

Conference Program

ICMME 2021

The 8th International Conference on
Mechatronics and Mechanical Engineering

第八届机电与机械工程国际会议

ICFMM 2021

The 6th International Conference on Functional Materials and Metallurgy

第六届功能材料与冶金国际会议



November 26-28 | Virtual

11月26-28日

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Committee 委员会

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Agenda Overview 日程概览

All schedules will process in **Beijing Time (GMT+8)** 日程时间安排均为**北京时间**

November 26, 2021 | 11月26日 (星期五)

9:30-11:00	Guest Speakers & Committee's Online Test 特邀报告专家及委员会线上测试	Zoom ID: 837 3140 0688 Zoom Link: https://us02web.zoom.us/j/83731400688
14:00-16:30	Authors' Online Test 参会作者线上测试	

November 27, 2021 | 11月27日 (星期六)

10:00-12:10	Opening Remarks & Guest Speeches 1-3 开幕式 & 特邀专家报告 1-3	Zoom ID: 837 3140 0688 Zoom Link: https://us02web.zoom.us/j/83731400688
13:30-15:00	Guest Speeches 4-6 特邀专家报告 4-6	
15:30-18:00	Parallel Session 1 平行分会报告 1	

November 28, 2021 | 11月28日 (星期日)

10:00-12:15	Parallel Session 2 平行分会报告 2	Zoom ID: 837 3140 0688 Zoom Link: https://us02web.zoom.us/j/83731400688
10:00-12:15	Parallel Session 3 平行分会报告 3	Zoom ID: 837 8240 9798 Zoom Link: https://us02web.zoom.us/j/83782409798

Guest Speaker

GUEST SPEECH 4

13:30-14:00, November 27, 2021 | 11月27日 (星期六)

Zoom ID: 837 3140 0688

Zoom Link: <https://us02web.zoom.us/j/83731400688>



Prof. Tao Feng

Nanjing University of Science and Technology, China

Bio: Prof. T.Feng received his Bachelor degree in 1999 from Zhejiang University and his Master and PhD in 2002 and 2006 from Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences. He was an Alexander von Humboldt fellow in Karlsruhe Institute of Technology (Karlsruhe, Germany) during 2010-2012. He is currently a professor of Herbert Gleiter Institute for Nanoscience (HGI), Nanjing University of Science & Technology.

His current research interest is the relationship of atomic structures and properties of nanostructured metallic materials. Research activities cover synthesis and processing, atomic structure characterization, thermal stability, mechanical and physical properties of nanostructured materials. He authored and co-authored more than 100 international peer-reviewed journal publications, 25 applied patents, and presented 10 invited lectures at international conferences and symposia.

Speech Title: Ultrahigh Hardness with Exceptional Thermal Stability of a Nanocrystalline CoCrFeNiMn High-Entropy alloy prepared by inert gas condensation

Abstract: CoCrFeNiMn nanocrystalline high-entropy alloy (nc-HEA) with an average grain size of 25 nm was prepared by inert gas condensation (IGC) using a laser evaporation source. An unprecedented increment in hardness was found from 484 HV to 791 HV after annealing at 600°C for 1h. More surprisingly, the original high hardness is maintained even after annealing at 1100°C, which demonstrates superb thermal stability of the nc-HEA. The underlying strengthening mechanism is attributed to the unique microstructure of the nc-HEA and its evolution during annealing. This study provides a new preparation technique (laser-IGC) for high-performance nc-HEAs with great potential for applications.

Guest Speaker

GUEST SPEECH 5

14:00-14:30, November 27, 2021 | 11月27日 (星期六)

Zoom ID: 837 3140 0688

Zoom Link: <https://us02web.zoom.us/j/83731400688>



Prof. Qunhong Weng
Hunan University, China

Bio: Qunhong Weng is professor in school of materials science and engineering, Hunan University. He obtained his Ph.D. degree from University of Tsukuba in 2015, Japan, and worked as a postdoctoral researcher at National Institute for Materials Science (NIMS), Alexander von Humboldt Fellow and group leader at Leibniz IFW Dresden, Germany, before joining Hunan University in 2018. His research focuses on functionalized layered materials, particularly those made of light B, C, N, and O atoms, and their applications in biomedical and miniaturized energy storage technologies. He has published over 45 peer-reviewed papers with a total citation of 4000 times. He also serves as a reviewer for over 30 scientific journals and has been invited to contribute progress reports/reviews to the journals of Adv. Mater. and Small.

