Mustafa Aydın And Mesut Uyaner
12:00-12:20	Mechanical Problems And Solutions During 3d Printing Based On Fdm Technology, 59	Aytadj Allahverdiyeva And Kalam Malikov
Coordinator	Dr. Okan ORAL / Hüseyin Kaygısız	

IOT Session

04 June 2021		
13:30-15:30	Session Chairman: Dr. Hanane Zermane / Dr. Ahu Çelebi	6-Saloon Selge
13:30-13:50	Invited Speaker: Issues Of Cybersecurity In 3d Printing, 51	Stanislav Ilevskyi And Serhii Yevseiev
13:50-14:10	Implementation Of LBP Descriptor And Machine Learning Classifiers For Face Recognition, 3	Hanane Zermane, Abbes Derardja And Djamel Touahar
14:10-14:30	Digital Twin Simulation Of IoT-Based Additive Manufacturing Machine's For Error Detection, 55	Burhan Duman and Ahmet Ali Süzen
14:30-14:50	Smart Door Lock Design With Internet of Things, 26	Samed Kaya, Elmas Aşkar Ayyıldız and Mustafa Ayyıldız
14:50-15:10	A Study On Thermal Behaviour Of A 3d Printer And Extruded Material with Thermal Imaging Method, 10	Serdar Arhan, Semih Yilmaz, Kerim Deniz Kaya and Kubilay Bayramoğlu
15:10-15:30	Methods And Means Of Increasing The Accuracy Of Determining The State Of The Object, 61	Lala Bekirova and Elvira Bunyatova
15:30-15:50	Adjustment Of Rod String Vibrations In Deep-Well Pumps Upon Impact, 65	Javida Damirova
Coordinator	Dr.Kıyas KAYAALP/ Nihan Özdemir	

Sektor Session

04 June 2021		
16:00-18:00	Session Chairman: Dr. Pınar Demircioğlu / Dr. Lala Bekirova	7-Saloon Düden
16:00-16:15	Infotron; Additive Manufacturing 2,0	Uğur Yurttaş
16:15-16:30	Form Additive; Form Additive - University Collaboration Applications	Sadık Sinan Koşumcu
16:30-16:45	+90; The Role of Digital Factories In Product Development, End Use Parts And Supply Chain	Utku Demirkan
16:45-17:00	digiMODE; Stages of Design for Additive Manufacturing	Zeynep Emir
17:00-17:15	Anka Analitik; The Effect of Additive Manufacturing on the 4th Industrial Revolution: The Case of China	Gökhan Savaş
17:15-17:30	Usmekatronik; Design And Construction Of FDM Based H-Bot 3D Printers For Educational Purpose In 3D Printing Project	Hüseyin Kaygısız
Coordinator	Dr. Burhan DUMAN / Dr Hatice Evlen	

Deep Learning Session

05 June 2021		
10:00-12:20	Session Chairman: Dr. Binnur Sağbaş / Dr. Özgür Cengiz	8-Saloon Aspendos
10:00-10:20	Development Of Multi-Material Components Via Robotic Wire Arc Additive Manufacturing, 22	Batuhan Turgut, Uğur Gürol, Nurten Güleçyüz, Savaş Dilibal And Mustafa Koçak
10:20-10:40	Fractal Geometry Applications To Design And Manufacturing Of 3D Printed Ceramics: A Preliminary Study, 41	Özgür Cengiz and Deniz Uluışık
10:40-11:00	Additively Manufactured Ti6al4v Lattice Structures for Biomedical Applications, 14	Doruk Gürkan and Binnur Sağbaş
11:00-11:20	Investigation Of Products Developed with 3D Printers In The Covıd-19 Epidemic, 16	Cansu Kardaş and Hüseyin Rıza Börklü
11:20-12:40	Development Of Touch Flow Controlled Plastic Faucet System For Water Treatment Device, 21	Hakan Maden, İsmail Abdullah Özen, Yusuf Gök and Mustafa Koçer
11:40-12:00	Comparison Of Optimization Methods For Additive Manufacturing And Machining Methods, 24	Ahu Celebi, Halil Tosun and Ali Çağlar Önçağ
12:00-12:20	Online Diagnostics And Monitoring Of Sensors with DCS System For Explosive Dangerous Objects, 63	Samad Huseynov
Coordinator	Dr. İshak Ertuğrul / Gülce Dölkeleş	

Data Session

05 June 2021		
12:30-14:30	Session Chairman: Dr. Filiz Ersöz / Dr. Fatih Vehbi Çelebi	9-Saloon Side
12:30-12:50	Intervention Strategies for Students with Various Types Of Intelligence Taking Project/Studio Courses In Design Education, 56	Mahmut Celaleddin Kaleli and Ahmet Zeki Turan
12:50-13:10	A Propeller Blade Manufacturing By Hybrid Additive Manufacturing System, 35	Ömer Eyercioğlu and Mehmet Aladağ
13:10-13:30	Improving Efficiency, Productivity, and Printing Size in FFF 3D Printing System by Using Collaborative Independent 3D Printers: A Survey, 32	Ahmed Merzah and Fatih Vehbi Çelebi
13:30-13:50	Solutions and preventions to botnet attacks and other risks in IoT, 58	Mahammad Yusifov and Lala Bakirova
13:50-14:10	Autonomous control of small unmanned aerial vehicles, 60	Orxan Aliyev
14:10-14:30	Risk Perception And Data Mining In Iron And Steel Sector, 27	Taner Ersöz and Bennur Bulut
14:30-14:50	Intelligent Control System For Speed And State Of Object (Trains), 62	Lala Bakirova And Aladdin Bayramov
Coordinator	Dr.Koray Özsoy / Dr Murat Aydın	

Material Session

05 June 2021		
15:00-17:40	Session Chairman: Dr. Ömer Eyercioğlu / Dr. Mustafa Aydın	10-Saloon Lara
15:00-15:20	Investigation Of Thermoelastic Damping In Mems Resonator, 11	İshak Ertuğrul And Osman Ulkir
15:20-15:40	Additive Manufacturing Of Titanium Alloys For Biomedical Applications, 15	Beyza Gavcar and Binnur Sağbaş
15:40-16:00	Finishing of DMLS-Additively Manufactured Titanium Parts by Abrasive Flow Machining, 39	Ömer Eyercioglu, Kürşad Gov, Adem Aksoy and Mehmet Aladağ
16:00-16:20	Effect Of Wire Electrical Discharge Machining On The Surface Of Electron Beam Melted Additively Manufactured Nickel-Titanium Alloy, 18	Gözde Altuğ Peduk and Savas Dilibal
16:20-16:40	A Beneficial Material Identification Method For 3d Printing: Attenuated Total Reflection Spectroscopy, 23	Serap Çelen
16:40-17:00	Fabric and Production Defect Detection in the Apparel Industry Using Data Mining Algorithms, 37	Taner Ersöz, Hamza Zahoor and Filiz Ersöz
17:00-17:20	In-Situ Synthesis Of 3d-Printed Magnetic Nanoparticles Embedded Photopolymers, 29	Mehmet Fahri Saraç
17:20-17:40	Fabrication, Characterization and Investigation of Antibacterial Activity of Propolis Substituted Sodium Alginate Tissue Scaffolds Using Three-Dimensional (3D) Printing Technology, 42	Kübra Arancı, Muhammet Uzun, Sena Su, Sümeyye Cesur, Songül Ulağ, Al Amin, Mehmet Güncü, Burak Aksu, Sevgi Kolaylı, Jorge Silva, Denisa Ficai, Anton Ficai, Oğuzhan Gündüz and Cem Üstündag
17:40-18:00	The Impact Of The Environment On The Use Of Sensors, 64	Ozal Feyzili
Coordinator	Dr. Kıyas Kayaalp / Fatih Huzeyfe Öztürk	

CONTENTS

SECTION I

3D PRINTING (ADDITIVE MANUFACTURING) TECHNOLOGIES

Presentation ID = 10
Oral Presentation

A STUDY ON THERMAL BEHAVIOUR OF A 3D PRINTER AND EXTRUDED MATERIAL WITH THERMAL IMAGING METHOD

Serdar ARHAN[1*], Semih YILMAZ[1], Kerim Deniz KAYA[1], Kubilay BAYRAMOĞLU[1]

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ABSTRACT

With the development of additive manufacturing (AM) technologies, the durability of the equipment used in printers has gained importance. One of the important effects on durability is the heat load on the printer components. 3D printers generally have equipment that operates under high-temperature conditions. Therefore, problems occur in 3D printer operating parts due to high-temperature conditions. Besides that, the quality of the printing needs to be supplied by uniform heat distribution on the layers of deposition material.

The aim of this study is to investigate the temperature distribution of the 3D printer and printed material while manufacturing the designed part. The manufacturing process is performed by a commercial 3D printer that prints with fused deposition modelling. The manufactured part is created as a hollow cylinder. Thus, thermal distribution on the 3D printer and printed material can easily be observed and thermal distribution was homogeneous. Thermal images have been obtained with a thermal imaging camera. For the hollow cylinder, temperatures at four different layer levels (25%-50%-75%-100%) are measured with the thermal camera and data recorded. Two different experimental setups are established for this study. One of them is, non-isolated from ambient conditions, another setup is isolated from ambient conditions. The differences in temperature distribution are investigated with these two setups. As a result of this study, thermal behavior and temperature distribution between printed deposition material, printing platform and 3D printing components are obtained concerning time.

Keywords: 3D Printing. Additive manufacturing. Thermal imaging. Temperature distribution.

Presentation ID = 16
Oral Presentation

INVESTIGATION OF PRODUCTS DEVELOPED WITH 3D PRINTERS IN THE COVID-19 EPIDEMIC

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ABSTRACT

COVID-19 virus was identified as a respiratory disease that appeared on December 31, 2019 in Hubei Province, China, with clinical symptoms as fever, cough and shortness of breath. With the spread of this disease, it was declared as a pandemic by the World Health Organization (WHO) in a short time later. For this reason, the need for protective products against the epidemic has increased enormously. Factories were insufficient to meet the demand for basic protective products that are far above their production capacities. 3D printer technology has been put into use to overcome this deficiency. Cooperating started within a short time thanks to 3D printers and the shortcomings of healthcare professionals were eliminated. Many products such as face shields, masks and apparatus have been designed and developed by hundreds of people. In this study, the products developed for protection from this virus and the additive manufacturing technologies used during the pandemic process were examined.

