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.

EDUCATION

Hunan University (HNU) ***Sep. 2022 - Present***

Master of Structural Engineering

Hefei University of Technology (HFUT) ***Sep.2018 – Jun. 2022***

Bachelor of Civil Engineering

- GPA:3.79 / 4.50 (Ranking: 2 / 252), Average Score:89.27

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, May. 2023 - Present*)

- **Outline:** We provide an AutoCAD plug-in for extracting the X-Y welding point coordinate of shear studs from CAD drawings and introducing a novel algorithm, 'Fast-Pixel-Matching'(FPM), for supplementing missing Z-axis coordinate information in 2D drawings. Based on our experiment, the FPM can shorten the positioning process of shear studs from 16.7 hours to 8.6 seconds for a complex structural component with 6000 studs.
- **Achievement:** Generated two research papers and one patent.

2. Automated welding of complex rebar joints in rebar cages for prefabricated concrete shear walls (*Supervisors: Prof. Lu Deng and Prof. Ran Cao, Nov. 2023 - Present*)

- **Outline:** Using Yolov9 for target identification and segmentation of complex rebar cage joints, fitting straight rebar, employing template matching for tie bar positioning, and predicting the 6DOF welding pose based on scene point cloud data. In the future, we will also adopt an end-to-end method to address this problem. Moreover, we have established an automated welding workstation for further research.
- **Achievement:** Generated a research paper and a patent (Working Manuscript).

3. Tying rebars at the intersection joints of reinforcing cage using a robotic arm and UGV (*Supervisors: Prof. Lu Deng and Prof. Ran Cao, May. 2022 - Present*)

- **Outline:** 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.
- **Achievement:** Generated a research paper published in ISARC 2024.

4. National Undergraduate Training Program for Innovation and Entrepreneurship & Student Research Training Program (*Supervisors: Prof. Zuocai Wang, Mar. 2020 – Jan. 2022*)

- **Outline:** 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.

5. Structure /Bridge Design (*Supervisors: Prof. Lihua Chen, Prof. Liang Zhang, Prof. Yulong Feng, and Prof. Cheng Hu*)

- **Outline:** Completed the conceptual design of a bridge, followed by 3D rendering using Lumion. Additionally, accomplished the architectural and structural design for two educational buildings.
- **Achievement:** Achieved a special award in a national-level competition and a first-class award in a provincial-level competition.

PUBLICATIONS

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

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

[3] **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 [C]. 2024 International Symposium on Automation and Robotics in Construction (ISARC2024).

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

[5] 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 [J]. Journal of Hefei University of Technology (Natural Science), 2022-09

[6] 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 [J]. Hans Journal of Civil Engineering, 2022-11.

[7] 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 [P]. CN 216838937 U, 2022-06-28.

AWARDS & HONOURS

- National Scholarship
- The First Prize Scholarship(×5)
- The Second Prize Scholarship(×2)
- Individual Scholarship
- Outstanding Graduate of Anhui Province
- Outstanding Graduate of HFUT
- Outstanding Merit Student
- Merit Student
- The First Prize of the "Industrial and Civil Construction Scholarship for Class of 1977" Civil Engineering Excellence Award
- The First Prize of the 3rd Bridge Design Competition in Anhui Province

SKILLS

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

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