ARTICLES

Session 1

1.1

Search for common physiological responses to videos evoking unpleasant emotions with different arousal levels

Masaji Yamashita and Yoshitaka Itoh

Abstract: In order to establish an objective method for evaluating emotions, we sought to identify the physiological parameters that change in response to various unpleasant emotions. Experiments and analysis were conducted using video stimuli that evoked the unpleasant emotions of “fear” (high arousal), “disgust” (medium arousal), and “sadness” (low arousal), as well as the pleasant emotion “exhilaration” (high arousal). The results of our questionnaire confirmed that the emotions evoked by each stimulus were valid. Because the physiological response of the autonomic nervous system differs depending on the arousal level of each emotion evoked, analysis of general physiological responses did not reveal any physiological values common to unpleasant emotions with different arousal levels. “Fear” and “exhilaration,” which have high arousal levels, showed similar physiological responses, while “disgust” and “sadness,” which have different arousal levels, responded with different physiological quantities. Furthermore, there was no commonality in the physiological responses to unpleasant stimuli. On the other hand, analysis using blood pressure waves showed that a physiological index linking two parameters that tend to change in common to the three unpleasant emotions increased in common to the three unpleasant emotions.

1.2

Artificial Intelligence in Pediatric Pneumonia Diagnosis

Evelin Henrietta Dulf, Raul Petru Banut, and Alexandru-George Berciu

Abstract: Pneumonia is a common occurrence in children under the age of five, particularly in those with underlying conditions. It is the leading cause of death in children worldwide. Chest radiography is currently the most effective method for identifying pneumonia. There have been several research papers discussing the potential of computer-aided diagnostic tools for pneumonia, but none of them have been designed for use with pediatric patients. This work addresses the lack of such a tool by proposing a solution based on supervised learning. A comparative study was conducted to ascertain which convolutional neural network performed optimally. The obtained results are comparable with those reported in the literature for adults. The final model is included in a website created for clinical use. The proposed application has the potential to assist clinicians in interpreting data sets and to facilitate accurate diagnoses, particularly in underdeveloped regions where clinicians may lack the necessary expertise.

1.3

Accurate MRI-based Alzheimer’s Disease Detection Using CNNs and Encoding Techniques

Florina-Luminița Rostaș, Raluca Cosmina Maria Ardelean, Emilia Sipos and Laura-Nicoleta Ivanciu

Abstract: Alzheimer’s disease is a well-known neurological condition that is the most common cause of dementia. It affects older adults leading to a decline in cognitive function, and memory which affects daily activities. This study investigates which combination between encoding technique (One-Hot, Label, Binary, Ordinal, and Leave-one-out) for the dataset and activation functions (ReLU, LeakyReLU) in the CNN model delivers the best performance, when Precision, Recall and F1score are evaluated. The different CNN models were trained over 10, 50 and 100 epochs. By using a publicly available MRI scans dataset, with four categories of Alzheimer’s disease, Non_Demented, Mild_Demented, Moderate_Demented, and Very_Mild_Demented. The study shows that an accuracy of 100% can be obtained when

OneHot and LeakyReLU are employed. The results outperform similar research, where the same dataset, encoding techniques and activation functions are used.

1.4

3D Reconstruction of Neovascularization in Age-Related Macular Degeneration from OCTA Scans

Adrian Pop, Adrian Groza, Ioana Damian and Simona Delia Nicoara

Abstract: This study presents a method for blood vessel segmentation in optical coherence tomography angiography (OCTA) images through filtering and intensity comparison of the main 2D scan images. The approach involves identifying possible blood vessels based on the analysis of pixel intensity frequencies from four perspectives, marking potential blood vessels by checking the cross-correlation between neighbors of previously identified points, and segmenting the volume from the lateral perspective to identify the blood vessels. The method incorporates three main techniques: detecting peaks indicative of potential blood vessels, cross-correlation analysis to retain significant peaks and reduce noise, and segmenting the final blood vessel regions from the volume. By overlaying areas of interest onto a 3D volume from OCTA scans and retaining the most intense regions, the study achieves a detailed 3D reconstruction of the neovascularized area, offering a promising tool for better understanding the disease evolution between multiple scans and treatments of nAMD.

