

CHARMIN PRITESH DESAI

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EDUCATION

University at Buffalo, The State University of New York

Master of Science, Engineering Science (Robotics)

Courses : Robot Control, Robot Algorithms & ROS, Machine Learning, Computer Vision

Buffalo, NY, USA

Aug 2021 – May 2023

Sardar Vallabhbhai Patel Institute of Technology

Bachelor of Engineering, Instrumentation & Control

Courses : Process Control, Industrial Measurement, Electrical Machines, PLC, Embedded, Power Electronics & Drives

Vasad, Gujarat, India

Aug 2016 – May 2020

SKILLS

Languages : Python, C , C++, Embedded C, PLC Ladder Logic

Libraries : NumPy, Pandas, Matplotlib, OpenCV, TensorFlow, Sklearn, Keras

Software : MS Office, MATLAB & Simulink, ROS & Gazebo

Hardware : PLC, PID Control, Electrical/Electronics, Embedded Systems

WORK EXPERIENCE

University At Buffalo : Teaching Assistant

Feb 2023 – May 2023

- Taught : Mathematical modelling of robot mechanisms using Euler-Lagrange method.
- 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-effector.
- 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

- Indoor Air Quality Monitoring System : Prototyped the device using Arduino with different gas sensors to detect particulate matter, N2O, SO2, H2, LPG, CH4, CO, and alcohol.
- 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](#)
- Industrial Temperature Measurement 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.
- Home Automation : Indoor lighting system controlled via IR detection. Using 8051 MCU and relay. [View](#)

ENGINEERING PROJECTS (AUTOMATION & CONTROL)

Automatic Water Management System : [View Project](#)

1. **Level Control** :- The level of water in overhead and underground tanks is measured through ultrasonic sensor, that constantly sends data to MCU which displays the level on LCD screen. Underground water pump turns automatically ON & OFF based on the level of water in overhead tank.
2. **Measurement** :- Flow sensor in pipeline continuously measures flow rate and measured consumption. It is interfaced to microcontroller giving it live data that is displayed on LCD screen.
3. **Wastage Detection & Prevention** :- Flow sensor detects water wastage in open unmonitored taps, then sends feedback to MCU. MCU commands solenoid valve to turn OFF in a particular pipeline shutting off water supply.
4. **Notification** :- MCU sends message to the user's phone using GSM technology notifying the user of an open water tap in the premises. User can later close the tap and restore the water supply.

Programmable Logic Controller (Ladder Logic) : [View Project](#)

- Empty bottles run on a conveyor belt by a 1-phase induction motor until identified by a photo-switch sensor.
- This halts the motor and starts a liquid filling apparatus for 4 seconds. Finally, the level sensor ends the filling.
- The conveyor is commenced again to fill new bottles; this repeats each cycle for 12 seconds.

Automatic Timer Socket (ATS) : [View Project](#)

- Smart socket with timing functionality. ATS prevents gadgets from overcharging that deteriorates battery life.
- ATS will turn off the plugged device/appliance after a set period from 1-99 minutes.

ENGINEERING PROJECTS (ROBOTICS & AI)

Autonomous Robot, ROS1-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 homogenous 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 and 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.

Face Detection and Clustering

- Implemented Face Detection on 100's of images using OpenCV and Python using Haar Cascade.
- Used KMeans Clustering algorithm to cluster the detected faces, an achieved a F1 score > 0.81 on test dataset.

Neural Network & CNN

- Built a Neural Network on income dataset of size 32500 to predict a person's income. Achieved accuracy of 85.60 % through hyperparameter tuning for model optimization.
- 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.

Wall Detection and Motion Planning (ROS)

- Implemented RANSAC algorithm for a mobile robot to detect walls in an environment from laser scanner data.
- Performed motion planning with Bug2 algorithm from utilizing data passed by RANSAC node.

House Pricing Prediction (Linear Regression) and Gender Prediction (Logistic Regression)

- Analyzed data to forecast house prices in Boston based and achieved 94.8 % accuracy using linear regression.
- Made analysis on a penguin dataset for gender identification using logistic regression with 91% accuracy.