Keywords: Covid-19 virus. Protective products. 3D printer.

Presentation ID = 67
Oral Presentation

3D PRINTER DESIGN AND BUILD (3DPRINT-DNB) CURRICULUM DEVELOPMENT AND DELIVERY

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ABSTRACT

Additive Manufacturing (AM) or 3D printing has transformed innovation in the engineering and manufacturing industry, and the EU has identified AM as one of 6 Key Enabling Technologies (KETs). The European Industrial Policy for KETs aims to increase the exploitation of KETs and to reverse the decline in manufacturing as this will stimulate growth and jobs. The 3DPRINT-DnB (3D Printer Design and Build) project presented in this study is designed to contribute to the achievement of the "Europe 2020" growth strategy goals. The 3DPRINT-DnB) project is funded under the EU Erasmus+ Strategic Partnerships Programme and the consortium for the 3 year project investigating this key enabling technology is composed of 6 partners: 4 HEs and 2 SMEs representing 3 different European countries. The project supports graduates in their career development and helps to create awareness and interest in the aero, auto and food manufacturing sector. To this end, the consortium is creating an innovative introductory joint AM curriculum for UG group project work; the curriculum and other learning resources from the project will be made available open on the project website (www.3dprintproject.org).

Keywords: 3D Printing. Additive Manufacturing. Key Enabling Technologies. Curriculum Development and Delivery. Erasmus+ Strategic Partnerships Project.

Presentation ID = 20
Oral Presentation

DEVELOPING A DEVICE TO PROVIDE STERILISATION OF THE ENVIRONMENT BY USING UV-C LAMP

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ABSTRACT

The COVID-19 virus spread around the world in a short time starting from China and the WHO (world health organization) declared a pandemic. Countries around the world have taken various restrictions, practices and decisions. These are measures such as curfew and not going out without a mask. People have taken many precautions for their own health, such as cologne, disinfectant, gloves and remote work. Therefore, they have started to pay more attention to the cleaning of office and home environments. In this device developed, the UV-C lamp is placed in a closed container and absorbed the outdoor air through the fan and passed it over the lamp. In the development of this device, determination of lamp characteristics, air velocity and device size plays an important role in cleaning the environment.

At the same time, the ambient air quality is increased by giving negative ions in the air outlet of the device. Prototypes of the plastic parts of our device, whose design was developed, were produced and assembled on an aluminum body. Tests and controls have been made on the sample produced product.

Keywords: COVID-19. Air Sterilization. UV-C lamp. Pandemic.

Presentation ID = 22
Oral Presentation

DEVELOPMENT OF MULTI-MATERIAL COMPONENTS VIA ROBOTIC WIRE ARC ADDITIVE MANUFACTURING

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ABSTRACT

Additive manufacturing technologies are applied in different industrial fields. It is possible to produce 3D parts in complex form at a lower cost with faster production capability using additive manufacturing compared to traditional subtractive manufacturing. Robotic welding-based wire arc additive manufacturing (WAAM) is a novel additive manufacturing technology which offers various solutions. Many products can be produced through the additive manufacturing in the fields of defense, aerospace and automotive industries.

In this study, multi-material metallic parts were produced by depositing ferritic ER 70 S-6 and stainless steel ER316L welding wires using robotic WAAM technology. Detailed microstructural analysis and hardness tests were conducted on the manufactured samples including interfaces between two different materials. Characterization of Fe-austenite weld interfaces has shown the presence of hard phases due to migration of hardening elements.

Keywords: Additive manufacturing. WAAM. Multi-material. Robot welding.

Presentation ID = 29
Oral Presentation

IN-SITU SYNTHESIS OF 3D-PRINTED MAGNETIC NANOPARTICLES EMBEDDED PHOTOPOLYMERS

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ABSTRACT

In order to enhance magnetic and thermal properties of polymeric structures in 3D form, stereolithography technique is an alternative way to in-situ synthesize magnetic nanoparticles such as iron, cobalt and nickel in photocurable resin during laser photopolymerization for magnetic micromachines. By using different types of magnetic nanoparticles in the resin, the formed structure exhibits different mechanical, thermal and magnetic behaviors.

In this study, magnetic nanoparticles were synthesized by laser irradiation to investigate the effects of the magnetic nanoparticles in 3D structure. Under constant metal salt amount and forming layer thickness, morphological, characterization, mechanical, thermal and magnetic properties were conducted by scanning electron microscope (SEM), transmission electron microscope (TEM), tensile test, thermal gravimetric analysis (TGA), differential scanning calorimetry (DSC) and vibrating sample magnetometre (VSM), respectively. As a result, it observed that the magnetic properties of iron-based polymeric structures show higher saturation magnetization while thermal stability remains low for other magnetic embedded polymer samples. In the presence of magnetic nanoparticles, its mechanical strength increased for all experiments against pure 3D resin, but it caused a more fragile structure. Finally, for each sample, singular magnetic nanoparticles were formed in the polymer matrix and verified that nanoparticles are completely reduced.

Keywords: Iron. Nickel. Cobalt. Stereolithography. Photocurable resin. Nanoparticle.

Presentation ID = 31
Oral Presentation

STRENGTHENING EFFECT OF FLOODING IN 3D PRINTED POROUS SOFT ROBOTICS SCAFFOLDS

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ABSTRACT

This study aims to design and 3D print porous elements for soft robotic applications and test the change of stiffness when the cavities are filled with liquids. When an elastic element has porous scaffolds, the stiffness can be controlled by filling the cavities with a liquid. A gyroid structure is selected for the design and evaluation of the characteristics of elements. The stiffness of the element in both non-filled and liquid-filled modes is analyzed using FEM simulation Software in two modes where a free and longitudinal compressive uniform loading. A porous test structure is created and tested in two modes for observation of the stiffness change. The results show that using liquid-filled porous scaffolds is applicable for stiffening elements in soft robotic applications.

Keywords: Soft Robotic. Flexible Filament. Porous. Stiffness. 3D Printing.

Presentation ID = 32
Oral Presentation

IMPROVING EFFICIENCY, PRODUCTIVITY, AND PRINTING SIZE IN FFF 3D PRINTING SYSTEM BY USING COLLABORATIVE INDEPENDENT 3D PRINTERS: A SURVEY

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ABSTRACT

Collaborative 3D printing (C3DP) is a unique technique to additive manufacturing, where numerous 3D printing robotics collaborate together to print the demanded objects. 3D printing procedures, specifically those based upon Fused Filament Fabrication (FFF) systems, have generally low efficiency and experience an absence of scalability in regards to both printing size and speed. Academics and scientists have proposed various methods to conquer these concerns. The majority of the efforts concentrate on increasing the size of the 3D printer itself or use several printing extruders where all of them print at the same time. One option is to adopt a modular collaborative 3D printing system that has several 3D printers working all at the same time to enhance performance, printing size, and speed. Collaborative 3D printing comes across as a grand obstacle in the scheduling of printing paths for the various printers. If not effectively set up, the print order may fail, and the printers' tool heads might hit each other.

Keywords: Collaborative 3D Printing. Additive Manufacturing. Fused Filament Fabrication.

Presentation ID = 25
Oral Presentation

TROUBLESHOOTING AND TACKLING THE COMMON PROBLEMS IN VAT PHOTOPOLYMERIZATION AND FDM 3D PRINTING

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ABSTRACT

The importance of 3D printing as a builder of the digital future is growing all the time. When it comes to the digital future, one clear goal is that, for example, spare parts are no longer necessarily shipped from factories around the world, but are 3D printed using a digital model of the spare part purchased from the manufacturer. Using 3D printers for replacement printing or home use is relatively simple. However, with 3D printers, you come across a wide variety of situations that require fault detection, troubleshooting, and general adjustment.

This article highlights the most common problems with 3D printers. The technologies chosen for this study are VAT Photopolymerization and FDM printing technologies because they are very common techniques for spare parts printing and home use. This study was conducted in concrete way, experimenting and producing problems intentionally, then solving them with solutions and techniques which are common and gained through experience.

As a result, this article is written as a guide to the most common problems with these chosen technologies. Solutions to the problems are showcased in simple and effective steps. After all, this study showed well the diversity of problem situations in 3D printing as well as the need for concrete expertise in troubleshooting solutions. The problems faced and tackled in this study were the most common ones but there can exist other problems too.

Keywords: VAT Photopolymerization. FDM. Common problems. Troubleshooting.

Presentation ID = 35
Oral Presentation

A PROPELLER BLADE MANUFACTURING BY HYBRID ADDITIVE MANUFACTURING SYSTEM

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ABSTRACT

Hybrid Additive Manufacturing (Hybrid-AM) describes multi-operational or multi-functional additive manufacturing systems. In industry, the increasing tendency in applications of Hybrid-AM brings up the challenge of improving novel methods for the manufacturing of new or hybrid parts. Hybrid AM can produce fully functional assemblies without any assembly operation. In this study, the hybrid additive manufacturing system means that an object is to be designed partly made from prefabricated or off-the-shelf parts and added by the WAAM process. For this purpose, a prototype Hybrid-AM system using the pulsed TIG-Wire-Arc technique was designed and constructed. The constructed SMD system has three drivers on the x, y, and z-axes and an additional rotary driver (fourth axis). Using the Hybrid-AM machine the wire form material can be deposited on an existing primitive profile i.e., a rod, pipe, a profile, or any 3D surfaces with reducing production time. In this way, spiral-shaped features or twisted blade shapes can be added to cylindrical parts. In this study, a stainless- steel propeller blade was deposited on a pipe by using the developed prototype Hybrid AM machine. A non-planar toolpath was used to deposition the subsequent layers and the surface of the propeller blade was finished using 4-axis CNC machining.

Keywords: Hybrid additive manufacturing. Wire arc. WAAM. Propeller blade. TIG metal deposition.