Speech Title: Emerging Properties and Applications of Functionalized h-BN Nanomaterials

Abstract: Functionalization of materials, either chemically or physically, is vital for tailoring their properties, which may also result in brand-new properties and applications. h-BN material and its nanostructures usually exhibit wide band gaps (~6.0 eV), and are not wetted by water. They are widely used as anti-oxidation coatings/containers/crucibles, polymer fillers, cosmetics, etc. Our work shows that h-BN, after proper functionalization, exhibits many interesting and unprecedented properties for versatile applications. Firstly, through physical activations, we could engineer the porosity and specific surface area of the BN materials. We developed a series of porous BNs with the BET surface area reaching up to 1900 m²/g. Besides, chemical functionalization of BN structures enables us to tailor the solubility, band and optical properties of the materials. Our developed highly hydroxylated BNs showed excellent solubility/dispersability in water, and were highly efficient for anticancer drug delivery; the recently discovered BON nanozymes with rich N-O structures could effectively catalyze hydrogen peroxide to generate hydroxyl radicals and significantly inhibits breast cancer growth; with oxygen doping and hydroxyl functionalization, much narrowed optical bandgap of BN nanosheets to 2.1 eV was obtained along with emerged paramagnetism and photoluminescence properties that were absent in h-BN.

Guest Speaker

GUEST SPEECH 6

14:30-15:00, November 27, 2021 | 11月27日 (星期六)

Zoom ID: 837 3140 0688

Zoom Link: <https://us02web.zoom.us/j/83731400688>



Prof. Shaohua Luo
Guizhou University, China

Bio: Shaohua Luo, who is a Special Term Professor of the Guizhou University, received the Ph.D. degrees in Mechanical Engineering from Chongqing University. His research interests include the dynamic analysis, circuit implementation and intelligent control of special electromechanical systems. His research has been supported repeatedly by National Science Foundations of China and Guizhou Province. As the first author, he has published more than 30 papers in which many are published in international top journals like IEEE Trans Fuzzy Syst (IF12), IEEE Trans Neural Netw Learn (IF10.5) and IEEE Trans Ind Electron (IF8.2). Meanwhile, as the first inventor, he has obtained 12 authorized invention patents including two Britain invention patents. He served as the innovation team leaders of the seventh research institute affiliated with the China Aerospace Science and Technology Corporation LTD and Guizhou University.

Speech Title: The Dynamic Analysis and Adaptive Control of Special Electromechanical Systems

Abstract: TBA

Session 1

Parallel Session 1 – Industrial automation and monitoring system

平行报告 1 – 工业自动化与监测系统

Date: November 27, 2021 | 11 月 27 日 (星期六)

Time: 15:40-18:00

Session Chair: TBA

Zoom ID : 837 3140 0688

Each presenter is request to join the meeting room 5-10 minutes before the session start.

请在您的 session 开始前 5-10 分钟加入会议室。

<p>CM1-030 15:30-15:45</p>	<p>A design rationale representation approach based on intent-driven ontology and MBD model in design change Zhengxiong Huang, Yazhou Chen, Songqing Xu Presenter: Zhengxiong Huang Jimei University, China</p> <p>Abstract: Aiming at the problem that the design rationale (DR) in design change has a wide range of sources and various forms, which makes designers difficult to reuse them, this paper proposes a DR representation approach for design change. Firstly, the overall three-layer structure of the approach is introduced; Use OWL to express the concepts related to the designer and product model in design change, and use SWRL and SQWRL to mine and extract useful DR information; A DR representation tool is developed based on CAD software to export the low semantic level information to the ontology as well as import the high semantic level information back to the Model Based Definition (MBD) model. The approach combines the expressing ability of ontology and visuality of 3D annotation to capture, represent and reuse DR information, which promotes the design change under the MBD environment. Finally, a stamping part is taken as an example, and designers can refer to the experience of the predecessors related to the changed parameter through using the tool.</p>
<p>CM2-009 15:45-16:00</p>	<p>Preparation of a UV curable coating modified by several inorganic particles Yaling Da, Jianxing Liu, Xiangxin Xue Presenter: Yaling Da Northeastern University, China</p> <p>Abstract: A UV curable coating modified by several inorganic particles was prepared and characterized. Several kinds of inorganic particles including glass powder, mica, alumina, talcum powder and polyimide were introduced to epoxy acrylate (EA) as fillers and mixed with reactive diluent, photoinitiators, and other additives to obtain an organic-inorganic ultraviolet (UV) curable coating. Different kinds of inorganic powders were mixed in proportion to the formula and ground in a ball mill for 16 h to obtain smaller particles. The particle size and morphology of inorganic powders were characterized by laser particle size analyzer and scanning electron microscopy (SEM). The results indicated that the particle size of inorganic powders was reduced effectively after ball-milled. The morphology of the synthesized UV curable organic-inorganic composite coating was observed, and the</p>