1.5

AI-based 3D segmentation of pulmonary vasculature of CTEPH patients

Angela Lungu, Andrew J. Swift, Alina S. Danciu, Michael Sharkey, Rod D. Hose, Maciej Malawski

Abstract: Chronic thromboembolic pulmonary hypertension (CTEPH) presents challenges for pulmonary artery segmentation due to vascular remodeling, stenosis, and obstructions. This study evaluates a 7-layer dilated convolutional neural network (CNN) with Tversky loss, applied to computed tomography angiography (CTA) images that were preprocessed with image enhancement techniques. The model achieved a Dice score of 0.792 on non-CTEPH data but scored 0.693 on CTEPH data, reflecting the challenges of manual segmentation, where smaller branches are often missed. While the results align with other research, advanced 3D CNN models have shown higher accuracy. Future work should refine ground truth data and explore 3D models to better capture CTEPH-specific complexities.

1.6

Post radiation treatment cancer recurrence prediction using multivariate adaptive regression splines from Head and Neck Squamous Cell Carcinoma CT Images

Muhammad Zunnurain Hussain, Muhammad Zulkifl Hasan, Muzzamil Mustafa, Aqsa Khalid, Ali Moiz Qureshi, Muhammad atif Yaqub, Rimsha Awan, Afshan Bilal , Zohaib Ahmed Khan, Arslan Javaid and Saad Hussain Chuhan

Abstract: Radiation therapy is the treatment procedure to kill the cancer cells after treatment planning in the radiation oncology workflow. If the target tumor is uncovered during therapy, biologically there are great chances of the cancer cells recurrence due to which the patient must undergo either CT or MRI scan again. There should be cancer recurrence prediction mechanism to avoid the follow-up scan. As there are several cases of treatment, recurrence and the cured cases worldwide, this work is an effort to predict the cancer recurrence using the feature-based machine learning techniques. With the clinical prognostic characteristics listed by the expert radiation oncologists from MD Anderson Cancer Institute, we developed a machine learning model using multivariate adaptive regression splines. The model was trained with 429 (70%) samples and tested with 188 (30%) which resulted in an accuracy of 89.9%. Further we have plans to extend the ML algorithm to other imaging modalities and other anatomies treated with radiation therapy. This would help the doctors for clinical decisions on follow up diagnosis and therapy.

1.7

Prototype for a Telemedicine Applications within the Framework of Energy-Positive Homes to Enhance Healthcare Accessibility

Roxana-Valentina Briscan, Denisa Stet and Simona Vlad

Abstract: Although technology is continuously developing, telemedicine is still not yet utilized to its full potential into a positive home environment. Many patients lack home-based equipment to monitor their health condition. To address this issue the authors of this paper propose the development of a small and low cost wearable Electromyograph prototype with surface electrodes. The device is specifically designed for patients diagnosed with Myasthenia Gravis. The purpose of this device is to enhance patients' comfort and to reduce the energy, time, and costs associated with visiting specialist doctors. Another benefit of the device is that it provides doctors with easy access to real-time data sent by the patient.

1.8

Comparative Analysis of Machine Learning Algorithms on Kidney Transplant Medical Data

Gabriel Cristian Dragomir-Loga

Abstract: In this work, we present the results obtained after using some of the most modern Machine Learning (ML) algorithms: K-Means (KM), Decision Trees (DT), Logistic Regression (LR), Bernoulli Naive Bayes (BNB), Gaussian Naive Bayes (GNB), Random Forest (RF), Support Vector Machines (SVM), K Nearest Neighbors (KNN), Gradient Boosting (GB). We worked with real clinical data that refer to kidney transplantation. Features include age, gender, Killer cell immunoglobulin-like receptor (KIR) characteristics and patient status. The conclusion depends on the small volume of data available and tells us that on average, using the above characteristics to classify the patient's status, the accuracy does not exceed 70% for any of the algorithms we used. GB and GNB out performed all the other estimators (accuracy 70%) with penalty in execution time for GB – 32.5 min, compared to other estimators where the execution time was under 1 min. GNB was the best to precision. SVM was the best to specificity. GB was also the best at recall and F1 score.

