Huiguang WANG

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Overview:

As a highly motivated and collaborative student majoring in engineering, I have a strong interest in *construction robotics*, and my current research focuses on developing a *welding robot* and rebar *tying robot*. Therefore, I have gained valuable experience in robotic arms, depth cameras, and machine learning. During my Master's studies, I participated in three construction robotics projects and published *five papers and patents*, *accumulating approximately ￥1,000,000.*

EDUCATION BACKGROUND

Hunan University (HNU)　　　　　　　　　　　　　　　　　　　　　　　　*Sep. 2022 – Present*
- *Master of Structural Engineering*
- GPA:3.4 / 4.0

Hefei University of Technology (HFUT)　　　　　　　　　　　　　　　　　*Sep.2018 – Jun. 2022*
- *Bachelor of Civil Engineering*
- GPA:3.7 / 4.0 (Ranking: 2 / 252), Average Score:89.27

PUBLICATIONS

[1] **Huiguang Wang**, Lu Deng, Ran Cao, Jingjing Guo, Fast-Pixel-Matching Algorithm for Automated Shear Stud Welding Based on the Integration of 2D Drawings and Structured Light Cameras [Conference]. 2024 International Symposium on Automation and Robotics in Construction (**ISARC2024, Scopus indexed**).

[2] Lu Deng, **Huiguang Wang**, Ran Cao, Xun Zuo, A welding method and system for steel-concrete composite structure connectors [Patent], CN 117102725 B, 2024-01-09.

[3] Lu Deng, **Huiguang Wang**, Ran Cao, Jingjing Guo, Automated Spot Welding Based on the Integration of 2D Drawings and Structured Light Cameras [Journal]. Automation In Construction (Under Review).

[4] Mi Liu, Jingjing Guo, Lu Deng, Songyue Wang, **Huiguang Wang**, AnyDirectTying: Enhanced Vision-based 6-DoF Pose Estimation for Robotic Rebar Tying [Journal]. Automation In Construction (Under Review).

[5] Lu deng, **Huiguang Wang**, Ran Cao, Jingjing Guo, Vision-guided Welding Method, Device, Medium and Robotic Arm for Rebar Cage [Patent]. (Under Review)

[6] Dean Li, Zuocai Wang, **Huiguang Wang**, Dashuai Jin, Vibration control for vehicle-bridge coupling of double main girder steel-concrete composite beam bridge based on PTMD [Journal]. Journal of Hefei University of Technology (Natural Science), 2022-09

[7] Liheng Tang, **Huiguang Wang,** Zihao Zhou, Shuanglong Yan, Zuocai Wang, Research of the Comfort Level of Prefabricated Composite Steel Plate Beam Bridge Based on the Vibration Effect of Driving Vehicle [Journal]. Hans Journal of Civil Engineering, 2022-11.

[8] Zuocai Wang, Xiaotong Sun, Zihao Zhou, Liheng Tang, **Huiguang Wang**, An energy-consuming support device for preventing web buckling of steel plate composite girder bridges [Patent]. CN 216838937 U, 2022-06-28.

RESEARCH EXPERIENCE (Click to details)

1. ***Automated robotic shear studs welding for steel-box beams bridge based on the integration of CAD 2D drawings and structured light camera***
   Supervisors: Prof. Lu Deng and Prof. Ran Cao　　　　　*Leader*　　　　　*May. 2023 – Present*
   - Provided an AutoCAD plug-in for extracting the X-Y welding point coordinate of shear studs from CAD drawings.
   - Introduced a new algorithm, 'Fast-Pixel-Matching'(FPM) to map the 2D coordinates to the 3D space.
   - Based on our experiment, the FPM provides efficiency with 7,000 times more than the manual method and similar accuracy in welding orientation estimation as light section sensors but at a much lower cost.
   - **Achievement:** Generated two research papers and one patent and made a topic presentation in ISARC, Lille, France.

2. ***Automated welding of complex rebar joints in rebar cages for prefabricated concrete shear walls***
   Supervisors: Prof. Lu Deng and Prof. Ran Cao　　　　　*Leader*　　　　　*Nov. 2023 – Present*
   - Provided a new algorithm, 'Rotate-ICP', to estimate the 6-DOF welding pose of complex rebar cage joints based on point cloud. In the future, we will also adopt an end-to-end method to address this problem.
   - Rotate-ICP has already been applied to robotic arm welding, achieving a welding success rate of nearly 100%. The welding execution efficiency is 6 seconds per joint, which is approximately on par with manual welding efficiency.
   - **Achievement:** Generated a research paper and a patent (Working Manuscript).

3. ***Tying rebars at the intersection joints of reinforcing cage with a robotic arm based on UGV***
   Supervisors: Prof. Lu Deng and Prof. Ran Cao　　　　　*Member*　　　　　*May 2022 – Present*
   - Target identification of stirrup joints is conducted using YOLOv8 / CenterNet, guiding the robotic arm to tie the intersection joints of the reinforcing cage. We integrated the UR10 robotic arm onto the UGV to tie rebar cages.

