CHARMIN PRITESH DESAI

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EDUCATION

University at Buffalo, The State University of New York **Buffalo, NY, USA**
Master of Science, Engineering Science (Robotics) **Aug 2021 – May 2023**
Courses : Robot Control, Robot Algorithms & ROS, Machine Learning, Computer Vision

Sardar Vallabhbhai Patel Institute of Technology **Vasad, Gujarat, India**
Bachelor of Engineering, Instrumentation & Control **Aug 2016 – May 2020**
Courses : Process Control, Industrial Measurement, Electrical Machines, PLC, Embedded, Power Electronics & Drives

SKILLS

Languages : Python, C , C++, Embedded C, PLC Ladder Logic
Software & Libraries : MS Office, MATLAB-Simulink, ROS-Gazebo, NumPy, Pandas, Matplotlib, OpenCV, TensorFlow, Sklearn
Hardware : PLC, PID Control, Electrical/Electronics, Embedded Systems

WORK EXPERIENCE

University At Buffalo : Research Assistant **June 2023 – Present**
1. Research assistant for Prof. Chen Wang, and improving algorithms for the Autonomous Robot project.

University At Buffalo : Teaching Assistant **Sept 2022 – May 2023**
1. **Taught** : Control systems and mathematical modeling of robot mechanisms.
2. **Reference** : Dr. Vojislav Kalanovic. You may contact my professor for my reference.
3. **Fanuc LR Mate 200-iD Robot Arm** : Standardized position of 6-DOF manipulator's end-effector in robot base-frame and world frame. Formulated calculations by Denavit-Hartenberg methodology and Forward Kinematics. Derived 6x6 Jacobian Matrix to generalize linear and angular velocities of end-effectors.
4. **Laboratory** : Simulated a 6-DOF robot arm on ROS-Gazebo and ran robot hardware via ROS1 commands and program nodes. Worked with different end-effectors and interfaced various sensors to the robot arm. Localized the end-effector using apriltag. Performed operations such as object stacking, color sorting, etc. View

Niyantras Automation : Automation Engineer **June 2020 – July 2021**
1. **Indoor Air Quality Monitoring System** : Prototype the device using Arduino with different gas sensors to detect particulate matter, N2O, SO2, H2, LPG, CH4, CO, and alcohol.
2. **Electrical Cutting Machine** : Developed an automatic turn-off functionality in the machine for operator and field personnel safety using NC switch and 4-pole contactor. View
3. **Industrial Temperature Transmitter** : Designed and devised a signal conditioning circuit working for RTD PT100 sensor and calibrated temperature range of 0-100 °C to 0-5 VDC output using IC741 Op-Amp.
4. **Home Automation** : Developed Indoor lighting system controlled via IR detection. Using 8051 MCU and relay. View
5. **Water Management Control System** : View Project
   - Level Control :- Ultrasonic sensor measures the level of water in the overhead and underground tank. Underground water pump turns automatically ON & OFF based on the level of water in the overhead tank.
   - Measurement :- Flow rate is constantly measured by the flow sensor in the pipeline to measure consumption.
   - Wastage Detection & Prevention :- Flow sensor detects water wastage in open unmonitored taps, then sends feedback to MCU. MCU commands a solenoid valve to turn OFF in a particular pipeline shutting off water supply.
   - Notification :- MCU notifies the user about water wastage in open tap using GSM technology. The users can later close the tap and restore the water supply.

Larsen and Toubro : Control & Instrumentation Intern **June 2019**
1. **Conveyor Belt Control:**
   - Created a PLC program to control a conveyor belt system, running empty bottles to be filled.
   - Included functionalities such as starting and stopping the belt, level sensors and filling actuators.
2. **Batch Processing System:**
   - Developed a PLC program to control sequence of operations for a fluid batch processing system.
   - Controlled operations like start and stop of pump, mixing, heating, level control, to produce resultant product.
3. **Material Handling and Separation System:**
   - Controlled the movement of conveyors and actuators to transport and segregate materials.
   - Separated the materials based on size as detected by a pair IR sensors.

ENGINEERING PROJECTS

Autonomous Robot, ROS-Gazebo : View Project
1. **SLAM** :- Used Gmapping on a TurtleBot3 robot in ROS gazebo to generate an image of size 384x384 pixels.
2. **Occupancy Grid** :- Performed image processing to generate an occupancy grid matrix of 400x400 pixels from SLAM.
3. **Path Planning :-** Used homogeneous transformations to formulate coordinate frame transformations between world frame and occupancy grid frame. Optimized A* algorithm and planned a 95% improved shortest path.
4. **Perception :-** Executed AprilTag continuous detection node to derive the transform from robot camera to apriltag.
5. **Localization :-** Improved robot pose estimation with nearly 100% accuracy through apriltag detection and parallelly calculating position using robot's linear and angular velocity.
6. **Recognition :-** Programmed a mathematical algorithm which estimates the true position of an object from continuously updated robot's pose and robot to apriltag transform.
7. **Exploration :-** Robot explores the environment searching for candidate targets, saves their position in its memory.
8. **Navigation & Control :-** Executed a controller node, driving the robot 80% faster from start to goal location. Enabled the robot to navigate the shortest path in the least possible time.

Robot Simulation and Mapping using Bug2 Algorithm and RANSAC on ROS
1. Created a map of the observable environment using the RANSAC algorithm.
2. Simulated a robot with odometer and LIDAR on ROS platform and performed motion planning using Bug2 algorithm, from utilizing data from RANSAC nodes to reach desired coordinates.

Multi-Face Detection and Recognition with Image Clustering
1. Created a program that can detect multiple faces from over 100 images using Haar cascading, resulting in an F1 score of 0.8.
2. Designed a program that uses multiple images of different people for detection, recognition, and clustering using K-Means clustering algorithm.

Neural Network & Convolutional Neural Network (CNN)
1. Built a Neural Network on an income dataset of size 32500 to predict a person's income. Achieved accuracy of 85.60 % through hyperparameter tuning for model optimization.
2. Built a CNN on Fashion-MNIST dataset of size of 70000 images to predict the item type. Achieved accuracy of 92.05 % through hyperparameter tuning for model optimization.

Optical Character Recognition (OCR) utilizing Connected Component Labeling (CCL) and Feature Extraction Techniques
1. Conducted an OCR project to accurately recognize characters of different sizes in an image.
2. Executed CCL to define boundaries around characters and employed zoning techniques to generate feature vectors and compare similarity with predefined characters. Achieved a high F1 score of 0.83.

House Pricing Prediction using (Linear Regression) and Gender Prediction using (Logistic Regression)
1. Analyzed data to forecast house prices in Boston based and achieved 94.8 % accuracy using linear regression.
2. Made analysis on a penguin dataset for gender identification using logistic regression with 91% accuracy.