2021 International Conference on Robotics and Control Engineering

RobCE 2021
Conference Programme

April 23, 2021 | Virtual Conference

Organized by

HONG KONG SOCIETY OF MECHANICAL ENGINEERS

Technically sponsored by

YORK UNIVERSITÉ UNIVERSITY

CHINA UNIVERSITY OF MINING AND TECHNOLOGY

CONTENTS

01/ WELCOME MESSAGE

Dear Participants,

Currently, the entire world is struggling against the virulent pandemic COVID-19. Unfortunately, each of us is affected, either overtly or covertly. Our conference, 2021 International Conference on Robotics and Control Engineering(RobCE 2021), is not an exception.

To actively respond the call of the government, to strengthen the protection work, to effectively reduce people gathering and prevent coronavirus transmission, RobCE 2021 which should be held in Tokyo, Japan from April 22 to 25, 2021 as planned, is now changed as on-line conference. Changing the format however shall not affect the desire of the conference. We wish to continue our communication to share our new research ideas, discuss challenges and form collaborations to solve various issues on Robotics and Control Engineering.

We would like to thank our outstanding Speakers: Prof. Ning Xi from The University of Hong Kong, HKSAR, China; Prof. Michael Y. Wang from Hong Kong University of Science and Technology, HKSAR, China; Prof. Makoto Iwasaki from Nagoya Institute of Technology, Japan for sharing their deep insights on future challenges and trends.

We would like to thank all the committees for their great support on organizing the conference. We also would like to thank all the reviewers for their great effort on reviewing the papers submitted to RobCE 2021. Special thanks to all the researchers and students who with their work and participate in the conference.

While we may not see each other face-to-face in Guilin, we hope the conference can still establish a solid linkage among all the participant as desired. We look forward to your contribution to making RobCE 2021 a success.

RobCE 2021 Organizing Committee

02 CONFERENCE SPEAKERS

Prof. Ning Xi
(Plenary Speaker)

Fellow of IEEE
President of IEEE Robotics and Automation Society (2018-2019)
The University of Hong Kong, HKSAR, China

Biography: Ning Xi received his D.Sc. degree in Systems Science and Mathematics from Washington University in St. Louis, Missouri, USA in December 1993. He is the Chair Professor of Robotics and Automation in the Faculty of Engineering and the Director of the Emerging Technologies Institute at the University of Hong Kong. Before he joined the University of Hong Kong in 2016, he was University Distinguished Professor, the John D. Ryder Professor of Electrical and Computer Engineering and the Director of Robotics and Automation Laboratory at Michigan State University. Dr. Xi received the Best Paper Award in IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) in August, 1995, and the Best Paper Award in the 1998 Japan-USA Symposium on Flexible Automation. Dr. Xi was awarded the first Early Academic Career Award by the IEEE Robotics and Automation Society in May, 1999. He also received The Best Paper Award of IEEE Transactions on Automation Science and Engineering in 2007. Dr. Xi was awarded SPIE Nano Engineering Award in 2007. In addition, he is a recipient of US National Science Foundation CAREER Award. Dr. Xi is a fellow of IEEE.

02 CONFERENCE SPEAKERS

Prof. Ning Xi
(Plenary Speaker)

Fellow of IEEE
President of IEEE Robotics and Automation Society (2018-2019)
The University of Hong Kong, HKSAR, China

Keynote Lecture: Compressive Feedback Control for Robots

Abstract: In the AI era, data play essential role for making decisions. The fundamental issues are how to use the data efficiently and conveniently to achieve the maximum benefits. In a robot control system, data has been used to obtain models for designing the controller and real-time feedbacks. The compressive feedback means the data that represents sensory information in the feedback of a control system is compressed or obtained from compressive sensing. Compressive sensing is a newly developed sensing method in which the key information can be obtained based on limited sampling or sensing. The compressive feedback method can significantly reduce sensing time and amount of data for the feedback purpose. Therefore, high-performance real-time control can be achieved even for the systems with slow sensory feedbacks or limited amount of data such as visual feedbacks. The key question is how to use such compressive information to control a robotic system. In this talk, following a brief introduction of compressive sensing and data compression, the theoretical foundation as well as implementation methods for modeling, analysis and design of compressive feedback control systems will be presented. Applications, including robot control, visual servoing and high precision nano motion control, will be discussed. The experimental testing results will also be presented.

