Xiangchen Liu

(011-86) 188 3163 3689 • lxctdjy@tju.edu.cn
leongoretzkatju.github.io/ • leongoretzkatju

Education

University of Tianjin University **September 2018 – Current**
Bachelor of Engineering
Major in Measurement and Control Technology and Instruments
Major GPA: 3.85/4.00

Research Interest

- Indoor SLAM, Scene Completion, 3D reconstruction, Geometric/Semantic Segmentation

Research Experience

SMAC: A Simultaneous Mapping and Completion System for RGB-D Sensors

- Supervised by Mr. Yanyan Li, Technical University of Munich, Dr. Yanbiao Sun, Tianjin University.
- Propose a versatile simultaneous mapping and completion system for indoor scenes, which aims to provide semantic, lightweight and complete 3D dense models for virtual reality applications. In order to reconstruct complete environments, on the one hand, I provide an image synthesis strategy aimed at restoring 2D pixels occluded by objects. On the other hand, the depth information of these occluded parts is calculated based on a ray casting approach. After restoring the 3D occluded areas, I take advantage of a resolution adaptive TSDF algorithm to build lightweight 3D models according to the texture information of scenarios.
- Project Website | Video links

Leadership Experience

Auto-aim system in Robomaster **Sep 2020 - Current**
Leader Vision/Algorithm Group

- The auto-aim system is to help our robot to achieve the intelligent detection of enemy robots, which makes use of traditional geometric feature extraction and the neural network as the detector, using the extended kalman filter(EKF) as the predictor, KCF as the tracker. Realizing automatic attack on enemy robots in robot competitions.
- Source Code: Vision2021 Vision2020

Super Capacity in Robomaster **Jan 2020 - Aug 2020**
Leader Control Group

- The Super Capacity Project aims to improve the maneuverability of robots in fierce competitions. Designed the control algorithm in the MCU(STM32) to get the sensor data from several sensors and optimize the data, using PID controller to control the general power of the robot, Accomplished the function to charge the capacity and release the energy in the capacity intelligently, improved the performance of our robots.
- Source Code: Control Code

Experience

Computer Aided Medical Procedures & Augmented Reality Lab, TUM **Munich, Germany**
Visiting Student Researcher with Yanyan Li

- **focus**: Indoor SLAM, Geometric/Semantic Segmentation, Adaptive TSDF
- **responsibilities**: 1) I proposed and implemented a ray-casting method to finish the real-time sparse map completion, using the re-projection method to update the completion.
  2) I designed a novel method for RGB and Depth Image Synthesis based on the geometric/semantic segmentation and estimation of the bounding box of the objects.
  3) I implemented a resolution adaptive TSDF based on the texture information of scenarios to create light-weight 3D dense reconstruction for virtual reality applications.

Robotics Team, Tianjin University **Tianjin, China**
Leader in Vision/Algorithm Group

- **focus**: Object Detection, Motion Prediction, Time Synchronization, Stereo Vision

- **responsibilities**: 1) I proposed and implemented an Object Detection combined with the yolo-v5 and geometric extraction. 2) I designed a motion prediction method fused with IMU data using the Extended Kalman Filter (EKF) to track and hit the enemy robots accurately.
  3) I used the stereo vision to detect the object and compute the depth more accurately.

Key Laboratory of Precision Measuring Technology & Instruments, TJU **Tianjin, China**

Visiting Student Researcher with Yanbiao Sun

- **focus**: Visual-Inertial SLAM, Plane Segmentation, Multi-sensor Fusion
- **responsibilities**: 1) The thesis of my graduation project is "Visual-wMPS fusion for accurate state estimation, which makes full use of the multi-sensor fusion and Non-linear optimization to estimate scale and camera pose accurately in the large-scale scenarios. I use the Bundle Adjustment to solve the optimization problem with Visual camera and wMPS. This work is based on the open-sourced framework ORB-SLAM3 and Vins-Fusion.
  2) I proposed and implemented a novel algorithm used for plane segmentation in the indoor scene, which uses multi-scale constrains and multi-ransac algorithms combined with the KDTree and KNN methods.
  3) I implemented a series of optimization algorithms, including EKF, Bundle Adjustment,Sliding-Windows Algorithm and Factor Graph.etc .
  4) I summarized the previous work on the Simultaneous localization and mapping(SLAM) by reading and analying the related papers and open-sourced code, including ORB-SLAM2/3, Vins-Fusion, Elastic-Fusion, Planar/Manhattan-SLAM.

Honors and Awards

- Oct. 2021, China University Robot Competition (Robomaster) Second Prize - Tianjin University
- May. 2021, China University Robot Competition in Northern Division First Prize - Tianjin University
- Oct. 2020, China University Robot Competition (Robomaster) Third Prize - Tianjin University
- Mar. 2020, Mathematical Contest In Modeling Honorable Prize - Tianjin University
- Nov. 2020, TI Cup College Student Electronic Design Competition Third Prize - Tianjin University
- Nov. 2019, The Chinese Mathematics Competitions First Prize - Tianjin University

Skills

- **Programming:** C++, Python, Embedded Programming
- **Techniques:** ROS, TensorFlow, ORB-SLAM2/3, Vins-Mono
- **Languages:** English

Related Courses

- Introduction to Robotics (ROS)
- Computer Vision (95)
- Object-oriented C++ (93)
- System verilog design (90)
- Advanced Mathematics (99)
- Probability Theory and Mathematical Statistics(97)
- MATLAB Programming (97)