ADITYA MALIK
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PROJECTS

Needle Intervention System with Mirror Ultrasound Imaging: Medical Fusion Lab, WPI — Aug 2020 – May 2021

- Developing a smart robotic needle intervention device with mirror Ultrasound imaging, which provides an intuitive and simple solution to guide the needle insertion path during PCNL procedures
- Designing and manufacturing an attachment for Ultrasound probe that provides users with the forward-view of the needle insertion process by changing the relative angle between a mirror and the Ultrasound probe
- Developing software and a Graphical User Interface (GUI) to collect data from a Clarius Ultrasound Scanner and visualize the needle insertion process by displaying real-time volume visualization of scanned area

Disaster Resilience in Victorian Schools: Melbourne, Australia — Jan 2020 – May 2020

- Partnered with the Australian Institute of Disaster Resilience (AIDR) and other government organizations to help 60 students in the fire prone area of Emerald in Victoria, Australia develop knowledge and awareness about bushfire safety to improve local disaster resilience
- Developed online lesson plans that combined interactive technology, project-based learning, and community involvement to educate students on how to reduce risk and manage emergencies in their local area
- Collected and analyzed student feedback to improve lessons and provide future recommendations for disaster resilience education
- Concluded our project by presenting our findings and recommendations to over 3 schools, government organizations, and fire departments in Emerald

Unified Robotics IV- Navigation, Position Estimation, and Mapping: WPI — Oct 2019 -Dec 2019

- Programmed **(python**) a robot capable of autonomously mapping an unknown environment using a LIDAR and frontier-based navigation
- Developed in **Linux** and used **ROS nodes** to determine frontiers to explore and calculate c-space. Implemented **A* path planning algorithm** and used the **ROS navigation stack**, including **Gmapping** and **AMCL**, to map an environment and localize the robot respectively
- Beat the fastest lab time of 2 mins, to completely map and navigate an unknown area in 30 seconds

Unified Robotics III– Robotic Arms and Robotic Manipulation: WPI — Aug 2019 -Oct 2019

- Analyzed and implemented position and velocity kinematics, and robot dynamics for a 3-DOF RRR Robotic Manipulator. Implemented quintic polynomial trajectory planning to achieve smooth movements, and used frame transformations to convert between robot frame, camera frame, and world frame
- Programmed **(C++**) the robotic arm to detect objects with a camera, dynamically track them, pick them up, and sort them based on color and size
- Detected objects (**MATLAB**) using color thresh-holding & edge-detection algorithm
- Watch the project video at: https://www.youtube.com/watch?v=EPb9Sx-1X1Q

Unified Robotics II–Sensing: WPI — Mar 2019 -May 2019

- Engineered a robot with a group of two students that was able to autonomously navigate a city and detect and put out any fires sensed in buildings (C++)
- Utilized IMU, Encoders, and infrared cameras with I2C communication serial lines on an ESP32 for effective navigation of an area. Designed a chassis and housings for the IR camera and fire extinguishing mechanism using 3D printed and laser cut parts

Unified Robotics I– Actuation: WPI — Jan 2019 -Mar 2019

- Designed and developed a robot with a group of two students that was able to autonomously replace solar collector panels (C++). Created detailed models for the entire robot with **Solidworks** and performed all force analysis and gear calculations using **Mathcad**. 3D printed and laser cut all the parts
- Built a custom electric circuit with an ESP-32, H-bridge, level shifters, and motor controllers, Pololu motors, and a Pololu line follower

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Great Problems Seminar- The World's Water: WPI Aug 2017-Dec 2017

- Collaborated on an interdisciplinary team of three to explore and research an innovative and sustainable method to deal with idol immersion in Kolkata, India
- Supervised writing of research paper by taking role as chief editor
- Presented a poster highlighting results from interviews and data collection as well as proposed solutions and recommendations to reduce the pollution caused by unsustainable idol immersion in Kolkata

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TECHNICAL SKILLS

- Programming: C/C++, Python, Java, MATLAB, OpenCV
- Robotics: Sensor integration, Actuators and manipulators, Navigation and Localization, Machine Learning, ROS, Gazebo, Rviz
- Web Technologies: HTML, CSS, JavaScript, React, MongoDB
- Software: SolidWorks, AutoCAD, Unix/Linux
- Certifications: Solidworks CSWA. Certificate ID: C-EJF6ZCNS9H