Session 2

2.1

Empathetic AI: Bridging Technology and Human Emotion for Enhanced Mental Health Support

Muhammad Zunnurain Hussain, Muhammad Zulkifl Hasan, Muzzamil Mustafa, Aqsa Khalid, Ali Moiz Qureshi, Muhammad atif Yaqub, Rimsha Awan, Afshan Bilal , Zohaib Ahmed Khan, Arslan Javaid and Saad Hussain Chuhan

Abstract: This paper explores the development and integration of empathetic artificial intelligence (AI) in mental health support services. We begin by discussing the growing need for mental health resources and the potential of AI to meet these demands. The focus then shifts to the concept of empathetic AI, which involves AI systems capable of understanding and responding to human emotions in a nuanced and human-like manner. We present the technological foundations of such systems, including natural language processing, emotion recognition, and machine learning algorithms that enable AI to interpret and respond to emotional cues. Further, the paper examines the ethical considerations and challenges in implementing empathetic AI, such as maintaining privacy, ensuring emotional accuracy, and avoiding biases. We also highlight the importance of integrating human oversight to complement AI capabilities. Case studies and experimental findings are presented, showcasing the effectiveness of empathetic AI in various mental health applications. These include therapy assistance, crisis intervention, and daily mental health monitoring. The paper concludes by discussing future directions for empathetic AI in mental health, emphasizing the

need for ongoing research, interdisciplinary collaboration, and policy development to maximize the benefits of this technology while mitigating risks. This exploration underlines the transformative potential of empathetic AI in enhancing mental health support, bridging the gap between technology and human emotion.

2.2

13.56 MHz RFID Module – from Application to Process Modelling and Effects on Human Health

Claudia Constantinescu, Claudia Pacurar, Adina Giurgiuman, Calin Munteanu, Sergiu Iulian Andreica, Marian Razvan Gliga, Sabin Dusa

Abstract: RFID (Radio Frequency Identification) is a technology very used in the last few years due to its reliability and ease of use. The applications are pre-sent in a large range of frequencies, but this paper is focused on a13.56 MHz module which is usually combined with an Arduino board. First, a simple application for student monitoring capable of storing information about each student and the time he/she checked in and out of class is presented. The advantages of such a system are highlighted and the components used to construct this system are described. The next step of this paper is to determine how the RFID module functions by numerically modelling it with and without the tags and cards near it, attempting also to show how the positioning of the tags influences the characteristics of the active tag's antenna. The last step of the study is centered on determining the influence of such a tag near human tissues and concludes by determining if it is safe or not to use an RFID for long periods of time.

2.3

Analysis of human exposure to electric and magnetic fields while charging and driving an electric vehicle

Marian Razvan Gliga, Adina Giurgiuman, Calin Munteanu, Sergiu Iulian Andreica, Claudia Pacurar, Claudia Constantinescu, Marius Botezatu

Abstract: The transition to electric vehicles is a promising strategy to reduce or eliminate harmful emissions, including carbon dioxide, nitrogen oxides, and particulate matter, from internal combustion vehicles. While electric vehicles offer environmental benefits, their operation involves the generation of electromagnetic fields (EMFs) in their immediate vicinity. Although the biological effects of EMFs have been extensively studied, the specific health risks to humans remain uncertain.

In electric vehicles, occupants are exposed to artificial EMFs due to their close proximity to high-capacity electrical systems operating for extended periods. Recognizing these potential concerns, electric vehicle manufacturers have incorporated various technological solutions during the design and manufacturing processes to mitigate EMF exposure. This study will conduct experimental measurements of the electromagnetic field generated by an electric vehicle un-der a range of operational conditions.

