

Deming Wang

- CONTACT INFORMATION** Tongji University, No.4800, Caoan Road. (+86)18117162325
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Personal Homepage <https://demingwang.weebly.com/>
- RESEARCH INTERESTS** 6d Pose Estimation, Bin Picking, 3d/2d Object Detection, Unsupervised Defect Detection, Computer Vision
- EDUCATION** **Tongji University**, Shanghai, China **Candidate for**
Ph.D.Candidate Control Science and Engineering, Sep 2017 - Present
- Research Topic: *6d pose estimation for texture or textureless objects.*
 - Advisor: Prof.Dr.Qijun Chen
 - Laboratory: Robotics and Artificial Intelligence Lab (*RAIL*)
- Tongji University**, Shanghai, China **GPA:4.77/5 Rank:3/86**
B.S. Automation, Sep 2013 - Jun 2017
- Thesis: *Research on 3D Reconstruction Technique Based on RGBD Image.*
- RESEARCH & PROJECTS** **Pose Estimation and Grasping**
- *Self-Supervised based 6D Object Pose Estimation with Geometric Consistency* [July 2019 - Now]
 - Proposed a self-supervised method for 6D object pose estimation without 6D pose labels, only utilizing RGB images.
 - Designed a joint network combining dense pixel-wise correspondence prediction sub-network and pose estimation sub-network.
 - *Feature Fusion Framework for 6D Pose Estimation* [Jan 2019 - Oct 2019]
 - Proposed a novel depth and color feature fusion framework for 6D pose estimation, in which the depth information and color features are combined in a pixel-wise form to acquire per-pixel fusion features.
 - In addition, a pose predictor and refiner is designed to produce an optimized pose result.
 - *Bin-Picking Systems for Metal Processed Products* [Jul 2017 - Jan 2019]
 - Designed and built a bin-picking system for metal processed products, which includes robot control block, RGBD-camera capture and calibration block, and pose estimation block.
 - Utilized a template-matching method with the rgb image to obtain pose roughly and refine the pose by least-square method with depth data.
 - *Bin-Picking Systems for Plastic Bottles* [Jul 2016 - July 2017]
 - Designed and built a bin-picking system for plastic bottles, which includes robot control block, RGBD-camera capture and calibration block, and pose estimation block.
 - Designed a Dual-RGBD camera structure and eliminated the noise of depth image, utilizing a multi-source data fusion method.
 - Proposed a two-stage framework for 6d pose estimation and bin picking problem, which combined instance segmentation network and iterative optimization method.
- Surfaces Defect Detection**
- *Defect Detection for Irregularly Shaped Processed Surfaces* [Apr 2018 - Jul 2019]
 - An automated defect detection system for engine cylinder covers is constructed. Cooperating with a robot arm, the system detects anomalies on the processed surfaces by computer vision.
 - An adversarial denoising autoencoder architecture is proposed to reconstruct complex contours to extract precise ROIs. An unsupervised method is used to locate defects.
 - *Vision-Based Defect-Detection Systems for Metal Processed Products* [June 2018 - June 2019]

- Designed and built a defect-detection system for metal processed products, which includes robot control block, multi-camera capture block, and defect detection block.
- Designed a deep neural network similar to YOLOV3 to detect surface defects of metal products.
- Captured and labled thousands of sample images to form a metal surface defect dataset.
- Completed the whole defect detection system, considering the collaboration among the robot motion, the four camers' image capture and the defect detection process.

• *An application of learning-based detection methods* [Dec 2016 - Jun 2017]

- An image acquisition device is established for mobile phone metal cases, and a dataset is generated after image preprocessing operations.
- The object detection methods, Faster R-CNN and YOLO, are employed to detect defects on metal cases of the mobile phone.

RoboCup Standard Platform League [Sep 2016 - Aug 2017]

- Improved the strategy of the role 'Striker', especially designing adaptive behaviors switching when the robot locating in different areas on the fields.
- Modified the kicking-off strategy of the role 'Striker' and enhanced collaboration among players, taking the position and strategy of opposite plays into account.
- Designed a new penalty shoot strategy to prepare for the penalty shoot challenge .

Smart Car Design and Realization [Mar 2015 - Aug 2016]

- Participated in a smart car competition which require to design smart cars to accomplish the dual-car collaboration task, mainly based on Freescale microprocessor and vision sensors like camera.
- Designed a small smart car using microcomputer, motors, steer and monocular camera.
- Designed a state machine and communication mechanism to accomplish the dual-car collaboration mission like overtaking, based on vision algorithms and 2.4G communication module.
- Other basic tasks included controlling its direction and speed with a closed-loop control system, path planning, and obstacle avoidance.

