Hardik Gossain

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WORK EXPERIENCE:

Freelance Developer **Nov 2023 - Present**

Remote

- Established AWS infrastructure to record and analyze IoT data, leveraging Lambda, S3, and API Gateway for seamless data processing. The project was onsite done for a startup which took around two months to complete.
- Engineered multiple path planning algorithm for multiple robots navigating from source to destination on a grid-based map. Collaborated with a PhD researcher over a three-month period to deliver a robust solution meeting project specification.

Production Associate – DENSO **Aug 2023-Jan 2024**

Guelph, Ontario, Canada

- Calibrated various machines, such as manipulators, to maintain precision in manufacturing parts for HVAC systems.
- Conducted thorough quality checks involving both physical and electrical assessments.
- Collaborated closely with team members to ensure timely completion of targets.
- Upheld exceptional quality standards throughout the manufacturing process.

Software Engineering Intern - Aerogram Private Limited **Jan 2020-Aug 2020**

Indian Institute of Technology, New Delhi, India.

- Directly worked on the product that later got launched for pollution monitoring in Delhi.
- Applied FreeRTOS on STM32 to collect data from sensors like accelerometer, gyroscope, PM2.5
- Designed PCB using Eagle for STM32 and onboard sensors.
- Used protocols like I^2C, CAN, SPI, UART for communication between sensors, STM32 and Raspberry Pi
- Performed Unit testing, Integration Testing and Hardware testing before deployment of the device.

EDUCATION:

Master of Engineering in Electrical and Computer Engineering **Sept 2021-Dec 2022**

University of Waterloo, Waterloo, ON, Canada

- Overall GPA: 8.4/10
- Relevant Courses: Multivariable Control Systems, Social Robotics, Robot Dynamics and Control, Intelligent Sensors, and Sensor Networks

Bachelor of Engineering, Electronics and Communication Engineering Aug 2017-Sept 2021

ADGITM (formerly NIEC), GGSIPU University, New Delhi, India

- Overall CGPA: 8.6/10
- Relevant Courses: Embedded Systems, DSP, Digital Electronics, Data Structures, Microcontrollers

SKILLS:

Programming Languages: Python, C++

Operating Systems: Windows, Ubuntu

Python Libraries: NumPy, OpenCV, Matplotlib, Pytorch, TensorFlow

Tools: Git, MATLAB, VREP, Gazebo, Rviz, Atmel Studio, Solid Works, Eagle, Cube IDE, Webots

Technologies: ROS, SLAM, LIDAR, Kalman Filter, Particle Filter, Path Planning, LQR

PROJECTS:

Modelling and Dynamics of 5 DOF Manipulator **May 2022-Aug 2022**

University of Waterloo

- Denavit–Hartenberg parameters were used to model the KUKA-YOU Bot on MATLAB and Simulink
- Applied Forward kinematics, Inverse Kinematics, Force Dynamics, path planning and optimization to make the robot perform pick and place operations.
- Used python and OpenCV for performing object detection and Motion Control.

Mathematical Controller for Under-Actuated Mobile Robot **Sept 2021-Nov 2021**

University of Waterloo

- Made a state-space model of the two wheeled robot and applied LQR and PID individually on it.
- Designed both the controllers using linear algebra on MATLAB and compared the results using graphical output.
- Simulated the controllers to stabilize the robot at a set point and concluded that LQR worked better for the robot.

Autonomous Dynamic Navigation using ROS **Sept 2020-Dec 2020**

ADGITM (formerly NIEC), GGSIPU University

- The mobile robot was based on the SLAM algorithm. The system used a LIDAR sensor to map the arena.
- Used the A* algorithm to find the shortest way to traverse from source to the destination.
- The robot was based on ROS and used the gmapping package to complete the task successfully.

RESEARCH EXPERIENCE:

[1] Gossain, H., Sharma, B., Jain, R., Garg, J. (2022). **Multi Robot Environment Exploration Using Swarm**. In: Piuri, V., Shaw, R.N., Ghosh, A., Islam, R. (eds) AI and IoT for Smart City Applications. Studies in Computational Intelligence, vol 1002. Springer, Singapore. https://doi.org/10.1007/978-981-16-7498-3_11

[2] Hardik Gossain, Sumnit Singh Gulshan, Avneet Kaur Batra, Atul Kumar Mishra, "**LOW-COST SECURITY SYSTEM WITH FEEDBACK CONTROL LOOP**", International Journal of Creative Research Thoughts (IJCRT), ISSN:2320-2882, Volume.8, Issue 12, pp.14-18, December 2020, Available at: http://www.ijcrt.org/papers/IJCRT2012003.pdf

[3] Hardik Gossain, Bhavya Sharma, "**MOBILE ROBOT NAVIGATION AND MAPPING USING OPTICAL ENCODERS**", International Journal of Creative Research Thoughts (IJCRT), ISSN:2320-2882, Volume.8, Issue 7, pp.254-258, July 2020, Available at: http://www.ijcrt.org/papers/IJCRT2007036.pdf

ACHIEVEMENTS / EXTRACURRICULAR:

Tata Crucible Hackathon 2020

Virtual Event

- Winner at North Zone Finals
- Developed a solution for the safety of two-wheelers. Implemented features like automatic SOS trigger when accident is detected, blind-spot detection and syncing of indicators with google maps.

Smart India Hackathon 2019

Indian Institute of Technology, Kharagpur, India

- Our team developed a solution for tracking assets in remote area for the Ministry of Coal (India)
- The product built was based on IoT and used MQTT protocol to send the GPS location coordinates along with data collected by sensors to the user.

Bosch Hackathon 2019

Indian Institute of Technology, Guwahati, India

- Developed a solution for tracking the fitness of car along with accident detection and prevention by adding features like haptic feedback for blind spots and adaptive algorithms

President of Robotics Club **Sept 2020-Aug 2021**

ADGITM (formerly NIEC), GGSIPU University, New Delhi, India.

- Managed a group of 100+ students interested in the field of robotics and related fields.
- Organized many workshops like PCB designing, Web Development, Aerial Robotics, Control systems, etc.
- Led my teams to win many national and international hackathons and robotics competitions.