	<p>mechanical and thermal properties of the coating were tested. Pure organic EA coating without the addition of inorganic particles was also characterized as controls. The distribution of inorganic particles in the coating was homogeneous and the surface of the cured coating was smooth. The results of mechanical properties tests showed that the addition of inorganic particles improved the hardness of the coating, but the effect on adhesion and flexibility was not significant. And the TGA curves showed that the thermal stability of the coating modified by inorganic particles was significantly improved compared with the pure organic coating.</p>
<p>CM2-007 16:00-16:15</p>	<p>A Study of Thin Film Encapsulation on Improving Electrical Characteristics and Reliability for Flexible OLEDs Qingwu Yin, Wendong Lian, Jinchuan Li, Jiajia Qian, Shengdong Zhang, Weiran Cao Presenter: Qingwu Yin Peking University Shenzhen Graduate School, Peking University/TCL China Star Optoelectronics Technology Co., Ltd</p> <p>Abstract: In this work, we investigated the effect of thin film encapsulation on V_{th} shift in a-IGZO TFTs. The result shows that decreasing the NH_3 flow rate of deposited SiON films, the trend of V_{th} shift under the operation mode can vary from negative to positive direction, which can be attributed to lower amount of hydrogen diffused from SiON to the a-IGZO TFTs. Beside, we designed the TFE with stable inorganic-organic-inorganic stack structure, of which the CVD1 deposited with low NH_3 flow rate and the CVD2 with high barrier property, and a 16.9-inch high performance flexible OLED panel with controlled V_{th} shift and RA lifetime over 475 h was achieved at the condition of 85 °C and 85% RH. This study demonstrates the influence of TFE on a-IGZO TFTs, and offers an optimized TFE structure which promises both electrical characteristics and reliability for flexible OLEDs.</p>
<p>CM2-1001 16:15-16:30</p>	<p>Strength Properties and Toughness Indices of Hybrid Polymeric Fibre Reinforced Renewable Oil Palm Shell Concrete Ming Kun Yew, Ming Chian Yew, Bee Chin Ang, Jing Han Beh and Foo Wei Lee Presenter: Ming Kun Yew Universiti Tunku Abdul Rahman, Malaysia</p> <p>Abstract: In this study, the strength properties and durability of polymeric fibre-reinforced concrete containing renewable oil palm shell (ROPS) lightweight aggregate were investigated. The influence of single Polyvinyl Alcohol (PVA) fibre, single Polypropylene (PP) fibre and hybrid PVA-PP fibre with different percentage of volume fraction, V_f (0, 0.3 and '0.25+0.05') on the compressive strength and toughness indices of ROPS LWC were investigated. The research outcomes show that compressive strength of ROPS LWC reinforced with single PVA fibre or PP fibre enhanced with the increase of V_f fibre. From the results, toughness indices increased significantly by 38.3% compared to control mix. Furthermore, the hybrid 'PVA0.25/PP0.05' had showed the optimum results as compared to other mixes. Thus, the outcomes of this paper showed that the blend of both PVA and PP polymeric fibre could potentially be utilized in concrete industry.</p>
<p>CM1-011 16:30-16:45</p>	<p>Design of Non-Destructive Evaluation System for Historical Frescos with New Acoustic-Optical Method Ying Xiang, Jian Dai Presenter: Ying Xiang Beijing University of Technology, China</p> <p>Abstract: This article outlines a non-invasive diagnostic test procedure, whose advantage is no damage to the artwork, that is based on the frequency response analysis of the acoustic excitation of the wall vibration. The detail of the test procedure for wall vibration and the system of the measurement instrument is described. Experiments were performed on a real artificial fresco in a historic vault. A two-dimensional map of surface vibration amplitudes is generated by scanning measurement points on the surface. This false-color image is then</p>

