Concurrent Parallel Sessions I&II 13:30-17:00

Innovation Award

Chair

Roanld Schnabel
President of VDE Germany

Committee

Xiao Ma
Professor at Nottingham Business School

Claesen Luc
Hasselt University

Kentaro Totsu
Tohoku University

Yi-Kuen Lee
Hong Kong University of Science and Technology

Lerwen Liu
Nanyang Technological University

FlexiStep

Dominik Materne, Alexander Woelk, Yushen Zhang

Abstract

Back pain is a prevalent issue in our modern society, affecting a significant portion of the population. According to a study conducted by the Robert Koch Institute and published in the Journal of Health Monitoring in March 2021, 61% of respondents reported experiencing back pain in the past 12 months, and this trend is on the rise. The impact of such pain on a person's everyday life and overall quality of life can be considerable, depending on the intensity of the symptoms.

While poor posture can be addressed with relative ease using insoles for shoes, recognizing and correcting misalignment typically only occurs once issues with the back and neck areas have already arisen. In an effort to proactively address this challenge, we have dedicated ourselves to developing a sole that monitors foot load and provides users with active, real-time feedback to prevent misalignment and incorrect footing.

It's essential to note that walking improperly can also contribute to weight gain, particularly in the legs, further reinforcing incorrect gait patterns. By addressing this unresolved problem, we aim to bring added value to humanity through our project, with the aspiration to revolutionize the healthcare market with our innovative idea.

RS Color Technology

Duan Lv, Bo Wang, Ziqi Chen, Jingyi Li, Hanqin Chen

Abstract

Intelligent color blind glasses include both software and hardware ends. On the software side, the "color chess" method is used to detect and collect visual information of the color defect. Users can adjust and establish personalized visual databases, which are transmitted to the hardware through Bluetooth. The hardware side obtains the image through a camera, uses deep learning to achieve YOLO object detection in Raspberry Pi, performs semantic segmentation on ROI areas to achieve contouring, and performs real-time color light compensation. The results are displayed at the corresponding positions on the microLCD. Using the principle of augmented reality + head up display, the prism projects corrected colored light into user's eyes. Then users can achieve color discrimination.

Biography

The RS Color Science and Technology Innovation Team, hailing from the University of Science and Technology Beijing in China, was established in June 2023. The team comprises ten members, with five core members, all sophomore students. The team members study at the Schools of Automation, Mechanical Engineering, Economics and Management, Mathematics and Physics, and Metallurgy, each adept in distinct fields. All members have a clearly defined role and perform their duties diligently.

Non-invasive Diabetes Detection by DIY Raman Spectrometer

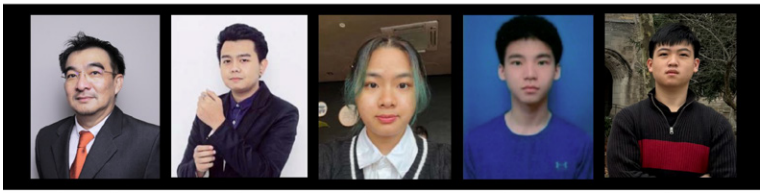
Wibool Piyawattanametha

Abstract

Our team has evolved from utilizing a laser diode-based DIY Raman spectrometer to integrating a fiber laser with our custom-built spectrometer. This pivotal enhancement has significantly improved our system's resolution and sensitivity, thereby boosting Raman scattering efficiency. Our system employs a fiber laser known for its exceptional beam quality and stability. When combined with our in-house spectrometer, it offers a cost-effective yet high-performing solution. Our advanced system design focuses on accurately detecting and analyzing glucose using Surface-Enhanced Raman Spectroscopy (SERS), which amplifies the signal of the glucose solution. In our experimental setup, glucose powder was used as the primary substrate. The spectrometer captured data, which was then processed using MATLAB software to create graphical representations. Our system's enhanced capabilities are evidenced in the data processing methods employed. This technique effectively isolates the glucose signal by eliminating background noise and intrinsic fluorescence, thus sharpening the characteristic peaks for enhanced identification and quantification. Figure 3b further elucidates the glucose signal post-baseline correction, highlighting the improved clarity and definition of the spectral features vital for precise glucose detection.

