Zhenyu Du

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EDUCATION

The University of Manchester Sep 2019 - Jan 2021

Advanced Control System Engineering MSc Manchester

- Relevant Courses: State Space and Multivariable Control, System Identification, Nonlinear and Adaptive Control Systems, Robots and Automatic Systems

The University of Manchester Sep 2016 - Dec 2019

Electrical and Electronic Engineering BEng Manchester

- Upper Second Class Honours
- Relevant Courses: Advanced Mathematics, Linear Algebra, Basic Control theory, C Programming, Electronic Circuit Design, Digital Signal Processing, Digital System Design, Embedded System, Digital Mobile Communication, etc.

PROJECT EXPERIENCE

Investigation on Lidar SLAM Jul 2020 - Sep 2020

The University of Manchester Manchester, UK

- **Principle Exploration and Test Environment Construction**
  - In-depth exploration of the characteristics of Hector and Gmapping SLAM Algorithm
  - Designed a **double-layer mobile robot** using ROS, applied SLAM algorithms, tuned parameters, and wrote the path planning algorithm
  - Designed and set up **four** experiments to explore the influence of different landmarks on Lidar algorithms; and investigated the influence of the corridor problem
- **Performance Analysis**
  - Both Gmapping and Hector SLAM performed well in the indoor environment with many distinctive landmarks
    - The Hector SLAM failed to build the map when the refresh rate was lower than **5Hz**, or the speed of the mobile robot was higher than **0.6m/s**
  - The mobile robot **lost its position** when the turning **angle was too large**
  - The Average CUP usage of the Gmapping is five times that the Hector SLAM
- **Further Exploration and Improving**
  - **Fused** the estimated position both from the **odometry** and the **Lidar** to improve the performance of the Hector SLAM with the long corridor
  - **Used** data from the **Inertial Measurement Unit (IMU)** to prevent the robot from losing its position due to a large rotation angle

Optimal Controller Design on Quadrotor UVA with the LQG Method Apr 2020 - May 2020

The University of Manchester Manchester, UK

- **Linearized** the model of quadrotor UVA and designed a linear multi-variable controller to control altitude
- Applied the LQG controller and simulated the performance in the Simulink where the **Q matrix** is equal to **diag ([800 0.01 0.01 0.1 0.1 0.01 100 400 400])**
- Tuned the parameter to reduce the steady-state error and the rise time in terms of yaw, pitch, and roll respectively; the tracking performance degraded by combining three terms because of the **coupling problem**
- Analyzed the **four uncertainty structures** and found the most suitable model to evaluate the robust stability

Facial Recognition System on the Portable Device Oct 2018 - Apr 2019

The University of Manchester Manchester, UK

- Built a face recognition system using Raspberry Pi and an Android phone to scan real-time video streaming, store data, and display people's identity
- **Construction of Face Recognition System**
  - Created an Android application with four activities to control the Raspberry Pi using JAVA and Android Studio
  - Programed the face detection, face recognition, and communication algorithms on the Raspberry Pi
  - Used the Bleno module in the NodeJS to program the Raspberry Pi as a BLE peripheral to communicate with the Android application
  - Introduced the async.series() to reduce the nesting callbacks and return correct results because of the single thread of Javascript
- **Model Training and System testing**
  - Introduced the receiver operating characteristic curve(ROC curve) to evaluate the Scale Factor parameter
  - Trained the face detection algorithm(Haar cascades) using **16,837** images and the accuracy was **95.13%**
  - Trained the face recognition algorithm(LBPH) using **5,289** images and the accuracy was **92.39%**
  - The effective range and signal strength of the system was **35m** and **-113dB** respectively

Embedded System Project Jan 2018 - Jun 2018

Team Leader Manchester, UK

- Created an autonomous vehicle including following a white line, avoiding obstacles, moving on an inclined plane, identifying the end of the track, and returning
- **Buggy Designing**
  - Used the Acetal as the chassis material to ensure strength while reducing the weight of the buggy
  - Used six IR sensors(**TCRT5000**) positioned in a **U-shaped** manner at the front of the buggy to detect the white and black line
  - Used DRV425EVM Magnetic sensor to detect the end of the track
- **Navigation and Control Algorithm**
  - Used analog input of each sensor multiplying by a growing value to evaluate the current position (**position = (a[0] * 100 + a[1] * 200 + a[2] * 300 + a[3] * 400 + a[4] * 500 + a[5] * 600)/ (a[0]+a[1]+a[2]+a[3]+a[4]+a[5])**)
  - Applied PD controller to calculate the error (Correction = KP * error + KD * (error – last_error))
  - Run the Check_The_End() function at every loop of the program; the buggy turned around and re-detect the white line if the magnetic sensor was triggered

SKILLS AND INTERESTS

- **Skills:** Matlab (Proficient), C++(Proficient), ROS(Skilled), KEIL(Skilled), ALTIUM DESIGNER(Skilled)
- **Certifications:** Photography (NYIP professional photographer certification), Machine Learning (Coursera Certificate)
- **Languages:** English (Proficient), Chinese (Native)

SOCIETIES AND ORGANIZATIONS

One Drama Society, The University of Manchester Oct 2016 - Oct 2018

- planned three drama performances and raised more than 1,000 pounds of funds.
- participated in the recruitment of members, participated in poster design and Photography.