Arashdeep Singh

Roll No.:M23IRM003
Autonomous Mobile Robots

Robotics and Mobility Systems
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EDUCATION

Degree/Certificate	Institute/Board	CGPA/Percentage	Year
M.Tech. (RMS)	Indian Institute of Technology, Jodhpur	8.02 (Current)	2023-Present
B.Tech. (ME)	Guru Nanak Dev Engineering College, Ludhiana	7.58	2016-2020
Senior Secondary	PSEB Board	90.00%	2015
Secondary	PSEB Board	91.84%	2013

PROJECTS

- **M.Tech Thesis: Development of Multi-Agent Control for Surface and Underwater Vehicles**   Github   YouTube

  - This work focuses on developing a control and decision-making framework for autonomous vehicles, integrating multi-agent coordination for task allocation, role switching, and concave obstacle avoidance to enhance mission efficiency.
  - **Tools & Technologies**: Gazebo, Matlab, Solidworks, ROS2, Arduino, Sensor Integration, Python, C++
  - **Skills**: Concave Obstacle Avoidance, Underactuated Robot Control, Multi-Agent Systems

- **ROS2-based Bin-Picking System: Integrating RGB and Point Cloud Data for Object Detection, Pose Estimation, and Grasp Planning**   Github   YouTube

  - This project presents an integrated robotic bin- picking system that uses advanced computer vision techniques and ROS2 for real-time object detection,pose estimation, and grasp planning.
  - **Skills**: Motion Planning, ROS2, CV, Camera Calibration, Kinematics and Dynamics
  - **Tools**: YOLO, GPD, PCL, Gazebo, RViz

- **Leader-Follower Formation Control of Non-Holonomic Mobile Robots**   Github   YouTube

  - Modeled leader-follower formation of differential drive WMRs, designed Lyapunov-based controllers, and simulated formations.
  - **Skills**: Robotic Kinematics, Formation Control, Lyapunov Stability, Matlab Simulation

- **2D Admittance Control: From Concept to Hardware Implementation**   Github   YouTube

  - Designed and implemented a complete 2D admittance control system, spanning theoretical modeling, simulation in Gazebo, and hardware integration.
  - **Skills**: Robotic Kinematics, Formation Control, Lyapunov Stability, Matlab Simulation

- **Multi-Vehicle Simulation Environment for AUVs and ASVs**   Github   YouTube

  - Created an integrated simulation platform enabling simultaneous testing and interaction of Autonomous Underwater Vehicles (AUVs) and Autonomous Surface Vehicles (ASVs) to enhance multi-agent coordination.
  - **Skills**: Robotic Kinematics, Formation Control, Lyapunov Stability, Matlab Simulation

- **Turtlebot Control Using Motor Cortex Signals (BCI Hackathon)**   Github   YouTube

  - Created Engineered brain-computer interface (BCI) prototype using OpenBCI to translate motor cortex signals into Turtlebot movement, achieving 78% accuracy in command execution and demonstrating real-time robotic navigation.
  - **Skills**: Robotic Kinematics, Formation Control, Lyapunov Stability, Matlab Simulation

- **Voice-Controlled Smart Home Automation System with Sensor Integration**   Github   YouTube

  - Developed a voice-controlled smart home system using Arduino Nano 33 BLE Sense, integrating environmental sensors and machine learning models.
  - **Skills**: Hardware-Software Integration, Voice Recognition, ML Integration, Sensor Integration, Embedded System Design

- **Designing a Lightweight Neural Network for Crop Disease Detection**   Github   YouTube

  - In this project, we focus on designing a lightweight Neural Network model capable of running on edge devices to assist in detecting crop diseases on-site.
  - **Skills**: PyTorch, CNN, MobileNet, Python

Key Courses Taken

- Introduction to Robotics, Mobile Robots, Artificial Intelligence, Computer Vision, Autonomous Systems, Embedded System Design, Fundamentals of Machine Learning, Robot Operating System, Introduction to Medical Robotics

Technical Skills

- **Programming:** C, C++, Python, Matlab, Shell Scripting
- **Tools & OS:** Git, Jupyter Notebook, Google Colab, Linux, Windows, ROS, Docker, Solidworks
- **Libraries**/**Frameworks:** Pandas, Numpy, scikit-learn, Open-CV, Matplotlib, TensorFlow, PyTorch
- **Sensors & Hardware :** IMU, Depth Camera, Lidar, Load Cell, Common Motors, Micro-controllers, Basic Motor Control

Certifications

- MathWorks Certification on Matlab Fundamentals,Linear Algebra, ODE
- SWCAD1.0: SOLIDWORKS CAD Fundamentals
- CS50 Introduction to Programming Using Python Certification
- LinkedIn : Additive Manufacturing Optimizing 3D Prints
- LinkedIn: Numpy, Matplotlib, Pandas, Bash Scripting