Presentation ID = 23
Oral Presentation

A BENEFICIAL MATERIAL IDENTIFICATION METHOD FOR 3D PRINTING: ATTENUATED TOTAL REFLECTION SPECTROSCOPY

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ABSTRACT

Vibrational spectroscopy which is used for different chemometric analyzes showed important advancement with the development of attenuated total reflection from past to today. It has been used as a beneficial method for different investigations including 3D printing. Attenuated total reflection spectrum, which occurs when the infrared radiation penetrates to the thin surface layer of the specimen, is a non-destructive, precision method which ensures material identification and determination. The aim of this investigation is to give basic information about attenuated total reflection and to report its usage in 3D printing and demonstrate its advantage with a characterisation of a specimen which has unknown chemical composition. Perkin Elmer attenuated total reflection spectroscopy device which has 4000-600 cm-1 spectrum range has been used at Ege University Application and Research Center for Testing and Analysis (EGE-MATAL) for this investigation.

Keywords: Attenuated Total Reflection. Chemometry in 3D Printing. Engineering Spectroscopy.

Presentation ID = 38
Oral Presentation

NON-PLANAR TOOLPATH FOR LARGE SCALE ADDITIVE MANUFACTURING

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ABSTRACT

The parts produced by additive manufacturing are inherently subjected to discretization effects due to their layer-based addition. The stair-stepping effect on the surface quality is inevitable for most of the techniques and it becomes more dominant for the regions having small surface inclinations. The stair-stepping influences the mechanical properties as well as the aesthetic perception. Many researchers have been presented several approaches to overcome or minimize the stair-stepping effects and improve the surface quality of additively manufactured parts. The attempts have been made generally for the FDM-printed objects, however, there is no or fewer efforts have been made for parts of large-scale additive manufacturing (LSAM). Due to higher deposition rates (up to 50 kg/hrs.) and larger nozzle diameters (i.e. bead size), the discretization effect is more in large-scale additive manufacturing. In this paper, the presented methods to mitigate the stair-stepping effect and improving the surface quality of additive manufacturing are reviewed and practicing in large-scale 3D printing is discussed. A preliminary experimental study of 3D printing with a non-planar toolpath was carried out and the results were presented.

Keywords: Large scale additive manufacturing (LSAM). Non-planar 3D printing, Stair-stepping effect. Surface quality.

Presentation ID = 57
Oral Presentation

ADDITIVE MANUFACTURING OF MICROFLUIDIC LAB-ON-A-CHIP DEVICES

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ABSTRACT

Additive manufacturing (AM) technologies, also known as 3D printing, which offer advantages such as design flexibility, short lead time and cost effectiveness compared to traditional production methods, are used in many different areas. With the exponentially increasing technological developments, complex structures at micron level can be produced and used in customized applications. One promising unique application of AM is Lab-on-a-chips (LOCs). These microfluidic devices can effectively be used in laboratory experiments carried out on a very small scale in biomedical, chemistry and clinical cases. Lab-on-chip systems, which are time-consuming, specialization-required, and expensive to produce with traditional 2D microfabrication technologies such as lithography and PDMS-glass bonding, have become easily producible with AM methods. Although there are many different AM methods can be used in 3D printing of microfluidics, Multi Jet Printing (MJP) method is frequently preferred because of its high sensitivity and dimensional accuracy. MJP AM technology is based on spraying photopolymer resins to a layer thickness of down to 16 μm, then curing with UV light. This paper critically reviews relevant methods and materials used for 3D printing of microfluidics, especially for the MJP based technologies. A case study on 3d printing complex microchannels for microfluidics application using a commercial material jetting based 3D printer (Objet 30 Prime - Stratasys) has also been presented. The results show that the 3D printing of microfluidics is a promising area for often novel applications.

Keywords: Additive Manufacturing. 3D Printing. Lab on a Chip. Microfluidics.

Presentation ID = 14
Oral Presentation

ADDITIVELY MANUFACTURED Ti6Al4V LATTICE STRUCTURES FOR BIOMEDICAL APPLICATIONS

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ABSTRACT

Additive Manufacturing (AM) is a rapidly developing technology which provides opportunity to build up complex geometries due to the freedom of manufacturing. Lattice structures, three-dimensional open-celled structures composed of one or more repeating unit cells, can be produced with unique mechanical, thermal, acoustic, biomedical and electrical properties by optimization of type and dimension of unit cell and additive manufacturing parameters. Lattice structures provide lightweight and porous parts which are widely preferable in biomedical applications. Different types of lattice structures have been used for obtaining bone like implant surface to accelerate osseointegration. There are many studies in this field, but the ideal designs and dimensional accuracy of the various lattice structures for biomedical field have not been completely reached. In this study, octahedral, star and dodecahedron lattice structures with thin strut diameter were manufactured by laser powder bed fusion technology (LPBF) by Ti6Al4V powder. Cubic and plate samples were built on z-direction and their top and side surfaces were inspected in terms of topographical characteristics and dimensional accuracy by scanning electron microscope.

Keywords: Additive Manufacturing. Lattice Structures. Powder Bed Fusion. Ti6Al4V. Orthopedic Prosthesis.

Presentation ID = 19
Oral Presentation

DEVELOPING APPARATUS TO KILL BACTERIA AND VIRUSES ON THE SURFACE WITH THE CLEANING ROBOT

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ABSTRACT

With the increase of Covid-19 cases, protective measures such as mask and distance rule have been taken throughout the world geography, which has been declared a pandemic. People often have no idea whether they are thoroughly disinfected when cleaning their homes with cleaning tools. In order for our customers to disinfect their homes while cleaning, a disinfection apparatus integrated into our cleaning robot device has been developed. System development has been made to spray the disinfectant liquid on the surfaces in the environment. An apparatus has been designed to be mounted on the trigger part of our existing cleaning robot device. Compressed air is needed to transfer the liquid from the disinfectant to the environment by spraying. For this, the trigger adapter connection was made to the outlet of the place where the device suction. With a system to be developed in the apparatus, some of the compressed air will enter the disinfectant liquid and the liquid will be delivered to the nozzle at the end of the apparatus. Production, assembly and operation controls of the plastic parts and prototypes of the developed apparatus were made. In the working control of the prototype part, it was observed that the disinfectant liquid passed through the nozzle in a pulverized manner. It is possible to adjust the liquid density with the control mechanism on the apparatus.

Keywords: Antibacterial liquid. Disinfection apparatus. Covid 19. Liquid spray system.

Presentation ID = 33
Oral Presentation

DESIGN AND PRODUCTION OF MULTI MATERIAL 3D PRINTER FOR SOFT ROBOTIC STRUCTURAL ELEMENTS

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ABSTRACT

With the latest technology, the development and interest in soft robots have gained speed. Flexible robots are generally produced by the casting method. This traditional production method cannot meet the required quality and production speed. For this, it is aimed to solve the problem by accelerating the production of robots without decreasing the quality. The most successful method for solving this problem is 3D printers, which could print multiple materials. It was decided to be used multi-materials printing, and the system design was carried out. This study aims to design and produce a multi-material 3D printer capable of printing non-conductive and conductive rapidly curing silicone that can be used in soft robotics and medical simulators. The electrical conductivity was achieved by mixing silicone and graphite powder. The parts in the designed system are also obtained by the additive manufacturing method. Test pieces were printed using the produced 3D printer. Specific tests have been carried out on the produced parts. Technical data such as strength, elasticity, electrical conductivity have been obtained.

Keywords: Soft Robotics. Additive Manufacturing. 3D Printers. Multi-Material Printing. Conductive silicone printing.

Presentation ID = 15
Oral Presentation

ADDITIVE MANUFACTURING OF TITANIUM ALLOYS FOR BIOMEDICAL APPLICATIONS

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ABSTRACT

The significant progress of additive manufacturing (AM) or three dimensional printing (3DP) has induced to a revolution in manufacturing sector providing high flexibility, feasibility of complex geometries in customization at the consumer level and also serving as an efficient tool for further research and development. AM processes are increasingly attracting many interests at industrial and academic fields. In the last two decades, biomaterial production with additive manufacturing has gained significance and the medical implant demand also has undergone explosive growth. Additive manufacturing and biomaterial combination is very promising, especially towards patient specific clinical applications. In this context, 3D printable biomaterials are suitable candidates for implants and the amount of additively-manufactured implants is significantly increasing due to their unique properties which are biocompatible, versatile and adaptable, have relevant mechanical (strength and stiffness) and biological functionalities, porous structure, design freedom, provide material save, produce with good accuracy, fulfill design requirements in geometry. Implant biomaterials should have high fatigue, wear and corrosion resistance, stability, osteogenesis and osseointegration properties as well as long lifespan to achieve an intended function. This study overviews the studies on additive manufacturing of most widely used implant biomaterials Ti and Ti6Al4V alloys, in terms of mechanical properties, biocompatibility and current state of applications of these biomaterials from different perspectives.

Keywords: Additive Manufacturing. Biomaterials. Titanium. Titanium Alloys. Implants.

Presentation ID = 28
Oral Presentation

INVESTIGATION OF THE APPLICATIONS AND POTENTIAL OF 3D PRINTERS IN VOCATIONAL AND TECHNICAL EDUCATION: İSKENDERUN VOCATIONAL SCHOOL OF HIGHER EDUCATION CASE

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ABSTRACT

3D printers are being added to our lives more and more every day. The most important effect here is undoubtedly the cheaper prices and the discovery of new areas of use. The use of 3D printers in education, especially in vocational and technical education, is increasing day by day. 3D printers are undoubtedly one of the most important tools for those who design in this field to transform ideas from a virtual environment into a tangible result. Thanks to these tools, students acquire various skills in the post-design prototyping phase. With 3D models and prints, it is also easier to explain subjects that are difficult to understand for students studying vocational and technical education. Thanks to these tools, which have various advantages over traditional machining in production studies, it is also easier for students to prepare for their fields of business. Vocational schools of higher education, which have the mission of training qualified technical staff required by the sector, will be able to train young people who can contribute to production by having their students make adequate practices in design and modeling. In this study, the usage areas and potentials of 3D printers in the departments of Iskenderun Technical University Iskenderun Vocational School of Higher Education, which is one of the schools that have assimilated the stated mission and has a long history, were examined. In the last part of the study, inferences about the findings reached within the scope of the research are given.

Keywords: 3D Printers. Additive Manufacturing. Vocational and Technical Education.