	<p>processed through image analysis techniques to determine the location and shape of the damaged area.</p>
<p>CM1-012 16:45-17:00</p>	<p>Towards Automated Drafting in Cad Systems Mladen Buric, Mario Brcic, Stanko Skec Presenter: Mladen Buric University of Zagreb, Croatia</p> <p>Abstract: The drafting or technical drawing of mechanical parts is a common activity during the design process. Traditionally, technical drawings are created manually by draftspersons with the support of CAD software, which is a time-demanding and error-prone task, requiring experience and a high level of technical expertise. To automate and accelerate this task, the present work introduces a tool named AutoDrafter which enables the automated creation of 2D technical drawings out of the 3D model's boundary representation (B-Rep). The AutoDrafter algorithm has been developed using a state-of-the-art CAD system Application Programming Interface (API). The tool covers not only the dimensioning process but also other aspects of automatic drafting such as the creation of a new drawing document, sheets, and views. To verify the robustness and accuracy of the algorithm, different CAD models have been subjected to the automatic drafting process.</p>
<p>CM1-024 17:00-17:15</p>	<p>Research on the monitoring technology for geological disasters by the intelligent video recognition technology based on the optical flow Qingjia Meng, Chenhui Wang, Wei Guo Presenter: Qingjia Meng Center for Hydrogeology and Environmental Geology Survey, CGS, China</p> <p>Abstract: In order to obtain the position and attitude information of non-cooperative targets in space, this paper establishes a relative navigation system based on stereo vision and the rotation speed measured by vortex light as observation data. Since the system is a nonlinear system, the unscented Kalman filter has stronger advantages than the extended Kalman filter for the strongly nonlinear system. Therefore, this paper designs an UKF to determine the relative position and attitude information of the dead satellite relative to the service satellite, and uses the service satellite's own inertial navigation system to obtain its precise position, velocity and attitude information, and then obtain the dead satellite's position and attitude information. On this basis, 100 Monte Carlo shooting simulation tests were carried out to verify the superiority of the algorithm. The simulation results show that the overall state of the system is considerable when the observable conditions are met; the estimation accuracy of the relative position is better than 0.01 m, the estimation accuracy of the relative velocity is better than 0.001 m/s, and the estimation accuracy of the target angular velocity is better than 0.005°/s, the relative attitude estimation accuracy is better than 0.04°.</p>
<p>CM1-025 17:15-17:30</p>	<p>Non-cooperative Target Relative Navigation Method Based on Vortex Light, Vision and IMU Information Tao Zou, Li fen Wang, Ting Zhu, Xue rui Zhai Presenter: Tao Zou Space Engineering University, China</p> <p>Abstract: In order to obtain the position and attitude information of non-cooperative targets in space, this paper establishes a relative navigation system based on stereo vision and the rotation speed measured by vortex light as observation data. Since the system is a nonlinear system, the unscented Kalman filter has stronger advantages than the extended Kalman filter for the strongly nonlinear system. Therefore, this paper designs an UKF to determine the relative position and attitude information of the dead satellite relative to the service satellite, and uses the service satellite's own inertial navigation system to obtain its precise position, velocity and attitude information, and then obtain the dead satellite's position and attitude</p>

	<p>information. On this basis, 100 Monte Carlo shooting simulation tests were carried out to verify the superiority of the algorithm. The simulation results show that the overall state of the system is considerable when the observable conditions are met; the estimation accuracy of the relative position is better than 0.01 m, the estimation accuracy of the relative velocity is better than 0.001 m/s, and the estimation accuracy of the target angular velocity is better than 0.005°/s, the relative attitude estimation accuracy is better than 0.04°.</p>
<p>CM1-029 17:30-17:45</p>	<p>Landslide monitoring system based on LoRa wireless sensor network Chenhui Wang, Qingjia Meng, Kai Yang, Yue Wu, Xi Wang, Wei Guo Presenter: Chenhui Wang Center for Hydrogeology and Environmental Geology Survey, China Geological Survey, China</p> <p>Abstract: The sampling time is not timely and the data information is not detailed due to equal interval sampling in landslide disaster monitoring, and it is difficult to meet the real-time perception of abnormal changes of disaster bodies. This paper presents a large landslide intelligent sensing monitoring technology based on adaptive data acquisition. The overall structure design, hardware and software design scheme of intelligent sensing monitoring technology are introduced in detail. The technology can realize rapid perception of environmental changes and deformation factor changes of landslide disaster bodies. The adaptive data acquisition strategy designed has good capture ability for abnormal changes of monitoring parameters of disaster bodies. It is a good alternative to realize real-time data acquisition of disaster bodies, so as to provide effective data guarantee for intelligent monitoring and disaster prediction of landslide disasters.</p>
<p>CM1-031 17:45-18:00</p>	<p>Analysis of Competitive Advantages of High-speed Railway Express in The Transportation System of Medium- and High-value Light Goods Market Based on Value Chain Yichen Sun, Lifen Yun, Hongqiang Fan, Yahoo He Presenter: Yichen Sun Beijing Jiaotong University, China</p> <p>Abstract: Based on value chain theory, this paper constructs the value chain model of high-speed railway express, and extracts six quantitative indicators from the transportation production activities, namely punctuality, safety, timeliness, economy, capacity limit and convenience. The logit model is used to calculate the market share of trunk express transportation system. The findings show that highway transportation has absolute advantage in medium- and high-value light goods market, while aviation sees a slow but steady increase in market share and eventually surpasses high-speed railway in the long-distance transportation above 1500 km. The sensitivity analysis of the parameters shows that the indexes of punctuality, safety, capacity limit economy have the most obvious impact on the market share. Our research findings offer a theoretical basis for the improvement of the core competitiveness of high-speed railway express.</p>

Session 2

Parallel Session 2 – Materials and Mechanical Engineering

平行报告 2 – 材料与机械工程

Date: November 28, 2021 | 11 月 28 日 (星期日)

Time: 10:00-12:15

Session Chair: Asst. Prof. Yew Ming Kun, Universiti Tunku Abdul Rahman,
Malaysia

Zoom ID : 837 3140 0688

Each presenter is request to join the meeting room 5-10 minutes before the session start.

