

Research Interest

My research direction is pattern recognition and intelligent systems, used to solve industry problems requiring image analysis.

Education Background

Hunan University

B.Eng. in Control Science and Engineering

Weighted Average Score 86/100 (Rank 5/45)

Thesis: Research on Visual Inspection System of Cable Surface Defects

Changsha, China

Sep 2018 – Jun 2021

Northeast Normal University

B.Sc. in Computer Science and Technology

GPA 3.6/4 (Weighted Average Score 84/100, Rank 3/37)

Thesis: Research and Implementation of Decolorization Algorithm of Real-time Contrast Preserving

Changchun, China

Sep 2014 – Jun 2018

Research Background

Development of a machine vision system for bridge cable surface defect detection

- Supervised by *Prof. Dr. Xiao Changyan*, Jan 2019 – Jun 2021
- Project Description:
 - The project focuses on the development of a vision-based system for the detection of surface defects on cables. The system comprises three key components: a climbing bridge cable inspection robot, an image acquisition control platform, and specialized image processing software.
- My responsibilities (Part of the research is resulted in my master's thesis):
 - Develop and create a virtual imaging platform to simulate the imaging and calibration process of the image acquisition module.
 - Utilize cluster segmentation and histogram matching to segment the background of the cable target in the collected multi-view images. Additionally, design a new cylindrical target image stitching algorithm to generate a 360° undistorted cylindrical expansion image of the cable.
 - Establish an extensive library of cable surface disease images for detection and recognition. Implement the YOLOv3 target detection and recognition framework and conduct model training using Visual Studio 2017. The system achieves a cable disease detection and recognition accuracy of over 94%.

Research and development of an online 3D measurement system for intelligent manufacturing workpieces

- Supervised by *Prof. Dr. Xiao Changyan*, Sep 2018 – Jun 2019
- Project description:
 - To achieve efficient and cost-effective spraying, it is essential to reconstruct the three-dimensional information of the workpiece and conduct path planning for the extracted part size.
- Responsibilities:
 - Procure experimental equipment, including selecting cameras and hardware, to establish an imaging experimental platform.
 - Utilize the TOF camera to capture depth information of each part to be inspected and to determine the spraying plane area and spraying distance of the reciprocating machine.
 - Develop and execute the point cloud segmentation algorithm to effectively separate industrial parts from the background and accurately reconstruct the three-dimensional point cloud model of the industrial parts.

Keyboard flatness detection

- Supervised by *Prof. Dr. Xiao Changyan*, Jan 2018 – Jan 2019
- Project Description:
 - Utilize high-resolution industrial cameras to construct a three-camera array imaging system.
 - Integrate image sequence stitching and a line-structured light algorithm to ascertain the keyboard's flatness.
- My responsibilities
 - Composition and troubleshooting of the flatness detection algorithm within the core codebase, implemented in C++.

Research and Implementation of Decolorization Algorithm of Real-time Contrast Preserving

- Supervised by *Prof. Dr. Junxi Sun*, Sep 2017 – Jun 2018
- Project Description (Bachelor's thesis project, an independent project):
 - The project focuses on decolorization, which involves converting a color image to grayscale. It addresses the speed issue of existing conversion methods and proposes a fast and effective decolorization approach to preserve color contrast.
 - The proposed algorithm optimizes decolorization through a simplified bimodal objective function and a fast non-

iterative discrete optimization.

- The algorithm is proven to be effective through qualitative and quantitative evaluation experiments, providing a basis for future decolorization and image processing technology.

Industry Background

Hunan Vanguard Group Co., Ltd.

Software R&D Engineer

Changsha, China

Apr 2023 – Jul 2024

- Develop control software for 3D printing equipment, including PLC, motion control card, and galvanometer control card.
- Create TCP network communication software to link the control software with the camera.
- Implement detection algorithms in the 3D printing process, achieving an accuracy rate of over 90%.

Shenzhen Shopee Information Technology Co., Ltd.

Software R&D Engineer

Shenzhen, China

Jul 2021 – Oct 2022

- Work on UI/interaction design tasks and drafting design documents, collaborated with backend team members, and led integration and API reconstruction projects.
- Develop and maintain Shopee's internal message card SDK, oversee Jenkins function configuration for Foody APP, and troubleshoot packaging and release issues.

Awards & Honors

1st Award of Graduate Students' Scholarship for Academic Year 2018 to 2021, Hunan University

2nd Award of the 1st Robots Innovation and Design Competition for Graduate Students of China, Aug 2019

Outstanding Student Honor for Academic Year 2017 to 2019, Northeast Normal University

Scholarship for Excellent Students' Work for Academic Year 2016 to 2019

1st Award of the Undergraduate Students' Scholarship, Northeast Normal University, Nov 2017

Scholarship for Special Academic Performance for Academic Year 2015 to 2017, Northeast Normal University

2nd Award of the Math Modelling Competition in Jilin Province, Nov 2015

2nd Award of the Program Design Competition in Jilin Province, Sep 2015

Publications

Conference Paper

Zhang, K., Zhou, L., Xiao, C. (2020). Feature-Less Stitching of Cylindrical Cable for Surface Inspection of Cable-Stayed Bridges. In: Peng, Y., *et al.* Pattern Recognition and Computer Vision. PRCV 2020. Lecture Notes in Computer Science(), vol 12306. Springer, Cham. https://doi.org/10.1007/978-3-030-60639-8_18

Patent

Xiao, C., Miu H., Zhou., Tan, L., Zhang, K. (2020). Method and device for rapidly measuring flatness of keyboard key caps based on structured light imaging. CN108562250B

Software Copyright

Laser selective melting control software. (2024). 2024SR0868905

Cable and tower surface image acquisition software. (2019). 2019SR1024476

Cable and tower surface image processing software. (2019). 2019SR1024463.

Skills & Certificates

Programming: C++, Java, Python

Software: STL templates, polymorphism, multi-threading, and C++11 standards; TCP network programming, SVN and git version management tools, CMake, GitLab

Languages: English – Working Language Proficiency, Chinese – Native