02 CONFERENCE SPEAKERS

Prof. Michael Y. Wang
(Keynote Speaker)

Fellow, American Society of Mechanical Engineers (ASME)
Fellow, Hong Kong Institution of Engineers (HKIE)
Fellow, Institute of Electrical and Electronics Engineers (IEEE)
Hong Kong University of Science and Technology, HKSAR, China

Biography: Michael Y. Wang is the Founding Director of the Robotics Institute, the Director of HKUST-BRIGHT DREAM ROBOTICS Joint Research Institute, and a Chair Professor of Mechanical and Aerospace Engineering and Electronic and Computer Engineering of HKUST. He has numerous professional honors–National Science Foundation Research Initiation Award; Ralph R. Teetor Educational Award from Society of Automotive Engineers; LaRoux K. Gillespie Outstanding Young Manufacturing Engineer Award from Society of Manufacturing Engineers; Boeing–A.D. Welliver Faculty Summer Fellow, Boeing; Chang Jiang (Cheung Kong) Scholars Award from the Ministry of Education of China and Li Ka Shing Foundation (Hong Kong); Research Excellence Award of CUHK. He is Editor-in-Chief of IEEE Trans. on Automation Science and Engineering. His main research interests are in robotic manipulation, manufacturing automation, and additive manufacturing. Before joining HKUST in 2015, he served on the engineering faculty at University of Maryland, Chinese University of Hong Kong, and National University of Singapore. A recipient of ASME Design Automation Award, Professor Wang is a fellow of ASME, HKIE, and IEEE.

02 CONFERENCE SPEAKERS

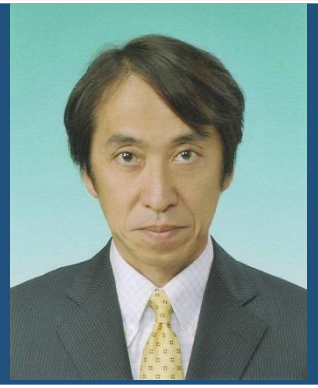
Prof. Michael Y. Wang
(Keynote Speaker)

Fellow, American Society of Mechanical Engineers (ASME)
Fellow, Hong Kong Institution of Engineers (HKIE)
Fellow, Institute of Electrical and Electronics Engineers (IEEE)
Hong Kong University of Science and Technology, HKSAR, China

Keynote Lecture: Finger Vision for a Sense of Robotic Manipulation

Abstract: Endowing artificial sense of touch comparable to human's has been challenging, yet significant to enabling adaptive and collaborative interaction in contact-rich tasks. This talk focuses on a novel vision-based tactile sensor for robotic manipulation. We introduce an augmented robot arm (VTacArm) designed with full surface tactile sensing to retrieve contact information and for down-stream feedback control. We first describe the robot arm design and its accompanying fabrication process. Then, we demonstrate that the tactile robot arm and the contact information extraction algorithm are integrated into a control system for collaborative interaction tasks. Bumping detection/reaction and contact motion following experiments are presented to show that the designed tactile robot arm and proposed contact sensing method are beneficial and give robot capabilities to adapt to human contacts. This work represents a broader development in novel full-body vision-based tactile sensing on robots as a new concept with significantly lower cost and manageable fabrication complexity.