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<p>CM1-001 10:00-10:15</p>	<p>Evaluation of flow and heat transfer performance of spiral coil jacket with different cross sections Lu Wang, Xiaoping Liao, Hongjun Li Presenter: Hongjun Li Zhejiang Sci-Tech University, China</p> <p>Abstract: The flow and heat transfer performance of the spiral coil jacket for a reactor with five different cross-section shapes was evaluated. The comprehensive performance of five jacket models was analyzed through PEC and JF evaluation factors, which provided a basis for jacket design in industrial application. The results showed that at certain Reynolds number, the Nusselt number of the arcuate cross-section jacket was lower than that of the half-pipe jacket, but the flow resistance coefficient was lower and the resistance loss was smaller. The secondary flow generated by the half pipe jacket made the temperature gradient in the corner of the cross section far less than that of the center, thus affecting the heat transfer of the jacket. The vortex structure analysis showed that the edges and corners of the inner wall of the jacket were prone to generate vortex structure. The comprehensive evaluation factors of PEC and JF showed that the arcuate jacket of 140° had the best comprehensive performance.</p>
<p>CM1-002 10:15-10:30</p>	<p>Energy consumption and mechanical proprieties of Hybrid Deposition and Micro-Rolling Cheng Huang, Haiou Zhang, Guilan Wang Presenter: Cheng Huang Huazhong University of Science and Technology, China</p> <p>Abstract: The traditional forging process involves high energy consumption due to the giant equipment, long process, and low material utilization. Recently, metal additive manufacturing technology has developed rapidly with the advantage of high utilization. However, looseness and defects caused by the anisotropy of layer forming would result in low mechanical properties and fatigue properties. The hybrid deposition and micro rolling (HDMR) combined in-situ rolling with additive manufacturing, which applies a forging force to the built part by a micro-roller. A comparison is carried out with the conventional forging approach in terms of energy consumption and mechanical properties. It was found that components of Ti-6Al-4V made by HDMR showed a better strength performance in tensile strength and impact toughness with lower energy consumption than the traditional forging approach. Additionally,</p>

	<p>HDMR realizes integrated manufacture instead of the distributed manufacturing of large-scale equipment in a lengthy process, which is a promising substitute for conventional forging.</p>
<p>CM1-021 10:30-10:45</p>	<p>Design and braking calculation of traveling device of gantry crane Ren Tao, Han Yifeng, Chai Xu, Xu Kai, and Jia Jiangming Presenter: Xu Kai Zhejiang Sci-Tech University, China</p> <p>Abstract: Gantry crane is an important part of the hydropower plant equipment, undertaking the task of opening and closing the dam gates. At present, the operation of the gantry crane is mainly controlled manually by the ground commanders who rely on visual inspection to direct the driver, and the positioning accuracy and efficiency are low. To address the problems, this paper is based on RFID technology to design the automatic walking positioning system of the gantry crane, analyze the braking process of the hoist carriage walking mechanism, calculate the braking distance and braking time of the carriage walking mechanism under different braking conditions, and obtain the relationship between the braking distance S and the braking time x of the walking mechanism under normal braking conditions, as well as the dynamics of the braking distance S during emergency braking. equation.</p>
<p>CM1-003 10:45-11:00</p>	<p>Research on braking load index of urban conditions in China based on energy theory Qin Xu Presenter: Qin Xu China Automotive Technology and Research Center Co. Ltd, China</p> <p>Abstract: In order to study the braking conditions in Chinese cities and establish a theoretical basis for test and application of urban braking conditions, the concept of braking load index is introduced based on the energy theory to characterize the workload of the braking system when the vehicle is moving. After analyzing the driving process, the mathematical functions of the first definition and the second definition of braking load index are established respectively based on the brake load definition. Through analysis and verification of actual test data, it can be concluded that the second definition of braking load could characterize the actual braking load of the road more accurately and provide more accurate working condition input for brake disc and friction lining temperature analysis, durability analysis and system verification of brake system, which is of great significance to engineering applications and theoretical research.</p>
<p>CM1-023 11:00-11:15</p>	<p>Design of 2×250kN large-span hoist hydraulic automatic grabbing beam Cheng Tanghua, Ren Tao, Chai Xu, Yao Kun, and Jia Jiangming Presenter: Yao Kun Zhejiang Sci-Tech University, China</p> <p>Abstract: In water conservancy projects, automatic grabbing beams, as an important supporting equipment of mobile hoisting equipment, are widely used to improve the performance of operating gates and trash racks. This paper takes the hydraulic automatic grabbing beam of the 2×250kN large-span hoist at Baihetan Hydropower Station as an example. The design of the hydraulic automatic grabbing beam for the hoist is systematically analyzed, combined with engineering examples, and the most unfavorable conditions are used. As a result of the calculation, some design parameters of the long-span grab beam were obtained. The test results show that all performance indicators can meet the design requirements and relevant standard requirements.</p>
<p>CM1-1003 11:15-11:30</p>	<p>Design of opposed piston 2-stroke internal combustion engine test platform Tianyou Pei, Shuheng Qiu, Feixue Chen, Weiwei Gao, Zheng Li, Chi Zhang Presenter: Tianyou Pei Chinese Academy of Sciences, China</p>