Led by Assoc. Prof. Wibool Piyawattanametha, Parawee Tangkiatphaibun, Pasin Kuncharin, Nicholas Piyawattanametha, and Aaron Piyawattanametha, our team demonstrates that integrating sophisticated optical components with intelligent system design can achieve high-quality Raman spectroscopy for non-invasive glucose monitoring using a homemade spectrometer. This innovation holds the potential to transform diabetes care, making it more accessible and manageable for patients globally.

Our team



a. Assoc. Prof. Dr. Wibool Piyawattanametha | b. Pasin Kuncharin | c. Parawee Tangkiatphaibun | d. Nicholas Piyawattanametha | e. Aaron Piyawattanametha

CardioQuest VR - The Heart Health Immersive Experience

Yang Li, Wenxin Lyu, Jiaying Chen, Simin Yang, Jingkun Lu, Lifan Luo

Abstract

CardioQuest VR represents a transformative project developed by a multidisciplinary team with a clear mission: to revolutionize the understanding and communication of heart health. By integrating virtual reality (VR) technology with cutting-edge sensor and soft actuator technologies, CardioQuest VR offers an immersive and interactive experience that vividly translates complex heart health data into tangible, experiential knowledge for both patients and healthcare professionals.

Biography

CardioQuest VR is a dynamic team of experts from diverse fields, united by a shared vision to enhance lives through the innovative fusion of virtual reality and haptic interaction. Our multidisciplinary approach combines the latest advancements in biomedical engineering, computer science, user experience design, and medical research to create groundbreaking solutions for heart health education and diagnostics.

Zirconium Pioneers In The Field of High-strength And Corrosion-Resistant Alloy

Dongrun Sun

Abstract

China is faceing significant corrosion issues, causing an annual economic loss of 1.6 trillion yuan. the zirconium industry in China is challenged by technological limitations, performance issues, and cost concerns. To improve these issues, our team has dedicated six years to the field of zirconium alloys, establishing a comprehensive database for high-strength, corrosion-resistant zirconium alloys. This database, the only one in China, has been utilized by five national key laboratories, including the State Key Laboratory for Metastable Materials Science and Technology and the National Key Laboratory of Petroleum. Through synergistic strengthening and in-situ regeneration techniques, we have developed new high-strength, corrosion-resistant zirconium alloy products.Additionally, we have designed proprietary preparation equipment, enhancing the efficiency and quality of our products. Our products have passed inspections by several institutions, including RoHS 1.0, CNAS laboratories, and national key laboratories, achieving an international leading level. They are suitable for use in aerospace, biomedical, and new infrastructure sectors. Our team members have published 8 patents and 14 high-level SCI journal articles, establishing a comprehensive technical barrier. Moreover, we founded Zirconium Innovation Materials Co., Ltd., utilizing blockchain technology and a cloud ERP system to establish six major systems covering technical support, production management, quality management, talent management, environmental protection, and intellectual property protection. We provide zirconium alloy materials and technical service support to enterprises. Our company has successfully collaborated with multiple enterprises, including CNPC, CNOOC, and China Steel Group, signing sales contracts worth 5 million yuan and R&D contracts worth 4 million yuan, supporting the national initiative to substitute imported zirconium alloys with domestic alternatives.

Biography

Team leader Wu Xinyu is a graduate student of Hebei University of Technology. Inspired by his own research experience in zirconium alloy and the national corrosion problem, he convened undergraduate and doctoral students in materials, physics, biomedical, economic management, graphic design, and other majors to create a Z.I.M team, dedicated to improving the corrosion problem of oil pipelines.