02 CONFERENCE SPEAKERS



Prof. Makoto Iwasaki
(Keynote Speaker)

Fellow of IEEE, IEEJ, JSPE
Nagoya Institute of Technology, Japan

Biography: Makoto Iwasaki received the B.S., M.S., and Dr. Eng. degrees in electrical and computer engineering from Nagoya Institute of Technology, Nagoya, Japan, in 1986, 1988, and 1991, respectively. Since 1991, he has been with the Department of Computer Science and Engineering, Nagoya Institute of Technology, where he is currently a Professor at the Department of Electrical and Mechanical Engineering. As professional contributions of the IEEE, he has been an AdCom member of IES in term of 2010 to 2019, a Technical Editor for IEEE/ASME TMech from 2010 to 2014, an Associate Editor for IEEE TIE since 2014, a Management Committee member of IEEE/ASME TMech (Secretary in 2016 and Treasurer in 2017), a Co-Editors-in-Chief for IEEE TIE since 2016, a Vice President for Planning and Development in term of 2018 to 2019, respectively. He is IEEE fellow class 2015 for "contributions to fast and precise positioning in motion controller design". He has received the Best Paper Award of Trans of IEE Japan in 2013, the Best Paper Award of Fanuc FA Robot Foundation in 2011, the Technical Development Award of IEE Japan in 2017, the Nagamori Awards in 2017, the Ichimura Prize in Industry for Excellent Achievement of Ichimura Foundation for New Technology in 2018, the Technology Award of the Japan Society for Precision Engineering in 2018, and the Commendation for Science and Technology by the Japanese Minister of Education in 2019, respectively. His current research interests are the applications of control theories to linear/nonlinear modeling and precision positioning, through various collaborative research activities with industries.

02 CONFERENCE SPEAKERS

Prof. Makoto Iwasaki
(Keynote Speaker)

Fellow of IEEE, IEEJ, JSPE
Nagoya Institute of Technology, Japan

Keynote Lecture: Fast and Precision Motion Control for Industrial Positioning Devices: High Trajectory Tracking Performance by Iterative Learning Control

Abstract: Fast-response and high-precision motion control is one of indispensable techniques in a wide variety of high performance mechatronic systems including micro and/or nano-scale motion, such as data storage devices, machine tools, manufacturing tools for electronics components, and industrial robots, from the standpoints of high productivity, high quality of products, and total cost reduction. In those applications, the required specifications in the motion performance, e.g. response/settling time, trajectory/settling accuracy, etc., should be sufficiently achieved. In addition, the robustness against disturbances and/or uncertainties, the mechanical vibration suppression, and the adaptation capability against variations in mechanisms should be essential properties to be provided in the performance.

The keynote speech presents an improvement approach of trajectory tracking performance of multi-axis robot manipulator, where an iterative learning control framework is especially applied as one of practical and/or promising approaches to improve the robot motion performance. Actual issues and relevant solutions for the robot trajectory control performance are clarified and, then, a practical controller design for the iterative learning approach, including the stability analyses, is presented to improve the trajectory tracking performance. In this speech, the effectiveness of the proposed controller design is discussing for an actual multi-axis robot manipulator, comparing to the conventional tracking control approaches.

03 PRESENTATION GUIDE

Oral Presentation

1. File format: MS-PowerPoint (*.ppt) or Adobe PDF (*.pdf)
2. Time: About 15mins, including Q/A time. Each presentation should have at least **10 minutes**.
3. Language: English
4. Fonts: Arial or Times New Roman
5. Dress code: Formal clothes
6. Facility: Presenters need to use own laptop, please notify conference secretary via e-mail in advance and test the connection before session start.

Poster Presentation

1. Poster Size: 1m*0.8m (height*width).
2. Language: English.
3. The poster should include: Paper ID, Conference Name's Acronym(RobCE 2021), Significance of the research, the methods used, the main results obtained, and conclusions drawn.
4. Posters are required to be condensed and attractive.
5. The conference organizer won't send/keep any posters after the conference.