Presentation ID = 24
Oral Presentation

COMPARISON OF OPTIMIZATION METHODS FOR ADDITIVE MANUFACTURING AND MACHINING METHODS

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ABSTRACT

Thanks to the developing technology and softwares, analysis and optimization of the engineering parts can be done through computer programs nowadays. Softwares play an active role not only in analysis but also in reducing the material cost as a result of lightening the part with changes in design. Manufacturing methods and comparisons of these methods with each other have always been the subject of research. Choosing the methods of manufacturing of material has a great importance for enterprise. The loads and strength of the designed part under operating conditions are very important for the manufacturer. The pros and cons of both production methods which are additive manufacturing and machining have been investigated and these methods have been compared for the use of Pet-G material. An FDM (Fused Deposition Modeling) type 3D (three-dimensional) printer has been used in the additive manufacturing method and CNC Router (Computer Numerical Control Router) has been used for the machining method. A part design created in accordance with the mentioned manufacturing methods and its mechanical properties after its twice optimization have been examined and compared. After the optimizations, the targeted reduction on the mass of production has been achieved. After the optimization process, the sample has reduced by about 63% in volume and mass according to the design program. The mass of the sample, which is approximately 300 grams, has been reduced to 100 grams. As a result of the tests, it has been observed that the strength values of the samples manufactured by machining are higher.

Keywords: Optimization. Topology Optimization. Additive Manufacturing. Machining. 3D Printer.

Presentation ID = 39
Oral Presentation

FINISHING OF DMLS-ADDITIVELY MANUFACTURED Ti6Al4V PARTS BY ABRASIVE FLOW MACHINING

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ABSTRACT

In manufacturing parts with complex structures, Additive Manufacturing (AM) technology presents many advantages. However, it is difficult to meet the quality requirement for the surfaces of AM parts due to deterioration of the as-built surfaces such as the staircase effect, balling effect, and powder adhesion. Abrasive flow machining (AFM) is a non-conventional finishing method that is recently getting popular with respect to demands on surface quality. Increasing surface quality demands and developing manufacturing technologies need high cost and time. Complex-shaped parts cannot be finished by conventional finishing methods due to geometry. With a help of the flowability of abrasive media, complex-shaped parts can be finished easily by non-conventional finishing methods. AFM operation answers all these demands in a short time period. In this study, an experimental study has been carried out on Ti6Al4V specimens manufactured by Direct Metal Laser Sintering (DMLS). The as-built surfaces of the specimens were finished by abrasive flow machining. A polymer-based abrasive media including 240 mesh size SiC abrasive of 60% concentration by weight was used. The average surface roughness has been decreased from 12.37 μm to about 0.17 μm after 10 cycles. The surface improvement and the material removal were measured after 0, 1, 3, 5, 10 AFM cycles. The results show that AFM is an effective method for finishing complex shapes manufactured by additive manufacturing methods.

Keywords: Abrasive Flow Machining (AFM). Additive Manufacturing (AM). surface finishing, Direct Metal Laser Sintering (DMLS).

Presentation ID = 43
Oral Presentation

INVESTIGATION OF CELL BEHAVIOUR ON THE 3D-PRINTED NEURAL SCAFFOLDS BY ELECTRICAL STIMULATION

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ABSTRACT

Damage to neural tissues results in loss of nerve function due to the low regenerative capacity of the central nervous system. Electrical stimulation (ES) shows great potential for nerve regeneration processes. The use of electroactive materials in the neural scaffolds are effective for applying ES. In this study, we synthesized bismuth ferrite (BFO) nanoparticles via co-precipitation route and incorporated 10 wt% polylactic acid (PLA) in chloroform to fabricate 3D-printed PLA/BFO scaffolds. We studied the chemical structures of BFO nanoparticles and 3D-printed scaffolds by FTIR, their crystallinity with XRD, as well as their morphological and mechanical properties. According to in vitro studies, all 3D-printed scaffolds displayed no cytotoxic effect and supported the proliferation of human adipose-derived mesenchymal stem cells (hADMSCs). Besides, the highest cell viability was detected on the BFO-blended PLA scaffolds compared to pristine PLA and BFO-lined PLA scaffolds. More importantly, a 48 hours ES on the hADMSC cultured BFO-lined PLA scaffolds showed that the cells in the control group were randomly distributed while the cells in the stimulated scaffold were aligned towards the BFO line. This study reveals the potential and efficiency of BFO nanoparticles on directing cells towards damaged areas for treating nervous system disorders.

Keywords: 3D Printing. Tissue Engineering. PLA. Stem cell.

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Oral Presentation

DEVELOPMENT OF CURRICULUM AND WEB-BASED MODULE ON 3D PRINTING TECHNOLOGY FOR UNDERGRADUATE STUDENTS

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ABSTRACT

3D printing technology, which has developed rapidly in recent years, has been widely used in many fields for industrial and personal purposes. Especially the rapid advancement of today's technology has enabled the concepts of learning to learn and distance learning to emerge as a new learning approaches and methods. In this study, a web-based training module has been developed that includes various topics such as the history of 3D printing technology, its basics and fundamentals, types, design of 3D printers, and the application of 3D printers in different areas. This web-based training module is supported by both the theoretical knowledge and visual media materials as well. Under the guidance of the training module, especially with the use of undergraduate students, it enabled students to learn 3D printing technology on their own and to make applications with 3D printing.

Keywords: 3D Printing. Educational Module. Web-Based Module. Distance Learning.

Presentation ID = 42
Oral Presentation

FABRICATION, CHARACTERIZATION AND INVESTIGATION OF ANTIBACTERIAL ACTIVITY OF PROPOLIS SUBSTITUTED SODIUM ALGINATE TISSUE SCAFFOLDS USING THREE-DIMENSIONAL (3D) PRINTING TECHNOLOGY

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ABSTRACT

Additive manufacturing or three dimensionally (3D) printing is one of the most popular technologies in regenerative medicine, tissue engineering, and wound therapy applications due to its advantages. The manufacturing of customizable, biocompatible, patient, specific, comprehensive, mechanically stable, and quickly manufactured products is extremely easy by the help of 3D technology. In this study, it was aimed to develop 3D printed sodium alginate (SA)-based tissue scaffolds containing propolis (Ps) for using as a dressing material. Different combinations of Ps containing SA tissue scaffolds were produced and crosslinked with calcium dichloride (CaCl2) solution. Chemical, morphological, mechanical, and biocompatibility properties of each scaffolds were analyzed respectively. Scanning Electron Microscopy (SEM) was performed for suface morphology. Mechanical, physical properties, swelling and degradation tests and Ps swelling behaviors were examined to check the stability of the samples. Antimicrobial analysis of Ps containing SA scaffolds and pure SA scaffolds were performed using S.aureus and E.coli strains. Ps introduced scaffolds had an excellent antibacterial activity due to certain compounds of Ps. In vitro cytotoxicity test was performed on the scaffold using the extraction method on the cell line of human dermal fibroblasts (HFFF2). Control SA and Ps containing SA were clearly found to be non-toxic. Overall, all studies are compatible with the results of the literature, so 3D printed, Ps added SA scaffolds are promising for use as scaffolds in tissue engineering applications and treatment of a variety of wounds by improving physical and chemical properties.

Keywords: 3D printing. propolis. sodium alginate. tissue scaffold. wound treatment.

Presentation ID = 54
Poster

DEVELOPMENT OF PVA ALGINATE BASED Nano-Ag DOPED HYDROGELS FOR ADVANCED WOUND DRESSING BY 3D PRINTING METHOD

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ABSTRACT

Advanced wound-burn dressings are important especially for the elimination of infections caused by chronic wounds. In recent years, with the development of 3D printing, several researchers have produced many wound dressings using 3D printers, and some of these wound dressings have been transformed into products to replace passive dressings. The aim of this study is to fabricate advanced wound dressing material from natural polymers such as alginate and chitosan to develop an antibacterial wound dressing material. The antimicrobial property of the dressing was obtained by adding Ag nanoparticles as an antimicrobial agents to the structure in a fine-tuned manner during the production process. In this study, Ag nanoparticle and antibacterial agent containing Polyvinyl alcohol(PVA)/ Sodium Alginate(SA)/ Chitosan(Ch) hydrogels were prepared. Then the hydrogels were printed by 3D extrusion printing method to accelerate the healing of chronic wounds. Characterization tests of the materials were performed. The morphology, chemical groups, and nanoparticle release were systematically studied using scanning electron microscopy (SEM), optical microscopy, Fourier transformation infrared spectroscopy (FTIR), and UV spectroscopy, respectively. It is observed that the nanoparticle homogenously dispersed in the structure. The infrared spectrum showed expanded OH stretching (4000-3300 cm - 1), and the antibacterial agent increased the peak intensity of PVA/SA/Ch hydrogels compared to nanoparticle doped one.

Keywords: Wound dressing. 3D printing. nanoparticle.

Presentation ID = 46
Oral Presentation

DEVELOPMENT OF TISSUE SCAFFOLDS THROUGH 3D BIOPRINTING FOR BURN WOUND HEALING

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ABSTRACT

Skin burns cause serious physiological problems that can result in cell-tissue loss, infection and even death. The fabrication and characterization of tissue scaffolds as wound dressing will be carried out through 3D bioprinting for the treatment of the skin burns with 2nd and 3rd degree in this study. Hyaluronic acid (HA) - methyl cellulose (MC) hybrid gels (HAMC) are promising for both biomedical application and extrusion type 3D bioprinting. HAMC gels have been synthesized for the extrusion type 3D printing. Viscosity, surface tension and density values of the additive gel samples will be determined and optimized as rheological properties for the 3D bioprinter. The morphological, thermal and chemical properties of the scaffold samples produced will be examined.

Keywords: Hyaluronic acid. Methyl cellulose. Burn wound healing. Propolis. Vitamin C. Amoxicillin, 3D bioprinter.

Presentation ID = 18
Oral Presentation

EFFECT OF WIRE ELECTRICAL DISCHARGE MACHINING ON THE SURFACE OF EBM-ADDITIVE MANUFACTURED NITI ALLOYS

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ABSTRACT

Nickel-titanium (NiTi) shape memory alloys are used in varied engineering products, such as biomedical device and mechatronic actuator applications. The conventional machining technology are utilized in the limited fields due to their effects on the hardness and brittleness of the machined alloys. However, the wire electrical discharge machining (WEDM) technology is one of the most preferred post-processing tool to obtain a surface with high quality. The electrical current and voltage values with pulse on and pulse off time are the crucial parameters for WEDM. These parameters should be optimized before wire electrical discharge machining process. Electron beam melting (EBM)-based additive manufacturing of the nickel-titanium powders provides obtaining bulk NiTi shape memory alloys using high energy electron beams. In this study, the application of WEDM which is used as a post-processing tool is evaluated for the EBM-based additive manufactured NiTi samples. Additionally, the scanning electron microscopy results of the wire electrical discharge machined NiTi samples are carefully investigated.