Phox

Ibuki Oono, Takahiro Sato, Ryo Kitta

Abstract

Phox is a device installed on a mailbox. The device has a camera to take photos inside a mailbox and a magnetic switch to detect the status of the mailbox door, whether it's open or closed. The main function of this device is to send mailbox status to users, operating in the following sequence:

1.The device is turned on by detecting the mailbox door opening.

2.After detecting the mailbox door closed, the device takes a photo inside the mailbox.

3.The device then sends the image to AWS (Amazon Web Service) via API.

4.Afterreceiving the image, AWS functions to recognize what is in the image.

AWS then sends an email to users. The email sent to users contains: the photo inside the mailbox, the result of image recognition, and the battery voltage. Image recognition is achieved by a Python library called "Sci-Kit Learn." As a machine learning model, XGBoost is used, with recognition accuracy of more than 95% under the circumstance of a fully enclosed mailbox.

DEEP BLUE GUARDIAN

Fenghe Liu,Jiahua Zhu

Abstract

The device uses fluid sound source, which is clean and zero-emission, with large radiation surface and high low-frequency energy conversion efficiency, and has the characteristics of innovation, energy saving, emission reduction, actual combat and multi-dimension. The device has the characteristics of being used in many fields. The primary application of the device is the underwater detector, which detects the target by generating sound waves with specific characteristics; After improving the directivity of its sound waves, it forms high directivity sound waves, which can be developed into marine infrasound sonar. In the field of higher education, this device can be used in college physics experiment teaching to realize the visualization of sound waves, which is convenient for students to understand the principle of sound wave generation and the influence of different rotating speeds and swinging angles on audio frequency, sound intensity and sound pressure. It can be applied t the detection of marine biota and marine scientific research, and is of great significance to marine fluid mechanics and marine seismic wave theory.This device is mainly used to detect seabed sediments and stratum structure, seabed topography, seawater flow, seawater temperature and velocity inhomogeneity, various objects in seawater such as fish, deep-sea scattering layer, icebergs and sunken ships, waves on the sea surface and underwater internal waves, etc., and can be used to predict natural disasters such as typhoons and tsunamis. Secondly, it can be applied to the teaching classroom of college physics experiments.

SolemSense

Uwe Benkarth, Maren Kirste, Nicolas Brugger

Abstract

The VDE COSIMA competition, short for "Competition of Students in Microsystems Applications," challenges student teams to develop innovative uses for sensors and microsystems. For this purpose, SolemSense designed and realized an energy self-sufficient soil probe that measures the temperature gradient and water content in the soil, as well as the light intensity at the surface. The probe operates autonomously powered by a combination of solar panel and battery, thus requiring no power cable and no maintenance for battery replacement. The collected data are transmitted every 10 minutes to a base station via the LoRa radio standard. The application range for this energy self-sufficient sensor system is very broad, extending from private gardens to greenhouses and farmlands, as well as to parks and environmental monitoring systems.

Biography

The student team SolemSense from Albert-Ludwigs-University Freiburg, consisting of members Nicolas Brugger, Maren Kirste, and Uwe Benkarth under the supervision of Professor Peter Woias, was able to achieve second place at this year's COSIMA competition during the MicroSystemTechnik Congress 2023 in Dresden.

A Multi-Function Protective Device for Electrically Controlled Frequency Selection and Filtering for Electromagnetic Anti-Interference

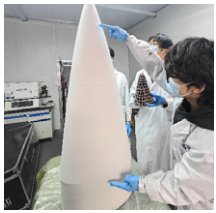
Wenxuan Zhang, Yiting Meng, Chenyao Zhao, Jiahao Qiu, Hao Lv

Abstract

During aerospace flights and ocean voyages, communication between aircraft, vessels, and land is prone to interference due to various factors such as natural electromagnetic interference and man-made electromagnetic wave interference, which often leads to communication distortion. This project provides a multi-function protective device for electrically controlled frequency selection and filtering for electromagnetic anti-interference At the same time, the application of a multi-layer composite structure enables the radome to possess mechanical protection, high-temperature resistance, anti-algae and anti-mold properties, super-hydrophobicity, and corrosion resistance, providing comprehensive protection for communication.