2.4

YourDiagnosFriend - Integration of machine learning in medicine

Laura Nemeș, Emilia Sipos and Laura-Nicoleta Ivanciu

Abstract: Artificial Intelligence has significantly transformed numerous aspects of daily lives, particularly in the healthcare sector where it performs tasks that traditionally requires human intelligence. YourDiagnoseFriend is a groundbreak ing web-based tool designed to classify and provide potential medical conditions based on user-reported symptoms. Implemented within the Django framework to ensure a robust and scalable platform, YourDiagnoseFriend is crafted to be user friendly, accessible, offering accurate and reliable diagnostics. Access is restricted to authenticated users to ensure data privacy and security. Users can select from various symptom categories and input their specific symptoms, which the system then analyzes to predict possible diagnoses and recommend specialized doctors. YourDiagnoseFriend facilitates early disease detection and guides users toward timely and

appropriate healthcare steps. This thoughtful design and functionality aim to empower users with valuable health insights, enhancing their overall health management experience and promoting proactive healthcare practices.

2.5

Foot drop orthosis, low cost, with thermoplastic

Ionel Șerban, Corneliu Druga, Barbu Cristian Braun, Alexandru Tulică and Ileana Constanta Rosca

Abstract: This paper aims to describe the realization of a proposed orthosis, made from an airy and lightweight low temperature thermoplastic, used in the case of foot drop for supporting, stabilizing, correcting the ankle joint in the process of locomotion. The described solution might be done as a simple DIY work with accessible materials and little technical knowledge. Besides this, it can be personalized to the anatomy of every user, due to the thermoplastic's properties and it is composed of two parts easily connected through a quick release band and Velcro. Thermoplastic can be modeled after being kept for a couple of minutes in water at a temperature of around 700C. The critical study indicates an abundance of available, on the market and not only, of technical solutions that imply different materials, solutions and methods including FES- Functional Electrical Stimulation. The paper also presents a bibliographic study made in order to understand the relevance of some keywords/terms, specific to this study, in a recognized database.

2.6

Efficient High-Voltage Probe Designs for EV Systems

Bogdan Cirstinoiu, Dumitru-Daniel Bonciog, Nicolae Ionica, Bogdan Nyiredi , Valentin-Laurentiu Ordodi , Nicolae-Marius Roman and Valentin-Ioan Maranescu

Abstract: This study investigates the performance of cost-effective high-voltage probes designed for electric vehicle projects (EV), with a particular emphasis on signal integrity across various frequencies and duty cycles. The paper addresses the challenges of measuring high-frequency signals in EV systems, where accuracy is essential but typically limited by the expensive cost of precise equipment. Significant errors were discovered at higher frequencies and duty cycles, which impacted measurement reliability. Both the dual opto-isolated probe, and inductive coupling probe shown a stable performance at lower frequencies, but their accuracy has decreased under more demanding conditions. These probes were deliberately intended to be cost-effective, acknowledging that high-voltage testing benches from the High Voltage Testing Laboratory cannot always be completely equipped for every project due to substantial investments and the high costs of precision instruments. The findings highlight the importance of optimizing affordable probe designs for high-voltage EV applications to ensure precise and reliable signal measurements while managing budget constraints.

2.7

Solutions for Heating in Healthcare Facilities: A Case Study on the Use of Heat Pumps and Energy Consumption Reduction

Constantin Cilibiu and Ancuta Coca Abrudan

Abstract: In the context of rising energy costs and increasing emphasis on environmental sustainability, hospitals face significant challenges in optimizing their heating systems while maintaining patient comfort and reducing operational expenses. This paper explores the implementation of heat pump technology as a sustainable solution for a hospital heating system, focusing on its impact on energy consumption and carbon footprint reduction. The study presents a detailed case analysis of a hospital that transitioned to a heat pump-based heating system, highlighting the technical, economic, and environmental benefits achieved. Key findings demonstrate a substantial decrease in energy consumption, leading to lower operational costs and a significant reduction in CO2 emissions. Additionally, the paper discusses the challenges encountered during the implementation process, including system integration with existing infrastructure and initial investment considerations. The results

underscore the potential of heat pumps as a viable alternative to traditional heating methods in the healthcare sector, contributing to both economic savings and environmental stewardship. This case study provides valuable insights for engineers, facility managers, and decision-makers in the medical field who are considering the adoption of green technologies to enhance the sustainability of healthcare facilities.

