Aamish Hussain

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Experience

Fraunhofer Institute for Material Flow and Logistics (IML) *Dortmund, DE*
Working Student *July 2023 – Sep 2024*
Robotics and Cognitive Systems Department

- **Tools and Exposure** Machine learning, OpenCV, Open3D, pytorch, Bash, python, 3D SLAM, Poinclouds, Gazebo, Git, ROS, Statistical Analysis, pointcloud processing
- Designed, implemented and tested vision based volume estimation pipeline for logistic goods and warehouse transport loads.
- Integrated Foundation Image Segmentation models and photogrammetry techniques for 3D data segmentation.
- Designed and built a custom dataset for vision based volume estimation, integrating multiple data sources and generating empirically testable scenarios for volume estimation. Participated in literature review for utilization of 3D SLAM in volume estimation tasks

Technische Universität Dortmund *Dortmund, DE*
Research Assistant- WHF *Sep 2022 – Aug 2024*
Communication Networks Institute

- **Tools and Exposure** Reinforcement Learning, Gymnasium(gym), Rllib, Stable Baselines 3, pytorch, neural networks, tensorboard, obstacle avoidance, software testing, computer vision, Linux, python
- Designed and Implemented a custom simulation environment for training and evaluating robot navigation tasks using Reinforcement Learning. The simulation focused on potential network disconnectivity scenarios faced by rescue robots.
- Implemented Reinforcement Learning agent training stack that integrated multiple algorithms, different network architectures and varied environment configurations.
- Evaluated the trained agents on unseen environments.

Independent Project Work *Islamabad, PK*
Sep 2018 – Jul 2019

- **Tools and Exposure** Circuit Design, PCB assembly, 3D printing, Bluetooth low Energy (BLE), DA14683, python
- Mechanical and Electrical Design of a low-cost smart watch aimed for new users.
- Prototyped its core functionality with BLE, CAD and assembly.
- Integrated Sensors and actuators, and digital display functionality
- Presentation of prototype to potential investors and venture capital firms.

NUST College of Electrical and Mechanical Engineering *Rawalpindi, PK*
Research Assistant *Aug 2017 – Jul 2018*
Department of Mechatronics

- Implementation of Visual Odometry for human and robot arm synchronization
- Modeling and Simulation of the robotic arm in Solidworks
- Development of GUI and literature review participation
- **Tools and Exposure** Mechanical Simulation, QT, Mathmenatical modeling, Lookup tables, Linux, python

Education

Technische Universität Dortmund, Germany *2024*
Master of Science in Automation and Robotics

- **Coursework:** Mobile Robotic Systems, Networked Mobile Robot Systems, Machine learning in Robotics,

3D Computer Vision, Logic Control, Statistics

- **Thesis:** Using Segment Anything Models to Estimate Volume of Transport Goods Represented in Colored 3D Point Clouds. (In collaboration with Fraunhofer Institute for Material Flow and Logistics)

National University of Sciences and Technology, Pakistan *2017*
Bachelor of Engineering in Mechantronics Engineering

- **Coursework:** Mobile Robots, Embedded Systems, Digital Signal Processing, Image processing, Control Theory, Design of Machines, PLC programming
- **Thesis:** Slurry Deposition On Asperous Surfaces: A State of the Art Additive Manufacturing Approach

Projects

Race against the machine *Portfolio Link*
CNI - TU Dortmund

- **Tools in Focus** : Nvidia Jetson, ROS, Docker, 3D SLAM, robot path following, RVIZ, gazebo, python, C++,
- Primary prototype for 5G connection based tele-operation of autonomous cars that are stuck in situations where they cannot proceed independently.
- Implemented subsystems: SLAM based navigation for f1/tenth cars, digital twin and simulation environment, tele-operation central and path following.
- Use of Modified ORB-SLAM3 for integration to existing code base for selfdriving. Utilizing Docker containers to deliver a robust application.
- Contributions to path following set-up by utilizing modified pure-pursuit algorithm written in python. Testing the approaches in simulated environment.
- Reviewed existing approaches for self-driving cars and wrote documentation

Slurry deposition Printer *Portfolio Link*
Rawalpindi, PK

- **Tools in Focus** : Real-time Embedded systems, Vector graphics, Mechanical design, 3D printing, Arduino, Fluid extrusion, Robot Kinematics, Serial Comunication, python, C++,QT
- Developed a 3D printer capable of printing on objects having different sizes, shapes, and surfaces.
- Contributed to the development of user control GUI using QT.
- Developed a system that takes an image and converts it into vector graphics, is manipulatable in GUI, and then can be converted into gcodes for GRBL and at the end, into CNC controls

Robot for solving dynamic mazes
Rawalpindi, PK

- **Tools in focus:**: Arduino, Infrared and Sonar sensors, Servo motors, Solidworks, Proteus Design Suite
- Designed a wheeled robot from the ground up for National Engineering Robotics Contest (NERC) *Website*
- The robot was capable of solving a dynamic maze when given a limited intial information at the start while performing pick-place tasks inside the maze.
- Subsystems: Dual-motor chassis, power electronics and motor driving circuits, Robotic mechanism for pick and place tasks, sensor suite and navigation algorithm.

Lower Extrimity Orthosis
Rawalpindi, PK

- **Tools in focus:** Arduino, IoT, mechanical and electrical design, angular displacement sensors.
- Developed an IOT device capable of delivering remote physiotherapy to muscular atrophy patients.
- The project aimed to reduce the time and travel required to receive physiotherapy by using a wearable mechanism that delivers physiotherapy through a suite of actuators and sensors. The frequency and quality of can be monitored by professionals remotely.

Skills and Technologies

Skills: Computer Vision, Machine Learning, Mobile Robots, SLAM, Sensor fusion, Point Clouds, Reinforcement Learning, Robot Navigation, Data Analysis, Software Testing
Languages: python, C++, C, MATLAB, Bash, Latex

Technologies: ROS, Docker, Git, Gazebo , Pytorch, Numpy, Pandas, Open3D, OpenCV, Solidworks, Proteus, Linux, Simulink, Jupyter, PLC
Hardware: Nvidia Jetson Nano, Arduino, Livox LiDARs, RGB-D sensors, Linear Actuators, NEMA Stepper Motors
Communication: English (C2),Urdu/Punjabi(Native), German(B1)

Awards

- Runner up TU Start-Up Week 2023
- Best Senior Project, NUST 2017
- NUST Merit Scholarship – 2015-17
- Runner up – FICS 2017, *Website*