Yuchen Rao

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Portfolio: https://yuchenrao.github.io/Portfolio/

EDUCATION

Master of Science in Robotics 09/2016 - Present
Northwestern University, Evanston, IL (GPA 3.95/4.00)
Bachelor of Science in Mechanical and Electrical Engineering 09/2012 - 07/2016
China Agricultural University (CAU), Beijing, China (GPA 3.88/4.00, Rank: 1/43)

SKILLS

- Proficient: C, C++, Python, ROS, Linux, Git/GitHub, Mathematica, MATLAB, SOLIDWORKS, AutoCAD,
- Experience: Eagle, Java, V-REP, Gazebo, Weka, MPLAB, CodeWarrior, Android Studio
- Knowledge: Machine Learning, Computer Vision, Natural Language Processing, Machine Perception of Music and Audio, PIC Microcontroller, PCB Design, Forward and Inverse Kinematics, Android Development, Optimal Control of Nonlinear System, Computational Geometry

PROJECTS

Robot Drawing Control Based on Detected Facial Emotion, Northwestern University 01/2017 - 04/2017
- Extracted facial features using OpenCV Haar Cascade and dense SIFT algorithm
- Developed machine learning pipeline capable of multi classification of user's real-time emotion (happy, sad, surprise, and disgust) using webcam
- Developed ROS software to control a Baxter Research Robot to draw images corresponding to result of emotion classification

Autonomous Path-Following Car Controlled by Android Phone, Northwestern University 04/2017 - 06/2017
- Designed and built a differential drive robot car using 3D printer and laser cutter
- Developed an image processing Android app for detecting the road with the phone's camera
- Motor controlled by PIC microcontroller on custom PCB communicating with Android over USB CDC protocol

Machine Learning Projects, Northwestern University 09/2016 - 07/2017
- Real time playing card recognition with OpenCV and Convolutional Neural Net in TensorFlow
- Developed a musical instrument classifier by using Mel-Frequency Cepstral Coefficients and SVM algorithm

Control and Dynamics Projects, Northwestern University 09/2016 - 07/2017
- Dynamic simulation of multi-body mechanical systems in generalized coordinates involving friction, impacts, and external forcing using Mathematica
- Simulation and synthesis of optimal control for a Pendubot using a functional gradient technique
- Development of a library for analysis of serial robot arms; features included: forward and inverse kinematics, inverse dynamics, trajectory generation, and visualization of trajectories through V-REP

Freescale Cup: Intelligent Car Racing (Electromagnetism Group), Beijing, China 05/2014 - 05/2015
Team Leader of Freescale Cup: Intelligent Car Racing of North China region (3rd place finish)
- Created software for controlling a car to follow a wire with PIC microcontroller
- Improved an adaptive PID algorithm to maintain steady velocity, and refined steering angle PD algorithm resulting in greater stability and accuracy of turning angle
- Designed fuzzy controller and filtering scheme to determine set point for low-level steering angle controller

RESEARCH EXPERIENCE

Emotional Classification of Chinese Micro-blog Articles, Tsinghua University, Beijing, China 10/2015 - 06/2016
- Extracted sentence features using Language Technology Platform Cloud with Java, and represented sentences as vectors corresponding to these features using word2vec
- Developed software for emotion classification (happy, sad, surprise, disgust, angry, and afraid) for online articles based on words and structure features of sentences using SVM^{Perf}, and improved accuracy by 15% over previous solution that ignore sentence structure