	<p>Abstract: Opposed piston two-stroke engine, due to the characteristics of fast expansion, high power density and indicate efficiency, and dynamic balancing, attracts many researchers' attention. In order to explore its combustion performance, a novel test platform consisting of drive system and combustion control system is proposed in this paper. The drive system mainly contains a 75-kW induction motor, a synchronous gearbox and two crankshaft mechanisms. The displacement of the piston and chamber pressure are acquired and used to control combustion parameters. Using this mechanical device, the rotary motion can be converted to the opposite movement of the two pistons precisely. All the designed functions of the platform are verified by the combustion experiments of an opposed piston two-stroke prototype. Furthermore, the experimental data is used to verify a one-dimension simulation model to evaluate the combustion characteristics of the prototype.</p>
<p>CM1-022 11:30-11:45</p>	<p>Design and load test method of 2×250kN large-span hoist Han Yifeng, Cheng Tanghua, Chai Xu, Yao Kun, and Jia Jiangming Presenter: Yao Kun Zhejiang Sci-Tech University, China</p> <p>Abstract: The mobile hoist is an important equipment of hydropower station, consisting of gate frame, trolley track, trolley, hydraulic automatic gripping beam, trolley track, trolley walking mechanism, trolley power supply device, trolley power supply device, ladder platform railing, driver's room, wind measurement device, trolley grounding device and electrical equipment, etc. It has a vital role for the normal drainage and flood control of steel gates, regulation of people's living water, irrigation of farmland, transportation of water conservancy and Hydroelectricity generation has a vital role. In this paper, for the requirements of Baihetan hydropower station inlet, 2×250kN large span gate machine is designed and its load test method is studied.</p>
<p>CM2-001 11:45-12:00</p>	<p>The performance of Zn-Ni alloy coating electrodeposited from stabilized bath from stabilized bath Shams Anwar, Faisal Khan, Yahui Zhang Presenter: Shams Anwar Memorial University of Newfoundland, Canada</p> <p>Abstract: A metallic part corrodes when it undergoes electrochemical reactions which cause the surface and structural deterioration of the metal. Through electroplating, metallic components can be protected from corrosion by coating them with Zn-Ni alloys. This study examined the electrodeposition of a Zn-Ni alloy film on a steel substrate from a chloride bath containing ethylene-diamine-tetraacetic acid (EDTA). A Pourbaix diagram using the OLI software was used to determine the stability of the Zn-Ni plating bath and the suppression of hydrogen evolution reaction (HER). Comparing the composition of Zn-Ni coating deposited in the EDTA bath with the pure Zn-Ni coating, the EDTA bath yielded higher deposition thickness and an average crystallite size reduction. The Zn-Ni coating deposited from the EDTA bath has a lower dissolution rate and better corrosion resistance properties than the non-EDTA bath. Polarization tests exhibited that the Zn-Ni alloy deposited from 0.119 mol/l EDTA bath at 20 mA/cm² current density showed lower corrosion current (I_{corr}) and more positive corrosion potential (E_{corr}). Atomic force microscopy (AFM) and Vickers microhardness testing were used to characterize the morphological properties, topographic structures, and microhardness of Zn-Ni coatings.</p>
<p>CM2-008 12:00-12:15</p>	<p>TiO₂/graphene nanotube arrays with enhanced photoelectric properties Fengling Zhang, Xiangxin Xue Presenter: Fengling Zhang Northeastern University, China</p> <p>Abstract: Highly ordered TiO₂ nanotube arrays were prepared by two-step anodic oxidation, and the graphene was assembled on them via the solvothermal method. The photoelectric</p>

performance was investigated, the results indicated the TiO₂/rGO nanocomposites with higher photocurrent response compared with pure TiO₂, and the cyclic voltammetry of the TiO₂/rGO at different scan rates of 10 to 200 mV/S showed a good electrochemical capacitance. The crystal structure, morphology, and chemical composition of the samples were also characterized by XRD, SEM, and XPS.