Keywords: Additive manufacturing. Electron beam melting. Nickel-Titanium Alloy. Wire electrical discharge machining.

Presentation ID = 41
Oral Presentation

FRACTAL GEOMETRY APPLICATIONS TO DESIGN AND MANUFACTURING OF 3D PRINTED CERAMICS: A PRELIMINARY STUDY

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ABSTRACT

Fractals are described as the infinite geometrical processes of the nature. The geometrical forms of the nature have already been defined using several mathematical theories and fractal algorithms that have been source of inspiration for designers within the framework of nature-imitating (biomimetic) design. The objects with complex geometries found in nature could be transposed efficiently by means of biomimetic design tools. Thus, the nature is depicted in 3D printing process in terms of the manufacturing processes as a matter of policy.
The naturally formed structures typically exhibit complexity and composed of fragmented geometric forms. These forms could be divided into parts which replicates individually the whole pattern. This differentiable feature of the fractals proving the potential use of 3D printing technology owing to its layer-by-layer deposition methodology which allows implementing the iterations efficiently. Hence, 3D printing of ceramics with complex geometry is a promising technique of manufacturing compared to the conventional manufacturing methods. Accordingly, in this research, experimental studies were performed in order to evaluate the applicability of fractal geometry as a tool of design process and in the production of extrusion-based 3D printing of ceramics.
The workflow of the study associates clays with manufacturing parameters. For this reason, local clays derived from central-Anatolia region of Turkey were analysed in terms of printability and designed ceramic pieces were printed using a Delta 3D clay printer. The physical and technological properties of the printed samples were evaluated. As a result, the preliminary experimental studies proved the potential of the fractal geometry implementations in 3D printing of ceramics.

Keywords: Fractal Geometry. 3D printing. Ceramics. Biomimetic design.

Presentation ID = 59
Oral Presentation

MECHANICAL PROBLEMS AND SOLUTIONS DURING 3D PRINTING BASED ON FDM TECHNOLOGY

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ABSTRACT

A 3D printer is a typewriter that converts any details modeled in a three-dimensional coordinate system into real physical objects. This technology can produce details with a geometric shape which can be barely made with conventional production methods. Users were interested in 3D printing technology before its wide application in industries. 3D printing technology can be utilized in various fields, such as medicine, military, food industry, biotechnology and other fields. Operator can face with certain problems, for example, unstable adhesion of detail to the printing platform, separation of layers, and non-adhesion the first layer of the detail to the printing platform while using 3D printers based on FDM, Fused Deposition Modelling, technology. These issues are usually due to the fact that the table, on which the printer is placed, is not resistant to vibtarion and the surface of printing platform is not smooth.

Keywords: FDM printing technology. 3D printing problems. layer problems. mechanical calibration of 3D printer.

Presentation ID = 7
Oral Presentation

DESIGN FOR ADDITIVE MANUFACTURING BASED ON MACHINE LEARNING: A CONCEPTUAL FRAMEWORK

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ABSTRACT

Additive manufacturing (AM) is a manufacturing method that allows the production of a threedimensional model, which has come into our lives due to the inadequacy of traditional methods and which is drawn with computer-aided design as a product. AM offers great design freedom to produce efficient, high-performance parts. However, accommodating AM process characteristics is essential to building production parts with minimum cost and waste. AM designs are recommended today to increase manufacturing efficiency and minimize costs. In order for a part to be manufactured with AM, the AM must comply with the design rules. The term "Design for Additive Manufacturing (DfAM)" is frequently used today. DfAM is the design method in which the part produced with EI is designed and optimized together with the production process. DfAM is the art, science, and skill of designing manufacturability using 3D printers. Unlike traditional manufacturing, this additive design process allows engineers to create more complex and production parts while reducing weight and material consumption. Due to the increasing amount of data, machine learning (ML) is used in medical diagnosis, image processing, prediction, classification, learning correlation. This study proposes a machine learning integrated design for the AM framework, which can learn the complex relationships between design and performance domains. Moreover, machine learning has already been used in AM with different aims such as process optimization and manufacturing defect detection. The study aimed to list the available researches that can be seen as using ML for some DfAM considerations.

Keywords: Additive Manufacturing. Design for Additive manufacturing. DfAM. Machine Learning.

Presentation ID = 8
Oral Presentation

COMPRESSIVE STRENGTH OF DLP 3D PRINTED VARIOUS MICRO LATTICES FOR BONE TISSUE ENGINEERING

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ABSTRACT

This study aims to design and manufacture different lattices and evaluate their success in terms of compression strength. Structures with a high surface area to volume (SA:V) ratio and microporosity are designed to mimic cancellous bone tissue. The volume-centered cubic and face-centered cubic lattice structures are higher in terms of the SA:V ratio among the designed specimens. Specimens in the cylindrical form used with four different lattices were successfully produced by 3D (Digital Light Processing) DLP printing. A preliminary evaluation of the lattices was made by searching for the lowest stress and displacement values under compression load with finite element analysis. The lowest von-Mises stress value was 6.37 MPa in the simple cubic lattice structure. The compression test was carried out under quasi-static conditions with equal preloading. The loads at onset damage were compared. The highest fracture average load was in face-centered cubic lattice structures with 10.14 kN. Among the specimens with low standard deviation in the compression test, the simple cubic and gyroid lattice structures' fracture force is higher.

Keywords: Lattices. Digital Light Processing (DLP). Bone Tissue Engineering.

SECTION II

DIGITAL INDUSTRY

Presentation ID = 3
Oral Presentation

IMPLEMENTATION OF LBP DESCRIPTOR AND MACHINE LEARNING CLASSIFIERS FOR FACE RECOGNITION

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ABSTRACT

Due to the increasing use of technology and data collection, we can now detect faces using machine learning algorithms. Image recognition is a hot topic in pattern recognition and computer vision. This paper provides a comparison of K-NN and SVM classification models for face recognition of the well-known dataset ORL after applying an LBP descriptor. LBP-based feature descriptors are efficient and nonparametric that have gotten encouraging performance and are widely applied in pattern recognition, image matching, and texture classification. It encodes the relationship between the pixel and its surrounding neighbors in a circular sequence manner. Based on obtained results by using the dataset that contains several images of persons in different looks and sides, we observed that the accuracy increases according to the increased number of neighbors and we also noticed that after several tests, the most recognized classes are 2 and 35 based on k-value. Moreover, the comparison of the two models reveals that the SVM model is more efficient than the K-NN model.

Keywords: Image Recognition. Face Detection. Machine Learning. LBP descriptor. K-Nearest Neighbor (K-NN). Support Vector Machine (SVM). Principal Component Analysis (PCA).

Presentation ID = 21
Oral Presentation

DEVELOPMENT OF TOUCH FLOW CONTROLLED PLASTIC FAUCET SYSTEM FOR WATER TREATMENT DEVICE

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ABSTRACT

The working principle of most of the water purification device taps used around the world is that they are completely mechanically controlled by a valve. With the developing technology, people want to have remote controlled and touch system devices in their homes. In order to provide ease of use to people, it is aimed to control the system by adding a touch panel that will provide control instead of opening / closing the valve that provides control over the faucet. With the touch panel control positioned on the faucet, water flow control will be provided by opening and closing the solenoid valve to be placed inside or outside the faucet. It is aimed to produce the outer material of the faucet as plastic and to be produced domestically and at a low cost. The outer design of the faucet will be made according to the solenoid valve and touch panel placement in dimensions suitable for the kitchen counter. Then, prototypes of the plastic parts of the designed faucet will be produced and assembled with each other.

Keywords: Touch Panel. Solenoid valve. Water Purification Device. Water Purification Faucet.

Presentation ID = 26
Oral Presentation

SMART DOOR LOCK DESIGN WITH INTERNET OF THINGS

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ABSTRACT

Most of today's electronic devices are becoming smart and traditional house doors are lagging behind this technology. With the development of technology, the need for remote and rapid control of devices has increased. With the internet of objects, it was possible to make the devices remotely available over a Wi-Fi network. In this study, remote control of the devices has been done by using ESP32 development board which includes Wi-Fi module. Here, an intelligent system consisting of ESP32, android based remote control application, solenoid door lock, fingerprint sensor, RFID card reader and keypad is provided. With the ESP32 module, doors that can be controlled remotely and intelligently can be controlled and transmit data instantly. So; a device that is controllable, safe, economic, easy to control.

Keywords: Internet of things. ESP32. Sensor. Smart door lock.

Presentation ID = 30
Oral Presentation

DETERMINATION OF HEAVY VEHICLE AIR DRYER TEST BENCH PARAMETERS AND EVALUATION OF THEIR EFFECTS ON PERFORMANCE

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ABSTRACT

Compressed clean air is required for the operation of components such as clutch, suspension and brake in heavy vehicles. Compressed air; it is produced by heavy vehicle air compressors. However, depending on the operation of the system, there is some oil and moisture in the compressed air produced by the compressor. Moisture and oil; this causes malfunctions such as freezing of the air system, damage to seals, valve failure and pipe blockages. This moisture and oil are cleaned by the defective dryer and prevented from entering the tank. Air drying process; the entire compressed air system must be protected against freezing, internal corrosion, and in this way, the operating safety of the system must be maintained continuously and its service life must be extended. Testing and safely integrating air dryers in the vehicle is important for safety. In this study, a heavy vehicle air dryer was designed and produced, and verification tests of this product were carried out. For design and manufacturing verification, a test bench that can simulate working conditions on the vehicle has been designed and manufactured. The air dryer has a mechanically operating system and the operation of the system is controlled by the springs inside. Since the springs are the components that directly determine the performance of the air dryer; knowing its characteristics and behavior helps to measure the performance of the air dryer. In addition, the characteristic features of the springs used in this study were also analyzed.

Keywords: Compressed Air. Air Dryer. Compressor. Finite Element Analysis. Test Bench.