Note:

1. We'll record the whole conference. If you do mind, please inform us in advance. We'll stop to record when it's your turn to do the presentation.
3. The recording will be used for conference program and paper publication requirements. It cannot be distributed to or shared with anyone else, and it shall not be used for commercial nor illegal purpose.

04 PROGRAMME OVERVIEW

April 23, 2021 Friday | Tokyo time, GMT+9 | Room ID: 788 825 805		
10:00-10:10	Opening Remark	
10:10-10:55	Plenary Lecture	**Compressive Feedback Control for Robots** Prof. Ning Xi ,The University of Hong Kong, HKSAR, China
10:55-11:35	Keynote Lecture 1	**Fast and Precision Motion Control for Industrial Positioning Devices: High Trajectory Tracking Performance by Iterative Learning Control** Prof. Makoto Iwasaki, Nagoya Institute of Technology, Japan
11:35-12:15	Keynote Lecture 2	**Re-inventing design: how design evolved and gained new significance** Prof. Michael Y. Wang, Hong Kong University of Science and Technology, HKSAR, China
12:15-14:00	Technical Session	R002, R1002, A1002, A1003, R1004 R007, R010, A002, A006, A008, A020, A026, A1005, A004, A019

Technical Session
Session Chair: TBA
12:15-13:45, April 23, Friday | Room ID: 788 825 805

R002

12:15-12:30

Development and Control of a Ball-Riding Robot with a Pitch and Roll Controlled Inverted Pendulum

Manukid Parnichkun, Asian Institute of Technology, Thailand

Abstract: Ball riding robot is a robot with wheels which tries to balance on a ball by controlling the ball movement. Inverted pendulum is a device which uses an actuating cart to maintain the upright position. In this paper a ball riding robot is equipped with a pitch and roll planar inverted pendulum. Thus, the controller has to balance both ballbot body and the inverted pendulum by relying on the actuated movement of the ball driven by the Ballbot wheels. This paper explains the design and control of this novel dynamics system.

R1002

12:30-12:45

Third-order extended state observer-based Non-cascade backstepping sliding mode controller for PMSM servo system

Yao Wang, Southeast university, China

Abstract: The speed and current are regulated in one controller under the non-cascade control structure for permanent magnet synchronous motor (PMSM) drive system. To improve the disturbance rejection performance, a third-order extended state observer (ESO) is designed to estimate the unmodeled dynamics, parameter perturbations and load disturbances of the PMSM system based on the second-order equation of motion. A speed-current single loop control for PMSM drive system is designed in a backstepping sliding mode controller. The response speed and robustness of the PMSM drive system can be improve by the backstepping sliding mode control based on the feedforward compensation of the third-order extended state observer. Strict stability analysis of the PMSM system is carried out. Comparative simulation and experimental results verify that the proposed control strategy has high speed tracking performance and disturbance rejection property.

05 TECHNICAL SESSION

A1002

12:45-13:00

Kinematics analysis of leg configuration of an ostrich bionic biped robot

Junjie Che, Southern University of Science and Technology, China

Abstract: Bio-inspired biped robots require high level dynamic control when walking or jumping. Compared with 4 or 6 legged robots, mechanisms of biped robots are more complicated and have more DOFs, which means both kinematical and dynamic models are more complex. In this paper, we formulated the kinematic models of ostrich bionic biped robot, which apply serial-parallel hybrid mechanism with 13 joints (5 active, 8 passive) each leg. The mechanism topology patterns are analyzed during walking, jumping and standing. We defined the feet as 5-DOFs end-effectors and both forward and inverse kinematic models are formulated using screw theory. An ordinary walking gait based on inverted pendulum was used to test the models and the results show that the robot can walk very well in simulation environments. The research of this paper has obvious application significance for the design, iteration and control of ostrich bionic biped robot.

