

Hassan Shahzad

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📄 Hassan Shahzad 🐙 TheHassanShahzad

MEng Robotics student at UCL with hands-on experience developing autonomous mobile robots using ROS2, Nav2, and SLAM. Specialized in building complete navigation stacks from hardware integration to high-level AI control. Proven track record of delivering working robotic systems through industry placement and personal research projects.

Experience

ROS2 Robotics Engineer

January 2024 — Present

Industry Placement - Autonomous Agricultural Robots

- Developed ROS2 Humble autonomous navigation with Nav2, AMCL, and SLAM Toolbox for agricultural robots
- Built high-fidelity Gazebo simulations with accurate sensor models and physics for field testing
- Implemented URDF pipeline for automated 3D robot model generation from CAD files
- Created microROS bridge for real-time sensor data processing and motor control

Projects

A24 - Autonomous SLAM Research Platform

Present — Present

- 3-year development of modular AMR with complete ROS2 Nav2 stack and SLAM Toolbox integration
- Implemented RP-LiDAR A1 360° scanning with custom mounting for precise 2D mapping
- Developed microROS firmware for ESP32 enabling efficient ROS2-microcontroller communication
- Achieved successful sim2real transfer from Gazebo simulation to hardware deployment

OpenBase2 - Low-Cost Autonomous Navigation

Present — Present

- Built £240 AMR using repurposed hoverboard motors demonstrating cost-effective robotics
- Implemented RTAB-Map SLAM with Intel D415 depth camera for 3D mapping and localization
- Developed ESP32 microROS nodes for distributed motor control and sensor processing
- Integrated WebRTC for remote teleoperation and real-time video streaming

BiStable - Self-Balancing Robot

Present — Present

- Developed 2-wheeled balancing robot with complete ROS2 architecture in 2-week UCL project
- Implemented dual-core ESP32 processing: Core 1 for PID balance, Core 2 for motor control
- Created PyBullet simulation for PID tuning achieving stable balance with MPU6050 IMU
- Integrated MediaPipe hand tracking for gesture-based robot control

Nav2 Agent - Natural Language Robot Control

Present — Present

- Pioneered LLM-controlled navigation enabling commands like 'Go to kitchen' in simulation
- Built LangChain-ROS2 bridge for AI-driven path planning and obstacle avoidance
- Developed semantic mapping system translating natural language to navigation goals
- Demonstrated feasibility of conversational interfaces for robot control

radioROS - Universal Wireless Controller

Present — Present

- Designed custom PCB with ESP32-S3 for universal ROS2 robot control
- Implemented hardware interrupt-based PWM processing for real-time control
- Developed ROS2 driver package with Twist message publishing for robot velocity control

Education

- Autonomous Robotics & Control
- SLAM & Computer Vision
- Embedded Systems & Real-time Programming
- Multi-robot Systems & Navigation

Certificates

ROS2 for Beginners - Level 1 & 2

March 2024

Udemy - Edouard Renard

ROS2 Nav2 Stack - SLAM and Navigation

May 2024

Udemy - Edouard Renard

Deep Learning Prerequisites: The Numpy Stack

February 2024

Udemy - Lazy Programmer Inc.

Deep Learning and Neural Networks in Python

April 2024

Udemy - Lazy Programmer Inc.

Skills

ROS2 & Navigation:

ROS2 Humble, Nav2 Stack, SLAM Toolbox, AMCL, microROS, Gazebo

SLAM & Mapping:

RTAB-Map, Gmapping, 2D/3D SLAM, Occupancy Grids, Sensor Fusion

Hardware Integration:

LiDAR, Depth Cameras, IMUs, Motor Control, ESP32, Raspberry Pi

Programming: Python, C++, URDF/XACRO, Docker, Git, PyBullet

AI Integration: LangChain, Computer Vision, MediaPipe, LLM Tool Calling

Interests

Research Areas:

Autonomous Navigation, Multi-robot SLAM, Human-Robot Interaction, Field Robotics