Session 3

3.1

The study of a low-cost system used to evaluate the body mass index

Traian Paduret and Mariana Rodica Milici

Abstract: This study presents a novel, low-cost system designed to evaluate Body Mass Index (BMI), a widely used indicator of health. The system lever ages affordable, readily available components to create a user-friendly and accessible tool for BMI assessment. By combining (specific components, e.g., weight scale, height measurement device, and microcontroller), the system offers a practical and cost-effective alternative to traditional clinical methods. The system's accuracy was evaluated through rigorous testing against standard BMI calculation methods, demonstrating a high degree of correlation. Furthermore, the system's portability and ease of use make it suitable for various settings, including home use, community health centers, and remote areas with limited access to healthcare. Potential applications of this system include population health monitoring, early detection of obesity, and personalized health management. The development of such a low-cost system has the potential to significantly improve access to BMI assessment, thereby promoting healthier life styles and reducing the burden of obesity-related diseases. Future research directions include exploring additional features, such as real-time feedback and integration with mobile health applications, to enhance the system's functionality and user experience.

3.2

Adaptable Mechanism for Walking Aids

Istvan Ver, Alina-Elena Ver and Silviu-Dan Mandru

Abstract: Health has a major impact on everyday life. Walking disorders affect a large number of people, who thus become dependent on the use of a walking device or walking aid. The walking devices are addressed not only to the elderly, to people suffering from various locomotor disorders, but also to people in the phase of post-operative recovery, who for a period of time must use such a device. Their use also implies certain recommendations such as avoiding walking on stairs with bilateral subaxillary crutches, or the walking frame, the need for a fixed support surface next to the antebrachial crutch when lifting / sitting down, the need for a handrail or help from a person to climbing / descending stairs with the help of antebrachial crutch, etc. This paper presents an adaptable mechanism suitable to any walking device, such as a cane, axillary crutch, antebrachial crutch (Canadian) or walking frame, having the role of making the functions of these walking devices more efficient, so that it provides a propulsion force when lifting and ensures a controlled sitting, with support only in the walking device. Thanks to the possibility of changing the length of the walking device, it makes it possible to go up / down stairs, with only support in the walking device, providing an increase in user independence and mobility.

3.3

A Photoplethysmography-Based Affordable Demonstrator for Monitoring Muscle Oxygenation Using Infrared Light

Ana C Fenesan, Alexandru Ianosi-Andreeva-Dimitrova and Silviu-Dan Mandru

Abstract: This study examines the application of near-infrared spectroscopy (NIRS) in monitoring skeletal muscle function and metabolism. NIRS is a noninvasive, portable technology that measures muscle oxygenation and hemodyamics by detecting the absorption of near-infrared light. This research evaluates the efficacy of NIRS in determining muscle oxygenation levels, metabolic activity, and blood perfusion during various physical activities. Despite its advantages, such as ease of use and its non-invasive nature, NIRS presents certain limitations, including limited light penetration and individual variability in hemodynamic responses.

3.4

Rehabilitation Sensory Device

Alina-Elena Ver, Istvan Ver and Silviu-Dan Mandru

Abstract: The paper presents a device with sensors, adaptable for correcting vicious postures, preventing conditions due to them, or recovering conditions such as scoliosis and other types of spine-specific conditions. Also, the device with sensors can be used to recover coordination, re-educate the movements of self-care gestures and those of other activities. The device is composed of tilt sensors, warning modules: light (led), sound (buzzer) and sensitive (vibration sensor) and optionally, development board, bluetooth module and an electrostimulation device.

The novelty of this device is the fact that it combines the action of the warning system with the one of correction, allowing the voluntary correction of the posture based on the feedback provided by the device, or the involuntary correction of the posture, with the help of electrical stimulation. In the case of using the device in various objects, for example cups, cutlery, hygiene items, etc., for carrying out exercises on the recovery of coordination, re-education of movements from self-care gestures or other recovery exercises from various ailments, electrical stimulation is not used. Also, the device allows the therapist to follow the patient's progress remotely, thus allowing him to adjust the recovery program depending on the pathology and the goals pursued.