Presentation ID = 53
Oral Presentation

3-TIER ARCHITECTURE FOR EDGE, FOG AND CLOUD COMPUTING IN THE IMPLEMENTATION OF IOT TECHNOLOGIES

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ABSTRACT

The combination of these technologies is used to more effectively manage data sources available in intelligent devices. The article reviews the differences between them and the effectiveness of each for users.

Keywords: Internet of Things. IoT. Edge computing. Fog computing. Cloud computing.

Presentation ID = 4
Oral Presentation

BUY-SELL MECHANISM WITH BI-DIRECTIONAL LSTM NETWORKS: A CASE STUDY OF BIST-30 STOCKS

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ABSTRACT

It performs learning from unlabeled or unchecked data with deep learning, known as the type of machine learning applied to larger data. Deep learning algorithms provide high accuracy in acquiring meaningful representations and conclusions from big data. In this paper, a model has been developed that offers a buy-and-sell proposal on stocks using bi-directional Long-Short Term Memory (LSTM) deep neural network. It was used five stocks (ASELS, GARAN, PETKM, TUPRS, THYAO) for the training of the proposed model and test of buy-sell success in BIST-30. The dataset is formed from buying and selling information for 15-minute these between 2010-2020. Financial news texts were converted to feature in the modeling of the buy-sell mechanism. The temporal buy-sell information and news texts were combined to align the feature vectors. The developed model can predict buy-sell based on the stock price information and financial reports. When the obtained results are examined, it is seen that the model can be used as an indicator in the stock exchange buy-sell transactions.

Keywords: BIST-30, biLSTM, Buy-sell Mechanism, Deep Neural Network, fastTEXT.

Presentation ID = 44
Oral Presentation

MODELING AND APPLICATION OF MAINTENANCE ACTIVITIES IN A MULTI-SITE COMPANY

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ABSTRACT

In an environment where competition is increasingly fierce, companies are constantly looking for new solutions to keep their market share, meet their increasingly demanding customers, and meet the needs of their staff. Companies must develop new innovative products not only of good quality and minimum cost, but also they must meet new constraints, particularly those related to respect for the environment and health / safety.

This work is part of the implementation of a maintenance structure in a multi-site production company, with fixed complex homogeneous machines. These machines require, for level 4 and 5 maintenance activities, very expensive mobile specific tools and maintenance characterized by activities with a great variability of tasks in nature, specificity and duration, thus affecting the five maintenance levels. This involves the intervention of technicians of various qualifications and skills, resulting in various hourly labor costs. It is then a question of dimensioning the resources by balancing the loads, by assigning to each level of maintenance a corresponding level of competence. This article concerns the modeling of the activities of this type of maintenance, by proposing a Local Maintenance Workshop (LMW) equipped with a set of mobile tools. The goal is to minimize the cost of maintenance and improve availability.

Keywords: Distributed maintenance. Level of maintenance. Costs. Skills. Stochastic petri nets.

Presentation ID = 52
Oral Presentation

OPTIMISATION OF COST AND DEFLECTION OF WIND TURBINE TOWER USING TAGUCHI DESIGN OF EXPERIMENT

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ABSTRACT

Wind turbine is poised as the technology to deliver Net Zero, but high cost of the technology coupled with frequency of tower collapse limits its wider adoption. This research optimises a 90 m tower of a standard 5 MW wind turbine. It employs Taguchi design of experiment (DoE) to study deflection of nine (9) tower designs formulated from varying reliability influencing parameters. The parameters are wall thickness, ratio of top-to-bottom diameter and the grade of steel. The models are created with Siemens NX package and simulated using ANSYS Workbench package. The finite element analysis (FEA) results are validated using analytical method. Model 1 is found optimal. It has 95 mm wall thickness, 0.45 top-to-bottom diameter ratio and is made of S275 steel grade. It deflects 9.3% less than the standard model. Furthermore, it cost 8.2% less than the standard model. This study demonstrates a method of realising cost-effective wind turbine towers at minimal deflection.

Keywords: Wind turbine. Turbine tower. Static structural reliability. Deflection. Wind energy. Renewable energy.

Presentation ID = 55
Oral Presentation

DIGITAL TWIN SIMULATION OF IOT-BASED ADDITIVE MANUFACTURING MACHINE'S FOR ERROR DETECTION

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ABSTRACT

In the light of the Industry 4.0 ecosystem, it has led to the emergence of new technologies in many areas. Some of these new technologies which are components of Industry 4.0, are Internet of Things, Additive Manufacturing, Cloud Computing and Cyber-physical Systems. All objects can be connected to the internet and communicate with each other over the network with the internet of things technology. At the same time, Smart Manufacturing concepts have also emerged. Another technology that gives a different direction to the manufacturing industry is Additive Manufacturing technology. Some advantages have emerged over traditional manufacturing methods with this technology. New approaches focused on improvement and cost have begun to be adopted for the manufacturing industry with the increasing capabilities of information technologies. Digital twin technology is one such approach. The digital twin is commonly referred to as a digital copy of a physical system. Digital twins provide information and models for the operation of design and manufacturing processes, troubleshooting, diagnosis, and problem solving. Various sensors are needed to monitor the situations in physical systems for data transfer to digital systems. Some of the layered production machines have sensors, while some do not have sensors suitable for digital twins. It is partially possible to place a sensor in these machines. In the study, in order to bring the advantages of digitalization to production systems, an Internet of Things (IoT) based system has been proposed to create digital twins using a virtual environment and a digital twin simulation has been made. The proposed system is able to detect errors by generating a digital twin from real machine data. In addition, predictions can be obtained by analyzing the historical data kept in the cloud environment. Since the system includes the cloud environment, the production process can be monitored simultaneously on the cloud via mobile or computer.

Keywords: Internet of things. Additive manufacturing. Digital twin.

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Oral Presentation

RISK PERCEPTION AND DATA MINING IN THE IRON AND STEEL INDUSTRY

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ABSTRACT

Risk is the possibility of threat, that is, potential harm. There may be risk price fluctuations, exchange rate changes, demand and request changes, and inaccessibility of the material for an enterprise. The biggest mistake is to consider the risk as a possibly harmful circumstance that should only be avoided. Since, when the risk is successfully managed, it empowers the formation of exceptionally imperative vital steps for businesses. Businesses have to show serious patterns to understand, anticipate, prevent, reduce and manage risk correctly and avoid the conceivable loss of life and property. A culture of trust is created in companies that understand the risk correctly and manage it with the right steps. The culture of trust prevents workers from getting distracted, as well as enabling workers to embrace the job and do their job lovingly. Thus, productivity increases in the long run. The purpose of this study is to determine the risk perception of the employees of a firm operating in the iron and steel industry. Possible risks are always high as the enterprise operates as heavy industry. The questionnaire applied to the employees consists of two parts. The first part consists of demographic features and the second part consists of questions regarding employees' perceptions of risk. According to the findings which will be obtained with the help of the research, the effect levels of the demographic characteristics of the employees on the employees will be determined and improved findings will be presented to the business management. According to the socio-economic and demographic status of the employees in the enterprise, it is pointed to uncover the risk discernment levels by cluster analysis.

Keywords: Perception of risk. Risk concept. Iron and steel industry. Work safety. Data mining.

Presentation ID = 34
Oral Presentation

DATA MINING APPLICATION FOR FINANCIAL DECISION OPTIMIZATION AT RISK

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ABSTRACT

Financial decisions can add value to the existence of businesses or individuals, as well as a wrong financial decision can cause businesses to cease to exist. Hence, financial decisions or financial assumptions are vital for businesses or individuals. In financial assumptions, risk refers to the probability of losing as a result of an investment made in an asset. Measures can be taken against possible risks in the future through financial assumptions. In this study, the logistic regression analysis (LR) method, one of the traditional methods, and the machine learning algorithm support vector machines (SVM) method, which is one of the new approaches, are compared in the loaning process. It is aimed to determine the importance of the compared methods, the accuracy of the model, the estimation power of the model, the estimation performance of the model, the determination of the importance of the independent variables that affect the non-repayment of the loan, and the superiority of the methods. According to the analysis results; the SVM method is superior to the LR method in calculating accuracy rate and prediction rate, and the LR method is superior to the SVM method in assumption performance calculation. The most significant variable in the SVM method is "Lending policy", the most significant variable in the LR method is "Interest rate", the second significant variable is "Interest rate" in the SVM method, and "Lending Policy" as the second important variable in the LR method. It is seen that the third most crucial variable in the two methods is the "Income" variable. The determination of the SVM method as the more important variable of the loan policy is deemed more suitable to the opinion of the banking expert. Detecting more realistic results of the SVM method compared to the LR method has shown the superiority of the SVM method.

Keywords: Support Vector Machines. Logistic Regression. Data Mining. Decision Making Under Risk.

Presentation ID = 37
Oral Presentation

FABRIC AND PRODUCTION DEFECT DETECTION IN THE APPAREL INDUSTRY USING DATA MINING ALGORITHMS

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ABSTRACT

Data mining has proven itself in various fields such as business, health, finance and education when it comes to extracting meaningful insights from data and knowledge discovery. In this study, it was aimed to determine the main causes of the error with faulty production data of a company that produces clothing by using data mining methods. Decision Tree, Naive Bayes, Random Forest and Gradient Boosted Trees Algorithms were used in the research. Accuracy level and Cohen's kappa value were taken for comparison algorithms in the study. While determining the main reasons for faulty production, the factors of which type of products the company produces for its customers, the sizes of the defective products, types of defects and explanations were taken into consideration. The most common mistakes in sewing production and the main source of the error were evaluated. According to the results, suggestions were made for the company to take various measures.

Keywords: Textile. Defect detection. Machine learning. Data mining, Classification algorithms, Decision tree.

Presentation ID = 48
Oral Presentation

NUMERICAL ANALYSIS OF DISPLACEMENTS IN A DISC MODELED FROM SIC/6061 AL ALLOY COMPOSITE

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ABSTRACT

In this study, the displacements from the inner surface of the disc designed under constant temperature distributions to the outer surface of a disc consisting of SIC/6061 Al alloy composite were examined. Temperature is very important for materials. The resistance of machines and equipment to temperature is different from each other. In this study, an aluminum borate disc was modeled; It is aimed to examine the displacements occurring at 10 °C, 20 °C, 30 °C, 40 °C, 50 °C and share it with the literature. The stresses obtained at the specified temperatures have been compared with each other and shared with the literature with graphics. The findings are considered to be very important in terms of materials science.