A1003

13:00-13:15

Modeling and Simulation of New Type Pneumatic Soft Torsion Actuator

Hongyuan Yang, Northeastern University, China

Abstract: With the rapid development of bionic robot technology, material technology and rapid prototyping technology, compared with the traditional rigid robot, soft robot has high flexibility, good adaptability and natural safe interaction, and has a huge application potential in various fields. This paper designs a soft actuator with multiple degrees of freedom that can achieve multiple spatial deformation motions. It can realize torsion in two directions, swing, elongation and other functions. The main structure of the pneumatic soft actuator studied in this paper is composed of a cylindrical matrix and six air chambers. Two sides of the three datum planes of the equidistant cylinder circle are symmetrically distributed with "groove" air chambers. The air chamber is divided into a semi-cylindrical connected chamber and a circular ridge. We use principle of virtual work and elastic strain energy to establish the kinematic relationship of torsion angle and pressure. The software ABAQUS is used to simulate the soft actuator by Finite Element Analysis.

R1004

13:15-13:30

Restoration of occluded face images based on improved CycleGAN model

Wang HaiRong, Haikou University Economics, China

Abstract: With the rapid development of VR technology in the past two years, VR has been applied to many fields such as communication, video, game and so on. But for VR wearers, their faces are largely obscured, which hinders access to complete facial information. Aiming at the above problems, the neural network generated by cyclic confrontation is used to realize the restoration of the masked face. The neural network can learn the mapping from the face image with VR glasses to that without VR, GAN is used as the generating model, in which the discriminator can judge whether the image is real enough to ensure that the generated image will not lead to deformity, the improved CycleGAN model can make the map learn the distribution transformation of the image, generate the non-occlusion image from the occluded image, learn the mapping of each other, and guarantee not over-fitting. At the same time, the CycleGAN model is implemented by Pytorch Algorithm, and the trained model is applied to the test data set of 500 different faces of celebA.

Poster Session: 13:30-14:00

R007

Robust localization and map updating based on Euclidean signed distance field map in dynamic environments

Xuebo Zhang, Nankai University, China

Abstract: Classical Simultaneous Localization and Mapping (SLAM) approaches are designed to map the static environments. In order to reuse the created map in the real world, this paper presents an approach based on Euclidean signed distance field (ESDF) map to cope with dynamic environments. To tackle the robust localization problem, the laser and odometry sensors are tightly coupled to estimate the mobile robot poses, which achieves superior performance over adaptive Mento Carlo Localization (AMCL) in terms of localization accuracy and robustness in both static and dynamic environments. As for map updating, an obstacle classification algorithm based on similarity is proposed to classify the new merged low-dynamic and high-dynamic obstacles. Then, the proposed algorithm based on wavefront propagation is used to update the prior ESDF map. Numerous experiments are carried out in realistic scenarios to validate the proposed approach.

R010	**Moving Target Tracking with a Mobile Robot Based on Modified Social Force Model** ***Qinxuan Sun,*** Nankai University, China Abstract: A target tracking approach is proposed for mobile robots in this paper to address the human-robot coexistenc and collaboration problem. The improved social force model (SFM) is applied to improve the tracking performance of the robot in crowded environments. When the robot approaches the pedestrians or obstacles, the tracking strategy is adaptively adjusted to avoid collision. The inverse reinforcement learning (IRL) is used to learn the parameters of the improved SFM, where the training data for the IRL is collected in real-world scenes. An effective criterion is designed to evaluate the tracking performance, which fully considers the relationship between the robot and surrounding environments. The experimental results demonstrate the effectiveness of the proposed target tracking method
A002	**Type Synthesis Method of Unconstrained SRCPR Based on Actual Workspace for Serial Robots** ***Lizhe Qi,*** Fudan University, China Abstract: In the field of industrial serial robots, the main problems existing at present are how to get the overall configuration of the serial robot and how to choose the optimal configuration of the serial robot. Aiming at these problems, this paper discussed the type synthesis problems of serial robots with prismatic pairs (P pairs) and rotational pairs (R pairs), and proposed a type synthesis method of unconstrained SRCPR (the serial robot configuration (SRC) with P pairs and R pairs) based on actual workspace for industrial robots. First, the "structural cell" of the serial robot SRCPR was proposed, and their topological relations were illustrated. Meanwhile, the dimensions of SRC were defined. Then, the relationships between the dimension of actual workspace and the dimension of SRC were founded. Finally, the type synthesis theoretical method of SRCPR was obtained by using the relationships.