4. ***National undergraduate training program for innovation and entrepreneurship & student research training program***
   Supervisors: Prof. Zuocai Wang　　　　　*Leader*　　　　　*Mar. 2020 – Jan. 2022*

- Utilize dynamic analysis software, a coupled vehicle-bridge dynamic analysis is performed on the composite beam bridge composed of vehicles and steel plates.
- Damping devices are designed for vibration control, and the load-bearing capacity of the steel beams is analyzed using ANSYS.
- **Achievement:** Generated three research papers and a patent.

EXTRACURRICULAR ACTIVITIES

1. **International seminar: *41st International Symposium on Automation and Robotics in Construction***
   Topic presentation   *Lille, France, 4 Jun. 2024*
   Outline: Made a topic report: Fast-Pixel-Matching Algorithm for Automated Shear Stud Welding Based on the Integration of 2D Drawings and Structured Light Cameras

2. **Voluntary activity**
   - ***The 3rd National Symposium on Vehicle-bridge Coupled Vibration and Its Application***   *Mar. 2023*
   Outline: As a team leader, communicated the itinerary with attending experts and professors, arranged airport pick-up and hotel check-in for more than ten professors.
   - ***Chunlei Event - Raising Education Funds for Students in Poor Areas***   *Nov. 2018*
   Outline: As the team leader, I led the team members to raise in education funds from tourists, becoming one of the groups that raised the most funds.

3. **Competition:**
   - ***The 3rd Bridge Design Competition in Anhui Province***   *Nov. 2021*
   Outline: As a member, Completed the conceptual design of a bridge, followed by 3D rendering using Lumion. Finally, won the First Prize of the 3rd Bridge Design Competition in Anhui Province, awarded by Anhui Provincial Highway Transportation Society.
   - ***The 3rd National Undergraduate Structural Design Information Technology Competition***   *Apr.2021*
   Outline: As a leader, accomplished the architectural and structural design for an educational building, comprising the analysis and design of frame structure and foundation. Finally, won the Special Prize of the 3rd National Undergraduate Structural Design Information Technology Competition, awarded by the China Civil Engineering Society.

4. **Internship:**
   - ***China Machinery International Engineering Design & Research Institute Co., Ltd***   *Jun. 2021 – Aug. 2021*
   - ***Zhejiang G&Z Architectural Design Institute Co., Ltd***   *Jun. 2022 – Aug. 2022*
   Outline: As a member of structure design department, the main work content includes bidding for two municipal projects and drawing structural design drawings. I systematically learned design software like PKPM and Midas Gen.

AWARDS & HONOURS

Scholarships & Honorary Titles
- The First Prize Scholarship in 2024, awarded by Hunan University   Oct. 2024
- The Second Prize Scholarship in 2023, awarded by Hunan University   Oct. 2023
- The First Prize Scholarship in 2022, awarded by Hunan University   Oct. 2022
- The First Prize Scholarship in 2021, awarded by Hefei University of Technology   Dec. 2021
- The First Prize Scholarship in 2020, awarded by Hefei University of Technology   Dec. 2020
- **National Scholarship (Awarded by The Ministry of Education of the People's Republic of China)**   Dec. 2020
- **The First Prize of the "Industrial and Civil Construction Scholarship for Class of 1977" Civil Engineering Excellence Award**   Dec. 2020
- The Second Prize Scholarship in 2019, awarded by Hefei University of Technology   Dec. 2019
- Individual Scholarship, awarded by Hefei University of Technology   Dec. 2019
- **Outstanding Graduate of Anhui Province, awarded by Department of Education of Anhui Province**   Mar. 2022
- Outstanding Graduate of Hefei University of Technology   Mar. 2022
- Merit Student in 2021, awarded by Hefei University of Technology   Dec. 2021
- Outstanding Merit Student in 2020, awarded by Hefei University of Technology   Dec. 2020
- Merit Student in 2020, awarded by Hefei University of Technology   Dec. 2020
- Merit Student in 2019, awarded by Hefei University of Technology   Dec. 2019

Academic Competition Awards
- **The First Prize of the 3rd Bridge Design Competition in Anhui Province**   Nov. 2021
- **The Special Prize of the 3rd National Undergraduate Structural Design Information Technology Competition, awarded by the China Civil Engineering Society**   May 2021
- The Third Prize in the 2020 Basic Mechanics Competition of Hefei University of Technology   Dec. 2020
- The Third Prize in The National Undergraduate Physics Experiment Innovation Competition HFUT   Oct. 2020

ADDITIONAL INFORMATION

Programming: Python, MATLAB, C++, C#

Hardware: Robotic arm (UR10, RM65-B, Han's E15), depth camera (Mech-Eye NANO / NANO ULTRA / DEEP, PS800, D435i)