Keywords: SIC/6061 Al alloy composite. Elasticitiy Module. Thermal Expansion Coefficient. Composite Material.

Presentation ID = 51
Oral Presentation

ISSUES OF CYBERSECURITY IN 3D PRINTING

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ABSTRACT

The rapid expansion of 3D printing technologies makes security issues among connected systems one of the most important. Intrusion to the system through the printer became a serious threat. This article discusses security gaps in 3D printing. The work also discusses the possible measures to reduce such a threat effect.

Keywords: Cybersecurity, Threats, 3D-printers, Network attacks.

Presentation ID = 11
Oral Presentation

INVESTIGATION OF THERMOELASTIC DAMPING IN MEMS RESONATOR

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ABSTRACT

Thermoelastic damping is accepted as an important loss mechanism at room temperature in micro-scale beam resonators. In this study, the equations of thermoelastic problems are created based on the generalized thermoelastic theory. Thermoelastic damping of the micro resonator is analyzed using both the finite sine Fourier transform method combined with the Laplace transform and normal mode analysis. In both approaches, it is computed numerically using a finite element solver. In these processes, damping was calculated in a typical micro electromechanical system (MEMS) based resonator structure using Comsol Multiphysics. Here Al, Ni and Ti materials are used. Analytical results show that the deflection amplitude and thermal moment become weaker and the vibration frequency increases, taking into account the thermoelastic coupling effect. In addition, it can be found from both analytical results and numerical calculations that these properties depend on size. When the thickness of the micro resonator is larger than its characteristic size, the effect of thermoelastic damping becomes weaker as the thickness of the resonator increases. The size effect caused by thermoelastic bonding will disappear when the micro resonator thickness is above a critical value that depends on material properties and boundary conditions. The effect of material properties on the Q factor has also been studied.

Keywords: Thermoelastic damping. MEMS. Resonator. Vibration Frequency. Q Factor. COMSOL.

Presentation ID = 47
Oral Presentation

ARTIFICIAL INTELLIGENCE IN MECHANICAL ENGINEERING (MACHINE LEARNING)

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ABSTRACT

Artificial intelligence can be called a computer science. Artificial intelligence is a collection of systems that establish a detailed link between each other by analyzing some of the data we have in order to perform the tasks given to human intelligence and abilities. The human brain can be imitated with artificial intelligence. In artificial intelligence alone, we do not have the intensity of emotions that we humans have. Imitating the human brain is the main principle of artificial intelligence. When the brain, which is taken as a central reference, is examined anatomically and neurologically, the brain perceives target problems in the external environment and after processing them, it can turn it into a computer model observed as behavior. Considering the robots that enter our house today, it is seen that artificial intelligence has a role in every field. Mechanical engineering is a science engineering branch that addresses a wide spectrum by taking into account the design, analysis and manufacture of mechanical systems using material technologies and some basic assumptions. By making mathematical modeling with mechanical engineering, it is possible to reach a solution by modeling these problems. Mechanical engineers; Wind turbines, heavy machinery, equipment, cooling and heating systems, artificial human organs and limbs, planes, helicopters, drones, UAVs (Unmanned Airspace vehicles), automobiles and passenger vehicles, engines and mechanical systems design and many other areas are optimally sustainable and taking into account the appropriate cost conditions.
Considering that the importance of artificial intelligence has increased as a result of some developments and epidemic diseases such as COVID-19, virtual meetings, education and training are held, and robots will be used in our home, it has been concluded that a study should be carried out on the use of artificial intelligence in the field of mechanical engineering. It is thought that artificial intelligence will be the main cause of significant progress in production without minimizing the role of humans, and therefore mechanical engineering companies will make solutions especially with "machine learning" technology. In this study, the definition of artificial intelligence is made and the sub-branches of artificial intelligence are explained. By sharing the literature studies in the field of artificial intelligence and engineering, the methods applied in mechanical engineering related to machine learning have been mentioned.

Keywords: Mechanical Engineer. Artificial Intelligence. Machine Learning. Deep Learning. Data Mining.

Presentation ID = 56
Oral Presentation

INTERVENTION STRATEGIES FOR STUDENTS WITH DIFFERENT TYPES OF INTELLIGENCE TAKING PROJECT / STUDIO COURSES IN DESIGN EDUCATION

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ABSTRACT

The study aims at making a classification for design students, one of the actors of the project/studio course, which is considered as social network organization in the thesis, this is tried to be resolved through the "Actor-Network" and "Black Box" theories, with the side that looks at diverse types of intelligence, similar to its counterpart in educational sciences; as well as targeting to confer a general picture of design students with different types of intelligence in project/studio courses. For this reason, firstly the studies on the subject in the educational sciences literature were tested, then 30 graduate industrial designers were interviewed with the qualitative research method. During the interviews, the participants were asked questions about the project processes in which they had the most bottlenecks during their project/studio courses and the potential reasons for this. Several evaluations were reached by cross-reading the information acquired from the literature, the data obtained from the face-to-face interviews from qualitative research methods, and the experiences of the researcher. It is considered that the most critical findings of this research are that most of the students who attend the project/studio courses have varying intelligence types and this is due to different reasons. It is also thought that the study has the potential to create awareness for the classification of design students over various intelligence types and to develop distinctive intervention strategies for each intelligence type and support studies on this subject.

Keywords: Design education. Multiple intelligence Theory. Digital Education.

Presentation ID = 61
Oral Presentation

METHODS AND MEANS OF INCREASING THE ACCURACY OF DETERMINING THE STATE OF THE OBJECT

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ABSTRACT

In order to determine the state of the object, the distance to it, inclination, density, etc. various types of sensors setting parameters with high accuracy, as well as methods and means to increase the accuracy of setting these parameters are presented in the article. The types of the presented sensors, the principles of operation, areas of application have been comparatively analyzed, their classification has been considered and their pros and cons have been analyzed. Among the considered methods, a complex method with laser sensors, which is an expedient method for determining the distance to the object with high accuracy, has been proposed, the principle-structural model, areas of application, features, advantages and disadvantages of the functional model have been analyzed. The proposed method with high temperature stability determines the distance to the object, inclination, density, etc. the possibility of measurement is shown. The optical system, which uses a laser source and sensors being capable of taking measurements in the visible range, is accompanied by perfect control based on sensor circuits and processing microcontrollers to achieve optimal results in the complex measurement and control process that allows to determine the characteristic parameters with high accuracy that set the state of a high object.

Keywords: Sensor. laser sensors, visible range. Object. complex measurements. Accuracy. functional model. structural model.

Presentation ID = 62
Oral Presentation

INTELLIGENT CONTROL SYSTEM FOR SPEED AND STATE OF OBJECT (TRAINS)

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ABSTRACT

An intelligent system that monitors the speed and state of a moving object is designed to reduce the risk of potential hazards that may happen with the possibilities of autonomous decision-making depending on the situation, the ability to exchange information via remotely controlled network sensors with databases of stationary measuring nodes installed at intersections and control crossings, assessing risks on the base of the data obtained from object characteristics parameters and side affective parameters, warning to the central control system based on the results and making decision to adjust the movement speed of the object depending on the level of hazard and whether the decision is approved by the center, provide information about the object located on the board, transmit warnings to security systems at intersections and impacting on the decisions depending on the risk, detecting the possibility of changes in the characteristic technical parameters of the object under the influence of internal and external factors and making appropriate decisions in accordance with risk assessment, etc. The proposed intelligent system has also the capabilities of free monitoring and control along with network of remote control of two or more moving objects (trains) with the exchange of information on processes, monitoring and control, monitoring of working conditions with the participation of a remote control wireless sensor network and a central control room.

Keywords: control system. remote measurement. remote control. wireless communication. intelligent system. diagnostics, monitoring. intelligent sensor.

Presentation ID = 49
Oral Presentation

PREDICTION OF FISH SPECIES WITH DEEP LEARNING

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ABSTRACT

Seafood, which has an important place in our nutrition, is an excellent source of vitamins and minerals. Seafood, which is very easy to digest among protein sources, contains very little harmful fat compared to other high protein sources. It is known that fatty acids such as omega-3 found in fish are good for many diseases that negatively affect human health such as diabetes, cancer and cardiovascular diseases. In addition, there are also fish species that can threaten human health, even if a small amount.
With the study carried out, it is aimed to predict the species of fish, which have an important role in the nutrition of human beings, by means of deep learning algorithms, one of today's popular machine learning methods. In the application developed for this purpose, 4411 fish images obtained from a controlled environment were used. The fish images used are real fish images obtained under different conditions (lighting etc.), although they consist of 483 different species. The "QUT FISH Dataset" was used for training and testing the deep learning algorithm prepared in the study.
With the Convolutional Neural Networks (CNN) method, which is one of the advanced deep learning techniques, features of fish species were extracted from the images in the data set. These extracted features are classified using a multilayer artificial neural network model. Classification success was measured by Precision, Recall, Accuracy and F1-Score functions, and values of 0.7582, 0.7579, 0.7372, and 0.7565 were obtained respectively.

Keywords: Deep learning. Convolutional neural network. Prediction of fish types.

Presentation ID = 63
Oral Presentation

ONLINE DIAGNOSTICS AND MONITORING OF SENSORS WITH DCS SYSTEM FOR EXPLOSIVE DANGEROUS OBJECTS

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ABSTRACT

The development of modern information technology systems for automatic control of technological processes. PSS (prosses safety system) and ESD (emergency shut down) systems, along with PCS (prosses control system) systems for the purpose of operative implementation of remote configuration and diagnostics of SMART field devices, are online diagnostics and monitoring of sensors in SCADA system.

Keywords: Smart Devices. Diagnostics. SCADA. PLC. FDT. DTM. DCS. PCS. PSS. Information Technology.