A006	**Research on Master-slave Isomorphism Design and Guide Wire Segmentation of Robot for Vascular Intervention** ***Li Wanghongbo,*** Wuhan University of Technology, China Abstract: Aiming at the research of precise control and human-machine collaboration in interventional surgery, a master-slave isomorphic coordinated control system of minimally invasive vascular interventional surgery robot is designed to meet the requirements of master-slave conformity and two-way information feedback. The robot prototype system can build precise positioning and control minimally invasive interventional surgery with analysis the kinematics of the guide wire to achieve precise positioning and precise control of the tip of the guide wire. After obtaining the clinically collected angiographic images of the vascular guide wire, the guide wire is segmented using MobileU-Net(MobileNet encoding and U-Net decoding) neural network structure. Compared with traditional pixel-based extraction method with median filtering, we get better results with less noise. The accuracy rate of our work is 1.75% much higher than only using U-Net in the guide wire segmentation. What's more, the speed of our network is 4ms much faster than U-Net on a recent GPU. The displacement path of the guide wire in the blood vessel is calculated, which shows that the average distance of the guide wire from the center line is less than 0.5mm.
A008	**An Improved Deadbeat Current Predictive Control with Active Disturbance Rejection for PMSM** ***Kaixuan Yin,*** Xi´an Jiaotong University, China Abstract: Aiming at the problems of steady-state error and low operating efficiency caused by parameter disturbance in deadbeat current predictive control system of PMSM, an improved deadbeat current predictive control with active disturbance rejection is proposed. Through analyzing the principle of current static error in two-step deadbeat current predictive control with time-varying parameters, a second-order variable-speed sliding mode disturbance observer is proposed, which can completely eliminate the current steady-state error and improve the dynamic tracking performance of the system. The sliding surface of the observer adopts the second-order variable-speed reaching law and effectively suppresses the chattering of the system. Simulation comparisons were carried out for the traditional deadbeat current predictive control, predictive model with first-order linear extended observer and predictive control with second-order variable-speed sliding mode disturbance observer. The effectiveness of proposed scheme in eliminating steady-state error, reducing current distortion rate and torque ripple is verified. The robustness and efficiency of the system have also been improved.

A020	**Path planning for mobile robotic arms incorporating adaptive gravitational fields** ***Xiaodong Liu,*** Fuzhou University, China Abstract: Mobile robotic arms require the cooperation of a mobile platform and a robotic arm to reach the desired position rapidly and efficiently to complete the specified operations. By improving the estimation function of the A* algorithm, the number of turns in the path can be reduced, making the overall movement of the robot smoother and more efficient. For the path planning of the robotic arm, a fast random tree method is introduced, and the gravity component is added to guide the growth direction of the random tree for problems such as poor real-time performance and non-global optimal results. For the issue of oscillations and sudden changes in the planning results, a smoothing process is applied to the paths obtained by the improved algorithm. Simulation results and experiments show that the improved path planning method has better performance in the application of mobile robotic arm.
A026	**Research on logic control of variable transmission ratio SBW based on Pan-Boolean algebra** ***Yichi Zhang,*** Wuhan University of Technology, China Abstract: In order to improve the steering performance of automobiles and make full use of the advantages that Steer by Wire(SBW) can design transmission ratio freely, a variable transmission ratio control strategy based on Pan-Boolean algebra is proposed. Based on the 2 DOF vehicle steering model, the Matlab/Simulink software is used to model and simulate the SBW system, and is compared with the same parameter fuzzy control variable transmission ratio method. The results show that at low speed-high angle, high speed- low angle, the sideslip angle of this method is smaller than that of fuzzy control, the overshoot of yaw velocity transient response is less, and the steering sensitivity and vehicle handling performance of this method is more stable than that of fuzzy control.