3.5

Neonatal Incubator: An Arduino-Based Prototype with Multi-Sensor Integration and Real-Time Data Streaming

Laura-Nicoleta Ivanciu, Ioana Ariton and Emilia Sipos

Abstract: With the rise in premature births and the high mortality rate of newborns within their first day, the need for incubators has become critical. This underscores the necessity of such a device to continuously track their daily progress and monitor the parameters such as temperature of the baby and of the environment from incubator, humidity, gas, pulse, sound and movement. This paper presents the implementation of an Arduino-based neonatal incubator prototype, capable of measuring various data: baby temperature, environment temperature and humidity, baby pulse, baby movement, and to detect whether the baby is crying, or the presence of gas or smoke. The acquired data is transmit ted in real-time, processed and displayed, for a facile interpretation. The prototype proves to be accurate and robust, successfully passing a series of tests, aimed at demonstrating the correct functioning of the sensors, both separately and combined. The proposed solution can be used in neonatal hospital units, to ensure the best possible conditions for the baby's growth. The sensor system and data visualization facilities keep the medical team updated regarding the baby's progress, and issues regarding the baby's health are promptly identified.

3.6
Low cost thermic system for transfusable substance improving
Barbu Cristian Braun, Corneliu Druga, Ionel Șerban and Leonard Gabriel Mitu

Abstract: The paper presents a stage of research regarding the design, development and testing of a flexible, low-cost system that allows improving the process of transfusion of vital substances. It is primarily about the process of heating and bringing them to an optimal temperature from the point of view of thermal biocompatibility for the beneficiary. From the implementation point of view, the heating solution proved to be an effective one both in terms of process duration and in reducing energy consumption. Regarding the functional testing, the method of recording and measuring the temperature values of transfusable substances using an infrared thermal imaging camera was used. Based on the results related to temperature measurement, finding values very close to the ideal ones specific to such processes, it was possible to conclude that the method is efficient, reliable, low-cost, and it can be implemented in the near future in hospitals and of blood transfusion centers, for all categories of subjects, regardless of the conditions that require a transplant.

Session 4

4.1
Measuring angle with an Arduino based device for a foot drop orthosis adjustment
Ionel Șerban, Corneliu Druga, Barbu Cristian Braun, Alexandru Tulică and Ileana Constanta Rosca

Abstract: This paper aims to describe a solution that might be used to measure, assess, the optimal angle, in the ankle joint, of a foot drop orthosis. This is done using a low-cost device composed of an Arduino UNO board; MPU6050 accelerometer and gyroscope module; 16x2 LCD display; servo motor SG90; a protractor and a portable battery. The described solution might be done as a simple DIY work with accessible materials and some technical knowledge. The described device, in this paper, is not an innovation, it could be identified on other open access sources in various configurations. The paper describes what this device is made of and how it is used to adjust the optimal angle in the ankle joint for those who use foot drop orthosis, but not only. The critical study indicates there are many devices and methods that can be used to assess the range of motion in joints. The paper also presents a bibliographic study made in order to understand the relevance of some keywords/terms, specific to this study, in a recognized database.

4.2
Biometric Medication Storage System
Rodica C Holonec, Laura Grindei, Laszlo Rapolti

Abstract: In response to the increasing need for secure and efficient management of prescription drugs, particularly controlled substances like opioids and sedatives, this paper proposes a biometric medication storage system. The system leverages fingerprint and facial recognition technologies to provide stringent access control, ensuring that only authorized personnel can access sensitive medications. Unlike traditional security methods, biometric systems offer higher security levels as biometric traits are unique, difficult to forge, and cannot be easily lost or forgotten. The integration of these technologies enhances not only security but also operational efficiency, reducing authentication time and simplifying access in critical situations. The system's design includes a dual-mode biometric authentication process, where users are first identified by their fingerprint, followed by facial recognition to verify identity before access is granted. The implementation features a Raspberry Pi as the central

processing unit, interfacing with a finger-print sensor, a camera, and a solenoid lock mechanism. This biometric approach ensures secure, traceable, and efficient medication management, meeting both safety and legal requirements while optimizing the storage and distribution processes of controlled substances.

