Vaibhav Raheja

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Education

University of Illinois Urbana-Champaign, *Masters Degree* 08/2023 - 12/2024
Major: Autonomy and Robotics CGPA: 3.77/4

NMIMS' MPSTME, *Bachelors Degree* 07/2019 - 06/2023
Major: Computer Engineering CGPA: 3.67/4

Work Experience

Intelligent Motion Laboratory, *Research Developer* 08/2023 - 12/2023

- Implemented advanced facial detection and analysis techniques using FaceMesh, OpenFace 1.0, and DeepFace for a robotic eye exam, alongside head pose estimation with ZED camera's depth tracking, to enhance the accuracy and effectiveness of facial feature detection in various scenarios.
- Engineered and simulated a robotic arm, focusing on optimizing camera placement for effective 3D mapping, thereby improving the precision of face detection and head pose estimation for comprehensive eye examinations.
- **Technologies Used:** Python, Robot Operating System (ROS), CAD.

All India Institute of Medical Sciences (AIIMS) Hospital, *Research Intern* 02/2021 - 05/2023

- Working closely with a diverse team, developed and executed an innovative research project financed by the Indian Council of Medical Research (ICMR). This project led to noteworthy achievements, such as a 10% decrease in surgery times and a 20% enhancement in accuracy.
- Played a key in the design and assembly of a custom 2-directional catheter and mouthpiece integrated with a camera system, contributing to successful intubation.
- **Technologies Used:** Python, 'xArm 5' robotic arm, Machine Learning, Robot Operating System (ROS), CAD.

Projects

Intelligent Ground Vehicle Competition (IGVC), | (*ROS, OpenCV, PID Control, Path Planning, CAD*)

- Led a multidisciplinary team as Co-Captain for this international robotics competition held in Detroit, USA. As captain of Team D.A.R.V.I.N, we achieved impressive 2nd and 3rd place rankings in the highly competitive Cyber and Auto-Nav Challenge categories, demonstrating our excellence in autonomous vehicle navigation in challenging environments.

Autonomous Driving Car | (*Python, Path Planning, Vehicle Control, CARLA Simulator*)

- Implemented Hybrid A*, Spline Interpolation, and Dynamic Programming for path planning search for waypoint navigation for racetracks in the CARLA simulator.
- Integrated a Proportional-Derivative (PD) controller for real-time autonomy with obstacle avoidance and steering angle adjustments, speed, and braking, enhancing the car's efficient navigation through racetracks.

Disease Detection System using Machine Learning | (*Python, Pytorch, CNN*)

- Achieved an accuracy rate of over 90% in predicting chronic diseases, including COVID-19, Pneumonia, Heart Disease, Chronic Kidney Disease, Diabetes, and various skin diseases. This system holds the potential to revolutionize early disease diagnosis.

Soft Robotics Hand | (*Arduino, 3D Modelling and Printing*)

- Created a Soft Robotic Hand controlled by five individual stepper motors, enhancing dexterity and flexibility, with Arduino for control and 3D modeling and printing for construction.

Custom Surveillance Drone | (*Arduino, 3D Modelling and Printing, ESC Controller, Pix hawk*)

- Engineered a custom surveillance drone featuring a modular 3D-printed body and high-performance 1200KV BLDC motors, controlled via a Pix hawk Flight Controller and an ESC for motor control.

Skills

Programming: Python, C++, Robot Operating System(ROS), OpenCV, PyTorch, PID Controllers, Motion Planning algorithms, Machine Learning(ML), Convolutional neural network (CNN)

Tools: Autodesk Fusion 360, Computer Aided Design (CAD), Linux, Git, Arduino, Raspberry Pi

Publications

Raheja, Vaibhav et al. (Nov. 2022). "Multi-Disease Prediction System using Machine Learning". In: *International Conference on Futuristic Technologies (INCOFT)*. URL: https://ieeexplore.ieee.org/document/10094382.