Biography

We are the Ceramic Matrix Composite Research Team of Harbin Institute of Technology (Weihai), which is built upon a professional key laboratory. We are dedicated to researching graphene-based novel composite wave-absorbing materials, aiming to ensure the safety of aerospace communication reception and flight using these new materials. We contribute Chinese wisdom to solving global challenges.



Breaking barriers and connecting the soul-Real time BrailleTranslation Aids Based on Partial Convolutional Fusion

Kailai Wang, Junhao Zhong, Zixuan Huang, Zilin Wang, Li Huang

Abstract

This project provides an exceptional learning experience for visually impaired individuals, featuring high braille recognition accuracy, fast recognition speed, precise translation capabilities, a userfriendly interface, and low hardware requirements. By integrating point-reading and advanced text recognition technology, the project addresses the scarcity of braille materials and assistive tools and alleviates the shortage of braille teachers. It has received three utility model patents, with one invention patent pending. Rigorous testing by the China Electronics Standardization Institute confirmed a braille recognition accuracy of 99.79%,a real-time recognition speed of less than 1.33 seconds per page, and a translation accuracy of 99.81%. The project is supported by the China University Innovation Fund Program and the "Climbing" Program, with partnerships established for practical application and market promotion. After two years of trials and feedback, the project team has continuously optimized and upgraded the product, now in its second generation, meeting the needs of the visually impaired community and educators. The Guangdong Provincial Association for the Blind and the China Braille Library have highly praised the project. As an efficient and convenient assistive device, it enhances learning efficiency and improves work efficiency in public service settings. The team will continue to refine functions, enhance portability, and develop new features, promoting employment and social inclusion for the visually impaired

Biography

Our team consists of three core groups, dedicated to developing innovative solutions for the visually impaired community. Led by Kailai Wang, the first group focuses on braille recognition and calibration, as well as natural language processing, utilizing the OpenCV tech stack. Junhao Zhong heads the second group, specializing in product technical adaptation, PCB hardware circuits, 3D model design, and exterior design. The third group, led by Zilin Wang, is responsible for general recognition testing based on cloud-based large models. The groups collaborate closely, united by a commitment to improving the quality of life for the visually impaired.

A platform for deriving new insights from data

Dickson Odhiambo Owuor

Abstract

I have developed a strong interest in conducting research focused on developing Computer Science approaches, such as unsupervised/supervised learning, graph theory, and chaos theory, among others, for analyzing data across various domains. In my experience, these approaches not only work efficiently but also provide a platform for deriving new insights from data. Therefore, I find it not only sufficient to publish papers about these approaches but also fulfilling to implement them using various programming languages and make them accessible to other researchers. Driven by an innovative and entrepreneurial spirit, I have developed and currently maintain the Python library so4gp.

One of my aspirations is to pursue a career as an academic professor specializing in chaos theory and its applications across various disciplines. I have discussed this goal with Prof. Nick Kotov, and together, we are actively applying chaos theory to analyze microscopic images of nanoparticles. Microscopic images of nanoparticles may appear chaotic and complex at first glance, yet they reveal a multitude of self-replicating patterns that give rise to fractal structures. In deterministic chaos, such fractals can be associated strange attractors that are not random at all.

Biography

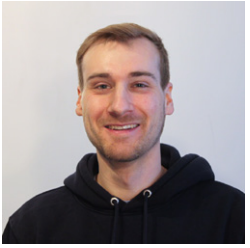
Dickson Owuor is a Computer Science researcher at Strathmore University, exploring and developing optimization techniques for data mining algorithms. He is also a lecturer with 5+ years of experience teaching courses in both undergraduate and postgraduate levels. He has supervised 30+ BSc projects, 2 MSc theses and, he is co-supervising 3 Ph.D. theses. He is in charge of forging industry and academic partnerships (local and international) at the school of computing and engineering sciences (SCES) in Strathmore University.