Presentation ID = 60
Oral Presentation

AUTONOMOUS CONTROL OF SMALL UNMANNED AERIAL VEHICLES

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ABSTRACT

The abstract identifies gyroscopes and their main characteristics, element base, construction principle, structure, advantages and features of construction in laboratory conditions. Recently, the creation of unmanned aerial vehicles (UAVs) is one of the dynamically developing areas. Of particular interest are multirotor PUAs, mainly due to a number of parameters and areas of application. These UAVs are also important in terms of application in aviation and aerospace. The main field of application of this type of devices is the control of various environmental parameters with the use of aerial photography, aerial video recording, military, as well as the use of additional equipment on board. This technology, which is of strategic importance, has been improved, and its implementation should be targeted. This issue is also important for us in terms of its application to various industries. Therefore, using modern technology, it is possible to create high-quality flight apartments with less financial costs. Not only from military aproach, also from medical, shipping, trading and other approaches, these fields can be improved with usage of unmanned aerial vehicles.

Keywords: Unmanned aerial vehicle. Navigation. Gyroscope. Accelerometer. sensor.

Presentation ID = 58
Oral Presentation

SOLUTIONS AND PREVENTIONS TO BOTNET ATTACKS AND OTHER RISKS IN IoT

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ABSTRACT

This thesis includes main problems in IoT (Internet of Things) and possible solution ways. As the name implies, things are physical objects that we interact with them in our daily life. It can be household object like refrigerator, light bulb or vacuum cleaner. Sensors are electronical components attached to the objects for measuring environmental or non-environmental parameters and sending values to the internet. For example, temperature sensor can measure temperature inside your refrigerator and send that value as a message to your phone. IoT includes all this big information in terms of hardware and software. And with this big technology the risks also maybe unavoidable. Hacker attacks can be real threat with the power of this technology. There are different types of that issues and solutions. Building IoT technology is a challenge but also building the security layers, systems to prevent that hacker attacks or any other possible risks is also another big challenge that engineers have to deal with.

Keywords: Issues in IoT. Data. Botnet. Malware. Ransomware. Sensor. Actuator.

Presentation ID = 64
Oral Presentation

THE IMPACT OF THE ENVIRONMENT ON THE USE OF SENSORS

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ABSTRACT

This article deals with researches conducted on the advantages of sensor networks and the impact of the environment on sensors in connection with the modern advances of microelectronics and the development of wireless communication technologies, which led to the emergence and development of sensor networks (SN). Difficulties arising from their size and sensitivity to external influences when using sensors that are sensitive elements of transmitters that detect changes in parameters such as temperature, pressure, humidity, sound, magnetic field, radiation, etc., in order to reduce their physical size, use as a network, having remote monitoring and control capabilities and reduce external influences in accordance with the nature and requirements of the physical process under study, the sensor network of industrial facilities network usage complex with sampling method based on priority identifiers is provided.

Keywords: Sensor. remote control. intelligent sensors. Ecology. Environment. Pressure. Equipment. sensor network.

Presentation ID = 65
Oral Presentation

ADJUSTMENT OF ROD STRING VIBRATIONS IN DEEP-WELL PUMPS UPON IMPACT

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ABSTRACT

In the article, studying the behavior of a rod strings is considered, the character of the change in dynamic pressure in rods is studied. On the basis of the equation fluctuation of a homogeneous core, the question on fluctuations of rod strings is studied more deeply.
One of the most important problems in the operation of sucker rod pumps is the problem of selecting a sucker rod string. The growth of well depths requires not only a complete analysis of the operation of the existing equipment, but also the rational operation of such wells. Many researchers have dealt with the calculation of the dynamic forces acting on the sucker rods.
Here, with the help of mathematical modeling, an analytical expression was obtained, which allows one to study the nature of changes in dynamic stresses in the rods, the problem of optimizing the choice of the dimensions and weight of the rods is formulated.

Keywords: Bars column. fluctuations of a homogeneous core. dynamic voltage. dynamic load. the weight of rod strings.

Presentation ID = 5
Oral Presentation

STRUCTURAL & DYNAMIC ANALYSES AND SIMULATION OF MOBILE TRANSPORTATION ROBOT

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ABSTRACT

In this study, structural and dynamic analyses were applied to the mobile transportation robot to find the structural strength and to calculate the power and torque requirements. The mobile transportation robot as designed using CAD software as two modules; mecanum wheeled locomotion module and robotic arm module, respectively. The analyses were carried on the CAE Software using the static structural and rigid body dynamics tools. In the structural analysis, the weight of the robot and the additional load (98.1 N) were applied to the body of the robot. The material of the robot body was selected as Aluminum 6061 O sheet metal. In the dynamic analysis, the operation environment and conditions were simulated in the CAE software. The structural analysis results showed that the designed robotic structure was strong enough with factor of safety value of three under applied loads. Furthermore, from the dynamic analysis, the total torque requirement of the mobile robot was about 16.56 Nm.

Keywords: Dynamic Analysis. Finite Element Analysis. Mecanum Wheel. Mobile Robot. Structural Analysis.

Presentation ID = 6
Oral Presentation

TOPOLOGY OPTIMIZATION OF MOBILE TRANSPORTATION ROBOT

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ABSTRACT

The main aim of this study was to decrease the weight of mobile transportation robot and to check the optimized shape using topology optimization and structural analysis. The analyses were applied using CAE Software with the methods of topology optimization and structural analysis. In the topology optimization process, the preserved areas were defined for connection and fixing areas. The aim was to decrease the weight of robot structure and lower the energy consumption of the robotic system. After topology optimization, the structural strength analysis was applied to the new optimized structure to check about the strength. The weight of the structure was decreased with the ratio of 20%. In addition to this, the structural strength of the robot was observed similar to the original body with the factor of safety value as three.

Keywords: Mobile Robot. Robotic Arm. Structural Analysis. Topology Optimization. Weight Reduction.

SECTION III

INDUSTRY DEVELOPMENTS

Oral Presentation

THE EFFECT OF ADDITIVE MANUFACTURING ON THE 4TH INDUSTRIAL REVOLUTION: THE CASE OF CHINA

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ABSTRACT

Manufacturing/production has been one of the important indicators of the power of countries since the industrial revolution began in the middle of the 18th century. Three Industrial Revolutions were carried out in the history of mankind so far. Simultaneously with the global economic crises in the last 20 years, the rapid development of science and technology, especially the advances in artificial intelligence, robotics and digital manufacturing technology, has radically changed the original/traditional production order. Accordingly, while developing countries change their national industrial strategies; China, which restructured the manufacturing sector in order to increase the global competitiveness of the manufacturing industry, has become the fastest adapting country to the fourth industrial revolution including the modern automation system, data exchanges and new generation production technologies. China has now become a direction for new generation manufacturing technologies by eliminating the deficiencies of its products that it has imitated/sampled for years. With regard to Additive Manufacturing, the new form of manufacturing, Chinese manufacturers are far ahead of many western companies and offer this quality with much more economical investment costs. As Anka Analitik, we realized this rise and turned our face to Asia.

Keywords: 3D Printing, Additive Manufacturing, China.

Oral Presentation

FORM ADDITIVE FOR 3D PRINTING

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ABSTRACT

Industry has difficulty adapting to new technologies such as additive manufacturing, as in the previous periods of industry change. Therefore, academic support should be taken from academicians while meeting with industrialists. In this way, companies continue to produce without decreasing their productivity in the areas they are inadequate. With this mission, cooperation between universities and industry should be strengthened. In this study, activities on additive manufacturing technologies are presented. For a long time, Form Additive, which has been the representative of leading and guiding companies both in the world and in our country, provides sales and service of industrial machines in particular.

Keywords: 3D Printing, Additive Manufacturing, Industry.

Oral Presentation

THE ADDITIVE MANUFACTURING 2.0

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ABSTRACT

The Additive Manufacturing (AM) industry is at a major transformation point, this transformational market change is being driven by the emergence of next-generation AM technologies that unlocks design reality, throughput, repeatability, and competitive part costs with a focus on making AM an easy to use, economic solution for prototyping, manufacturing aids and mass production.

Keywords: Additive Manufacturing 2.0, Mass Production, Design Reality, Manufacturing Aid, Transformation.

Oral Presentation

THE STAGES OF DESIGN FOR ADDITIVE MANUFACTURING

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ABSTRACT

Metal additive manufacturing world has different technologies. Each technology has different advantages and limitations but to be able to take those advantages, the design of the part should be made according to additive manufacturing technology you are using. Topology optimization concept is very important for design for additive manufacturing. And also engineering heuristic approaches play an important role in topology optimization. . In the study, different metal additive manufacturing technologies are mentioned and it is focused on stages of design for additive manufacturing.

Keywords: Metal Additive Manufacturing Technologies, Topology Optimization, Design for Additive Manufacturing.

Oral Presentation

DESIGN AND CONSTRUCTION OF FDM BASED H-BOT 3D PRINTERS FOR EDUCATIONAL PURPOSE IN 3D PRINTING PROJECT

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ABSTRACT

3D printing has been widely used in industry, medicine, and many fields to develop new prototypes and novel products. Even consumer usage has been increased during the last decade as well as the number of commercially available and open-source alternatives. Consequently, the rising generation has been taken the advantage of new low-cost, robust, and high-tech 3D printing systems to develop their imagination and design/manufacturing capabilities. Therefore, 3D printers are important especially for learning purposes such as medical models, architecture, mechanical engineering, design/manufacturing departments, and so on. In this study, a low-cost and robust H-Bot kinematics-based FDM printer was designed and manufactured for educational purposes. The system has been developed with up-to-date features such as a TFT user interface, a WiFi modüle, silent running, semi-close transparent frame, low energy consumption, and ergonomic design with durable metal components. Assembly records and manuals were also provided with troubleshooting information to ensure the further spread of usage of Additive Manufacturing technologies. A face-to-face course was also arranged for local people to introduce the system and demonstrate the usage.

Keywords: 3D Printer, 3D Printing, Design, H-Bot, Education.

Oral Presentation

THE ROLE OF DIGITAL FACTORIES IN PRODUCT DEVELOPMENT, END USE PARTS AND SUPPLY CHAIN IN ADDITIVE MANUFACTURING

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ABSTRACT

In this study, from prototyping to mass production, the role of 3D printing service bureaus, additive manufacturing and related applications are given. It is even possible to produce complex designs with additive manufacturing. There are several factors that affect choosing the right technology for the desired application and part. Being able to offer different types of professional, high-end production solutions is one of the most important advantages for service offices.

Keywords: 3D Printing, Digital Factory, Additive Manufacturing.