4.3

Students Evaluating Teachers Before, During and After the COVID19 Pandemics. Human Interaction in Education, a Psychological and Behavioral Perspective

Mihaela Cirlugea

Abstract: The paper presents a survey regarding the student behaviour and perception of the educational process, before, during and after the pandemics. The study was done on subjects in the second year of study, where the author and the team teaches. Student comments and evaluations are discussed over three periods of time: before pandemics (moderate), during pandemics (critical), after pandemics (positive). The educational process was evaluated in terms of percents indicated by students after they attended the curricula. Comparing them, the conclusion showed that before the pandemics the scholar process was a moderate classical one face-to-face, during pandemics the whole process was stressful, impersonal and negatively perceived, while after pandemics a collaborative human interaction was developed. A crisis situation determined the creation of a positive learning environment, where human interaction was very important. The skills we obtained while online teaching were useful but complementar to the collaborative on-site learning process.

4.4

Modern methods meaning visual training for strabic and amblyopic children via assisted serious games

Barbu Cristian Braun, Corneliu Druga, Ionel Șerban and Leonard Gabriel Mitu

Abstract: This paper describes how a solution was developed and tested by which severe visual vision problems that frequently occur in childhood could be largely avoided or at least greatly reduced. The paper presents a stage of this research, which mainly focused on the prevention of the most common vision pathologies in children, namely amblyopia and strabismus. For this purpose, a non-conventional method has been developed, complementary to the classical methods, whereby vision testing and game training constitute the main activity in some therapy sessions. Concretely, we proceeded to the conception, design and testing of visual testing and training strategies in the form of serious assisted games, dedicated to amblyopia and strabismus type pathologies among school and preschool children. A fundamental stage consisted in the design and graphic programming of two software interfaces that are the basis of game-assisted training, the first for amblyopia and the second for strabismus. The method was repeatedly tested and improved throughout its development and finally it was tested on a sample of 10 children. It could be concluded that, on the one hand, the procedure could be implemented both from the point of view of screening type testing in schools and kindergartens, and from the point of view of visual training procedures for the drastic reduction of the two types of pathologies . In other words, the procedure was approved by all the tested children, proving to be attractive, dynamic and educational at the same time.

4.5

Conceptual model of an eye movement simulation proce dure for motor dysfunction prediction

Alexandra Maria Lazar-Cateanu, Barbu Cristian Braun, Mihaela Ioana Baritz, Angela Repanovici, Daniela, Mariana Barbu, Anca Ioana Tataru-Ostafe), Mirela Gabriela Apostoai

Abstract: The visual process is sustained by complex interactions between the functioning of the ocular globes, the central unit (brain), and the surrounding environment. This process is supported by the recording of movement parameters, which can provide information about the state of normality, attention, memory, refractive visual dysfunctions, the condition of the

oculomotor system, or emotional state. Over time, various procedures and ocular monitoring systems have been developed, and analyses of the types of eye movements have been conducted. However, significantly fewer studies have focused on a crucial aspect: the prediction of eye movement evolution for the assessment of normality or the presence of visual dysfunctions. In this paper, the authors present an analysis of the process of predicting potential ocular dysfunctions through the simulation of eye movements. The method used is based on the knowledge of simulating eye movements using the LabVIEW programming environment and the ability to correlate these simulations with video-recorded movements. In conclusion, the processing of the obtained data and the conceptualization of predictive analysis for the evolution of eye movements reveal the system's ability to reasonably estimate ocular behavior. This can contribute to the creation of a predictive kinematic model for the evolution of the visual system, with implications in learning processes, detection of dysfunctions, or behavioral manifestations.

Session 5

5.1

Predictive Mathematical Modeling of COVID-19 Pandemic: A Comparative Analysis of ARX and ARMAX Approaches

Cristina M Stancioi, Vlad Muresan, Mihail Abrudean and Nicolae-Marius Roman

Abstract: This study compares ARX and ARMAX models for forecasting COVID-19 case dynamics. Both models have been frequently used in time series forecasting and are considered here for their efficacy to estimate the spread of COVID-19. The ARX model utilizes delayed values of the dependent variable as well as exogenous inputs, whereas the ARMAX model includes a moving average component to account for random disturbances and noise in the data. This study focuses on each model's performance, accuracy, and stability, emphasizing how the presence of external factors like movement patterns, government actions, and vaccination rates influences predictive ability. The work is based on real world COVID-19 data, and the models are evaluated using important metrics such as root mean square error (RMSE) and goodness of fit. The results show that, while both models are successful, the ARMAX model makes more accurate predictions in the face of noise and changing external factors. This comparison emphasizes the benefits and drawbacks of each method and provides insights on developing time series models for pandemic forecasting.