StraightUp

Jan Bartenbach, Marcus Hamann-Schroer, Erik Vautrin, Dario Mager

Abstract

We are developing a novel intelligent wearable targeting long-term posture improvement. Accurate detection of upper body posture is key to its effectiveness, which we achieve by utilising the anatomical relationship between shoulder position and overall posture. For measuring the shoulder position and movement we use a novel sensor system made from shape memory alloys, optimised for reliability, cost effectiveness and seamless integration into textiles. This enables comfortable all-day wear. Our AI-powered algorithms accurately detect unhealthy postures and recognise common daily activities to provide reminders only when necessary for back health. Given the significant economic burden of back problems, such as 38 million doctor visits and 96.8 million sick days with an annual cost of €45.2 billion in Germany alone, our solution has significant market potential. We aim for widespread adoption, targeting private individuals, physiotherapists, and companies for occupational healthcare, while seeking collaboration with health insurance companies for cost-effective distribution.



Huiyuan Technology

Jie Jiang, Xinhongyu Chen

Abstract

Monoclonal antibody drugs have been widely used to treat rheumatic immune diseases and various cancers and tumors, but the high price is an economic burden for many people. The reason for its high price lies in the preparation of monoclonal antibodies, which cell fusion is a crucial step in determining the quality and efficiency, and it is the very low rate of cell fusion that leads to the high cost. The core competency of our project is to propose a new method of micro-nano-composite bipolar cell fusion and designed an equipment, resulting in a 113% wider range of applicability of cell sizes, up to a 3-fold increase in the efficiency of cell fusion, and a 77% increase in the effective yield of fusion. Our equipment has been applied in Chongqing Academy of Animal Husbandry and Zhongrong Chuangling Pharmaceutical Company, which has shown good performance in the application process. We believe our project will continue to lead the way in cell fusion technology.

Biography

Huiyuan Technology, found in 2021 , is the pioneer of micro-nano-composite bipolar cell fusion instrument, which specialize in improving cell fusion rate and efficiency. Our team is composed of 12 students from Chongqing University majoring in electrical engineering, mechanical engineering, business administration and other majors, and we continuously move forward to explore the unknown, insist on innovation, and find each other's value. Our mission is make the price of monoclonal antibody drugs less expensive by increasing the cell fusion rate, and bring hope to more people.






Smart Vanguard - 5G Firefighting Smart Helmet

Kaiyuan Yao, Chen Xu, Bokai Zeng, Zihuang Su

Abstract

Smart Vanguard - 5G Firefighting Smart Helmet is an intelligent firefighting helmet based on 5G technology, whose main features include real-time monitoring, video communication, intelligent navigation, emergency rescue and lightweight comfort. The helmet has multiple built-in sensors that can monitor the firefighter's body status, ambient temperature, oxygen concentration and other data in real time and upload the data to the cloud. At the same time, the helmet built-in high-definition camera and microphone, firefighters can have real-time video communication with the command center or other firefighters through the helmet, for contact and collaboration. In addition, the helmet is equipped with a GPS positioning system and map navigation function, which can help firefighters quickly and accurately find the fire scene. The design of the helmet is to ensure firefighters' comfort and flexibility with lightweight materials, comfortable liner and adjustable headband. Our project vision is to provide smarter and hi-tech support for fire rescue work through the development and sales of intelligent fire helmets, improve the efficiency and safety of firefighters, and reduce the incidence of fire accidents. We believe that with the promotion of 5G technology, this intelligent fire helmet will become a new favorite in the future fire equipment market.

Kaiyuan Yao

Chen Xu

Zihuang Su

Bokai Zeng