A1005	**A current-limiting control drive circuit for DC motor start-up and blocking** ***Bingjie Chen,*** Jiangsu Runic Technology Co., Ltd, China Abstract: When the DC motor starts, the motor is stationary, the induction potential on the armature is zero, and the motor current rises quickly to produce a large inrush current, which will not only cause damage to the unit equipment but also cause perturbation of the power supply. In addition, in some applications encountered in the motor blocked rotation, electrical energy is fully converted to armature and MOSFET transistor thermal energy, accelerating the aging of the armature enamel wire, reducing the service life of the motor. In order to solve the problem of excessive inrush current when starting and blocking the motor, this paper presents an H-bridge a current-limiting control drive circuit for DC motor start-up and blocking. The circuit designed in this paper adds a current detection circuit to the driving circuit, and uses the parasitic inductance of the motor armature to effectively limit the peak current of the motor through the control of a fixed shutdown time to achieve the current limiting effect. The test results show that the motor can limit the current output during starting and blocking, and the current output is good without affecting the normal operation of the motor.
A004	**Group Consensus Control for Multi-agent Systems with Group-distributed Switching Topologies and Group-distributed Event-triggered Mechanism** ***Gaoyang Yin,*** Naval Aviation University, Yantai 264001, Shandong, China Abstract: When the DC motor starts, the motor is stationary, the induction potential on the armature is zero, and the motor current rises quickly to produce a large inrush current, which will not only cause damage to the unit equipment but also cause perturbation of the power supply. In addition, in some applications encountered in the motor blocked rotation, electrical energy is fully converted to armature and MOSFET transistor thermal energy, accelerating the aging of the armature enamel wire, reducing the service life of the motor. In order to solve the problem of excessive inrush current when starting and blocking the motor, this paper presents an H-bridge a current-limiting control drive circuit for DC motor start-up and blocking. The circuit designed in this paper adds a current detection circuit to the driving circuit, and uses the parasitic inductance of the motor armature to effectively limit the peak current of the motor through the control of a fixed shutdown time to achieve the current limiting effect. The test results show that the motor can limit the current output during starting and blocking, and the current output is good without affecting the normal operation of the motor.

A019

An Autonomous Moving Target Tracking System for Rotor UAV

Ruibo Xing, University of Chinese Academy of Sciences, China

Abstract: This paper presents a set of overall system design for tracking moving target with rotor Unmanned Aerial Vehicle (UAV). The tracking scene of the system is the autonomous tracking of the vehicle target in the environment with obstacles. Aiming at the autonomous ability of moving target tracking, this paper adopted the Single Shot MultiBox Detector (SSD) target detection method to detect the moving target of interest, which was used as a template for SiamRPN++ frame by frame tracking. After the target tracking has been completed in each frame, the center coordinates of the target selection box, which are converted to the UAV coordinates system through coordinates conversion, are used as the target points of path planning. Combined with the real-time visual inertial simultaneous localization and mapping (SLAM) system, VINS-MONO, to estimate the drone's pose and perceive the surrounding environment. Fast-planner can effectively plan the feasible path of moving target tracking under the obstacle environment and control the UAV tracking target. The design work of this autonomous moving target tracking system for rotor UAV was presented, and the key functional modules were closed-looply tested and verified within the gazebo software. The method used in this paper can detect the vehicle again in the case of target occlusion loss. A system of tracking moving vehicle in obstructed environment, which provides a set of basic research scheme for subsequent UAV tracking research, has been built.

07/ CONFERENCE COMMITTEE

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