Session 3

Parallel Session 3 – Robot control and humanoid mechanical design 平行报告 3 – 机器人控制及类人机械设计

Date: November 28, 2021 | 11 月 28 日 (星期日)

Time: 10:00-12:15

Session Chair: TBA

Zoom ID : 837 8240 9798

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请在您的 session 开始前 5-10 分钟加入会议室。

<p>CM1-005 10:00-10:15</p>	<p>Biomechanical design of a passive knee exoskeleton for adaptive walking assistance Li Bo Presenter: Li Bo Chongqing University of Technology, China</p> <p>Abstract: This paper designed a wearable exoskeleton to assist knee joint. We analyzed the anatomical structure and locomotion mechanism of knee joint by OpenSim, and found that knee flexion angle was less than 60° during level walking, and the higher the stair was, much greater the force of knee extensor was. An adaptive passive exoskeleton was developed, which allowed the knee joint move freely during level walking. While climbing stairs, as the flexion angle was more than 60°, it stored energy when the knee bends, after then to assist knee extending. Comparison experiments based on the measurement of sEMG signals demonstrated that the exoskeleton reduced the muscle activities of knee extensor in all situations. The greater the bending angle of the knee joint, the more obvious the assisting effect was. The proposed passive exoskeleton has an adaptive walking assistance effect, it can reduce the muscle fatigue of knee joint.</p>
<p>CM1-032 10:15-10:30</p>	<p>Application of Support Vector Machines Model in Classification of Knee Joint Angle Hongde Piao, Shanhai Jin Presenter: Shanhai Jin Yanbian University, China</p> <p>Abstract: In the control of the lower limb exoskeleton, the angle of each joint is very important information. At the same time, obtaining information on all joint angles of the lower limb exoskeleton requires multiple wearable sensors to achieve this. However, the large number of</p>

	<p>sensors means that the placement and calibration of wearable sensors present a significant challenge. This study proposes the use of data from the waist and the thigh to classify the knee angle of the human body using Linear-Support Vector Machines (L-SVM) and Radial Basis Function-Support Vector Machines (RBF-SVM), with the algorithms achieving a correct rate of 89.7% and 91.8%. The experimental validation shows that the model proposed in this study has a high accuracy rate, solving the complex calibration problem of multiple sensors while obtaining more information about the joint angles. The model can be useful for the future development of lower limb exoskeletons in terms of design and angular information extraction.</p>
<p>CM1-006 10:30-10:45</p>	<p>Design of an upper limb exoskeleton to assist disabled individuals Liu Minchao, Li Bo Presenter: Liu Minchao Chongqing University of Technology, China</p> <p>Abstract: In order to assist patients with impaired upper limb locomotion in daily life, this article proposes an upper limb exoskeleton which is kinematically compatible with the human upper limb. In addition to the 7DOFs of the free upper limb, two passive DOFs were introduced to support the pectoral girdle protraction/retraction and elevation/depression, and ensure the instantaneous center of shoulder rotation is aligned with human. Furthermore, a Bowden-cable-based actuation was designed to reduce the whole weight and moment of inertia. Subsequently, to evaluate the performance of the proposed exoskeleton, the experiment of discrete point tracking was tested for elbow joint through the designed PID controller. Experimental results indicated that the designed PID control system could achieve stable feedback control. Thus, the proposed exoskeleton could re-realize the desired position accurately. This exoskeleton achieves the human-robot kinematic compatibility and precise position control, laying the foundation for the next step of continuous trajectory tracking control over the multiply joints.</p>
<p>CM1-004 10:45-11:00</p>	<p>Singular Path Smooth Tracking Algorithm for Robot Manipulators Jinxiang Liu, Jingyi Gao, Jinjing Sun Presenter: Jinxiang Liu Institute of Radio Measurement, China</p> <p>Abstract: In recent years, serial manipulator is playing an increasingly important role in aerospace, automobile and other manufacturing fields. In this paper, the singularity configuration of a 6-degrees of freedom (6-DOF) serial manipulator is studied. This paper proposes a method of identifying singular posture based on the condition number of Jacobi matrix. We proved the relationship between singularity and condition number of the Jacobi matrix. This method is capable for identifying whether a motion path of robot manipulator passes near singular points. Based on the condition number, this paper proposes an algorithm for path tracking through singular points. The simulation results demonstrate that this method is effective in identifying whether the motion path passes near singular points, and accurately tracing the motion path through singular points.</p>
<p>CM1-007 11:00-11:15</p>	<p>Mechanical design of a passive lower-limb exoskeleton for load-carrying assistance Liu Jiahong, Li Bo Presenter: Liu Jiahong Chongqing University of Technology, China</p> <p>Abstract: This paper presents a passive exoskeleton with 17 degrees-of-freedom (DOF) for load-carrying, which includes two 3DOFs ankle joint, two 2DOFs hip joint, two 1DOF knee joint, one 1DOF backpack, and two redundant DOFs at the thigh and shank, respectively, to improve the compatibility of human-machine locomotion. The modular backpack was designed to facilitate carrying of different loads. A horn-shaped spatial mechanism was designed to connect the hip joint and the backpack, and transfer the payload to the ground. A</p>