5.2

Virtual Reality Soccer Game for Lower Limb Rehabilitation

Silviu George Ciorap, Monica Blănaru, George Iftimie, Eugen Crețu and Radu Ciorap

Abstract: Motor disabilities require a comprehensive approach that combines knowledge from diverse fields and promotes innovation in treatments and rehabilitation methods. A modern and effective way to combine entertainment with therapeutic exercises is Virtual Reality (VR) applications, which play an essential role in facilitating the locomotor rehabilitation process in an engaging and motivating way for patients. This paper aims to present a locomotor rehabilitation solution at a patient's home using mobile sensors integrated into a VR system. It was designed as a soccer game where the patient has to hit a ball and strike a target, and exercise helps the patient recover the mobility of the lower limb. The application was realized in Unity 3D and exported to a cell phone mounted in VR glasses. An MPU9250 sensor connected to the ESP-WROOM-32 development board records the lower limb movements. The ESP32 mode connects via WiFi with the application running on the cell phone.

5.3

Product strategy on ventricular assist devices market

Anca Constantinescu-Dobra, Madalina Veliche and Claudia Martis

Abstract: The global market for artificial heart and ventricular assist devices (VADs) has witnessed significant growth in recent years, driven by technological advancements and strategic initiatives by leading companies. Prominent manufacturers such as Abbott Laboratories and Abiomed carve out a substantial market share, mainly due to a diversified product strategy and strategic expansions. This article provides an overview of the key players, recent mergers and acquisitions, and market trends, focusing on the products strategy of those companies through the last decade, considering the evolving landscape of this critical segment of the medical device industry. The used technique for product strategy assessment was the strategic positioning map. It was taken into consideration the diversity of the product range, the price, the promotion and the additional services. While some companies focuses on a narrower range of medical products with a particular emphasis on temporary artificial heart devices and hemodynamic support, others offers a broader and more diverse range of medical products, including ventricular assist devices, drugs, and nutritional supplements that allow them a stable position on the global market.

5.4

A Comprehensive Solution for Effective Blood Donation and Distribution

Manan Kathuria, Tanisha Singh and Shaifali Sharma

Abstract: This research paper introduces an innovative Online Blood Donation Management System (OBDM), incorporating distributed client-server computing technology to establish a centralized database. The primary objective is to optimize blood donation and distribution processes, facilitating donor registration and profile management, real time inventory monitoring and donation scheduling for blood banks, and instantaneous communication of blood requirements by hospitals. The paper emphasizes the systematic approach of the OBDM system in tackling challenges associated with blood donation and distribution. Additionally, we propose a management platform for blood bank operations using data flow diagrams. A thorough examination of the design components reveals that the OBDM system seeks to modernize conventional processes by addressing privacy concerns, technological obstacles, and the need for a broader donor pool, positioning it as a holistic solution. Our findings demonstrate that the proposed modules effectively mitigate imbalances between blood supply and demand, identify the most suitable donors during emergencies, and enhance data privacy.

5.5

Development of a Patient-Mounted Ambulatory Infusion Pump Device - Solutions for Home Treatment and Patient Freedom

Anca I. Nicu and Iannis-Patriciu Ilisuan

Abstract: The paper describes the development of a portable, patient-mounted infusion pump prototype aimed at increasing patient mobility during long-term intravenous treatments. The design allows patients to move freely while receiving IV medication, addressing the limitations of traditional stationary infusion pumps. It also opens the possibility of at-home treatment by enabling long-distance configuration and disallowing patient control access. 3D modeling software and printing technology were used to create a functional prototype, featuring a stepper motor-driven peristaltic pump, a wireless control interface, and a wearable textile support system. The infusion pump was configured through a web-based interface, enabling users to adjust infusion parameters such as volume and duration. The created device can serve as a starting point for the development of wearable infusion devices, with potential for future refinement and application in medical settings.