Water Filtration Air Purifier [Jan 2016 - Aug 2016]

- Utilized a Siemens Controller, water tanks, water pumps, and PM2.5 sensors to set up an air purifier.
- Constructed a closed-loop control system in which the feedback is the PM2.5 value of the circumstance to adjust the purification efficiency automatically.

PUBLICATIONS

1. **Wang, Deming**; Yan, Yi; Zhou, Guangliang; Li, Yongqi; Liu, Chengju; Lin, Limin; Chen, Qijun. 3D Vision-Based Picking System with Instance Segmentation Network and Iterative Optimization Method, *Robot* 2019,41(05):637-648
2. Lin, Limin; Liu, Chengju; Ma, Lu; **Wang, Deming**; Chen, Qijun. Arm Trajectory Generation for Humanoid Robot Based on STFT, *Robot* 2019,41(05):591-600
3. Yan, Y., **Wang, D.**, Zhou, G., and Chen, Q. Pixelwise Defect Detection for Irregularly Shaped Processed Surfaces on Metal Castings (submitted to IEEE transactions on Industrial Informatics)
4. Zhou, G., Yan, Y., **Wang, D.**, and Chen, Q. A Novel Depth and Color Feature Fusion Framework for 6D Pose Estimation (submitted to IEEE transactions on Multimedia)

SCHOLARSHIP

- **Scholarship for New Outstanding PHD Students**, School-Level **Dec 2017**
- **National Scholarship (2015-2016 AY)**, Nation-Level **Dec 2016**
- **QiDi Scholarship (2013-2016 AY)**, School-Level **Dec 2016**
- **National Scholarship (2014-2015 AY)**, Nation-Level **Dec 2015**
- **Second Prize, Tongji Scholarship of Excellence (2013-2014 AY)** **Dec 2014**

HONORS	• Honor of Excellent Student in Tonji Univ., (2017-2018 AY)	Dec 2018
	• Third Prize , Nathional Post-Graduate Mathematical Contest of Modeling	Nov 2017
	• Major Participant , RoboCup 2017 SPL World Top 8 Teams	Aug 2017
	• Shanghai Outstanding Graduates ,	Jun 2017
	• Champion , China Open Robot Football Match of Robocup	Apr 2017
	• Honorable Mention , Interdisciplinary Contest In Modeling	Dec 2016
	• Second Prize , Shanghai College Student Smart Car Competition	Aug 2016
	• Second Prize , "Siemens Cup" China Intelligent Manufacturing Challenge	Aug 2016
• Second Prize , "TI Cup" National Undergraduate Electronic Design Contest - <i>Anolog System Design Invitational Contest</i>	Sep 2016	

SKILLS C++, Python, Matlab, Ubuntu, Deeplearning Framework(Tensorflow/Pytorch), Qt, OpenGL

PRACTICE EXPERIENCE	Artificial Intelligence Innovation Application Contest (2019)	2019
	<ul style="list-style-type: none"> - The target of the contest is to design a deep learning network to complete an image classification task for 55 different kinds of objects. - Designed an image classification network and ranked 27/732 (top 3.69%) with classification accuracy of 98.1% 	
	Piece Grasping based on Aruco Code and Desktop Robot	2018
	<ul style="list-style-type: none"> - Designed and built a vision system to assist the desktop-robot to accomplish a picking task (picking a kind of flexible circuit board). - A point-grey monocular camera is attached to the robot arm to capture the image and locate the flexible circuit board. - Designed a hand-eye calibration framework to determine the relative position between the robot and the camera. - Designed a pose estimation framework to get the pose of the circuit board with the aruco code attached to the board. 	
	Intelligent Furniture Control System Based on HomeAssistant	2018
	<ul style="list-style-type: none"> - Based on the HomeAssistant open-source library, a server is deployed on a Raspberry Pi 3b to construct a family control system. - Add object modules, such as Bluetooth outlets, air purifiers, PM2.5 monitors, and switches. Using mobile phone control all connected devices. 	

CHINESE PATENTS	• Defect detection on processed surfaces of metal castings. CN109636772A. [Under Review]
	• A picking system for a stack of identical workpiece. CN108555908A. [Under Review]
	• A novel 6D pose estimation method. CN109801337A. [Under Review]
	• A depth information acquisition system based on dual RGB-D cameras. CN109741405A. [Under Review]