

PROJECTS

Needle Intervention System with Mirror Ultrasound Imaging: Medical Fusion Lab, XX 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 X 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 X 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

ADITYA MALIK

amalik@wpi.edu | 508-615-3811

<https://www.linkedin.com/in/adityamalik3/> | <https://github.com/amalik3099>

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

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
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