	<p>tension spring was adopted to absorb the gravitational potential energy of the load when walking, and fix the horn-shaped spatial mechanism at both sides. The segmented brace at the thigh and the shank were designed to adjust different legs. In order to improve the force transmission performance, we cancelled the extension DOF of the hip joint, and moved the rotation axis of the knee joint backward. The knee joint assistance mechanism was designed to allow the knee joint move freely when the flexion angle did not exceed 60°. However, when the knee bends over 60°, the knee joint presses the torsion spring to store energy. After then, it releases energy to assist knee extending. The Cooper-Harper scale tests demonstrated that the exoskeleton had excellent static support effect and movement flexibility, which verified the rationality of the exoskeleton design.</p>
<p>CM1-008 11:15-11:30</p>	<p>Research on intelligent control technology of Maglev robot based on Neural Network Qin He Presenter: Qin He Wenhua College, China</p> <p>Abstract: The fusion of magnetic levitation technology and robot is an important direction in the research of precision robot. Aiming at the motion characteristics of magnetic levitation robot realized by elastic deformation, this paper proposes that in the aspect of intelligent target positioning of magnetic levitation robot, multi-target recognition and detection calculation method of convolution neural network is used to accurately locate the target object; in the model-based torque control structure, the magnetic levitation robot is established. The parallel processing RBF neural network model of the inverse motion problem of the floating robot could improve the solution speed while maintaining a certain accuracy. In order to improve the trajectory tracking accuracy of the maglev robot, BP neural network has been used based on the traditional sliding mode variable structure control. Simultaneous interpreting the mapping relationship between the master control module and the sensor, the neural network algorithm reduces the network weight by means of error back propagation. Then, when the heading angle and longitudinal velocity of the maglev robot are time-varying, the path following has been controlled. The application of these strategies would have a certain reference value for the effective intelligent control of Maglev robot.</p>
<p>CM1-016 11:30-11:45</p>	<p>The design and performance test method of live working anti-vibration hammer robot YU Chi, QIN Weinan, ZHU Kai, LEI Xinglie, YU Guangkai, and ZHU Qiang Presenter: LEI Xinglie China Electrical Power Research Institute, China</p> <p>Abstract: In order to solve the maintenance of anti-vibration hammer on transmission lines, a structure of live working anti-vibration hammer robot which can walk and cross obstacles and adapt to strong electromagnetic field environment is proposed. First, designed the main functional structure of the robot's walking wheel, work arm, etc., analyze the overall composition of the robot and the function requirements; secondly, according to the main performance, proposed the test method of anti-electromagnetic interference, climbing and obstacle crossing ability of the robot, and carried out performance test; finally, carried out maintenance work on the actual line, which verified the rationality and rationality of the design and the performance test method, which meets the actual operation requirements and provides support for the development and performance test of the live working anti-vibration hammer robot.</p>
<p>CM1-026 11:45-12:00</p>	<p>Analysis of Multi-sensor Fusion Localization Accuracy Based on GDOP Bing JI, Gan-lin SHAN Presenter: Bing JI Army Engineering University of PLA, China</p> <p>Abstract: Quantitative analysis of multi-sensor fusion localization accuracy is an important issue in air-defense system. According to basic principle of fusion localization of active and</p>

	<p>passive sensor, a general GDOP (Geometric Dilution of Accuracy) calculation model was established through CRB (cramer-rao boundary) method. Using this model, main influence factors of multi-sensor fusion localization accuracy were analysed systematically, which verifies the feasibility and rationality of the model and has practical value for multi-sensors placement.</p>
CM1-027 12:00-12:15	<p>PLC Ladder Diagram for a Sliding Mode Filtering Tracking Differentiator Wande An, Shanhai Jin Presenter: Shanhai Jin Yanbian University, China</p> <p>Abstract: Tracking input signal by providing its derivatives is important in control applications. However, input signal usually contains undesirable noise that may lead to system failure. On the other hand, in industrial environment, Programmable Logic Controllers (PLC) are still main digital controllers. Different from computers and MCUs, PLC employs a program language called Ladder Diagram, which maps the control logics through graphical symbols and blocks. This paper presents a ladder diagram for implementing a sliding mode filtering tracking differentiator on PLC to track input signal by removing noise. Experimental results validates the effectiveness of the presented method.</p>

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