

AKHILESH ANANT GONABAL

RESEARCH ASSISTANT

Department of Design and Manufacturing, IISc, Bengaluru - 590012

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Education

National Institute of Technology Karnataka

B.TECH IN ELECTRICAL AND ELECTRONICS ENGINEERING | CGPA 7.63

- Recipient of a merit-based scholarship by the Government of Karnataka.
- Recipient of the Foundation For Excellence (FFE) Scholarship for academic excellence awarded to high-performing students.

Surathkal, India

Aug. 2016 - June 2020

Expert Pre-University College

CLASS 12 | KARNATAKA STATE PRE-UNIVERSITY BOARD | PHYSICS, CHEMISTRY, MATHEMATICS, BIOLOGY | PERCENTAGE 93.67%

Mangaluru, India

July 2014 - March 2016

Relevant Coursework

Mathematics Linear Algebra, Probability Theory and Applications, Discrete Mathematical Structures, Optimization Techniques

Electronics Digital Signal Processing, Control System, Power Electronics, Microprocessors, Digital and Analog Electronics

Computer Science Data Structures and Algorithms, Programming in C, Python for Everybody (Coursera), Neural Networks and Applications, Machine Learning, CS50's Web Programming with Python and JavaScript

Mechatronics Open Source Virtual Instrumentation, Theory and Practice For Sensors and Actuators

Skills

Programming Languages C/C++, Python, HTML, JavaScript, CSS

Hardware & Embedded Platforms Jetson Nano, STM32, Teensy, Arduino, Raspberry Pi, ESP32, ESP8266

Frameworks & Utilities ROS, Gazebo, RTOS, LaTeX, MQTT Explorer, Postman, Wireshark

Software & Simulation Tools MATLAB, Simulink, NI LabVIEW, Fusion 360, SolidWorks, Fritzing, MS Office

Operating Systems Ubuntu Linux, Microsoft Windows, Raspberry Pi OS

Work Experience

Robotics Innovations Lab, CPDM | Indian Institute of Science

RESEARCH ASSISTANT

- Developing a bio-inspired, multi-modal collaborative robotic system for complex inspection tasks in constrained environments, addressing challenges in navigation, payload capacity, and operational efficiency.
- Designing modular mechanisms, including wall press systems and 2-DoF joints, to enable robotic manoeuvrability through 90° bends in tunnels, emphasising adaptability and robustness.
- Integrating advanced sensing and computational systems, including Intel D435i depth camera and Jetson Nano, to achieve SLAM and autonomous navigation in challenging environments.
- Targeting a reduction in operating costs from Rs.1000/meter to Rs.108/meter over a 3-year lifespan through advanced autonomy and robust mechanical design.

Bengaluru, India

May 2024 - Present

Center for System Design | National Institute of Technology Karnataka

JUNIOR RESEARCH FELLOW

- Led the establishment of an advanced ACPS lab, integrating sensor-actuator nodes with robust communication networks to bridge theoretical concepts with practical applications.
- Developed a virtual lab platform for ACPS, enabling remote learning for 40+ students with real-time data analysis through simulations, improving practical understanding by 28% based on student feedback.
- Served as a Teaching Assistant for the ACPS course, instructing students, grading assignments, and mentoring projects—bridging theoretical concepts with real-world applications.

Surathkal, India

Sept. 2022 - May 2024

TATA Power Company Ltd

LEAD ENGINEER

- Managed SCADA-based power distribution automation systems (IEC 60870, Modbus, IEC 61850) and communication protocols (Fiber, GSM, LoRa), ensuring seamless data flow and adherence to industry standards.
- Developed a web-based O&M dashboard with automated email/SMS alerts for critical substation signal failures, reducing customer power downtime by 30–40%.
- Analyzed three years of SCADA historical data (SQL Server/historian) to generate actionable insights, optimizing substation operations and maintenance.
- Automated routine processes (e.g., system health monitoring, periodic reporting), improving overall operational efficiency by 60–70%.

Mumbai, India

Sept. 2020 - Jan. 2022

Patents and Publications

Patent: “A SYSTEM FOR INSPECTION AND MAINTENANCE OF COMPLEX ENVIRONMENTS USING MULTIPLE-MODAL OPERATIONS AND METHOD THEREOF”

Bangalore, India

PUBLISHED AND AWAITING EXAMINATION | APPLICATION NO. 202441099717

Dec. 2024

- Proposes an autonomous, multi-modal robotic system capable of navigating pipelines, uneven terrain, and liquid mediums for remote inspection and maintenance, with potential use in infrastructure and utility sectors.

Publication: “Lab Experimental Framework for Demonstrating Integral Concepts of Applied Cyber-Physical Systems”

Coimbatore, India

AKHILESH ANANT GONABAL, NEIL JOSE, K V GANGADHARAN | ELEVENTH ISSS NATIONAL CONFERENCE ON MEMS, SMART MATERIALS, STRUCTURES AND SYSTEMS

Dec. 2023

- Proposes a robust, modular experimental framework bridging theoretical CPS concepts with real-world sensor-actuator systems, significantly enhancing hands-on engineering education and research.

Projects

SMART CITY

Feb 2019 – Apr 2019

GUIDE: PROF. GANGADHARAN K. V

- Engineered a scalable IoT-driven smart city model, integrating sensors and communication protocols to demonstrate autonomous resource management and interconnectivity.
- Integrated an MQTT-based wireless communication protocol for a central command center, enabling real-time monitoring and control across all modules.
- Coordinated automated tasks (e.g., dispatching emergency, garbage, and delivery bots) through sensor data and decision logic.
- Implemented overhead image processing to analyze bot movements, optimize routes, and track statuses in real time.
- Deployed a centralized dashboard to facilitate continuous monitoring and improve situational awareness across all subsystems.

TECHNICAL STACK: *Python, C, Arduino, Raspberry Pi, ESP8266, MQTT, Sensors, Actuators, JavaScript, HTML*

REMOTE TESTING OF RASPBERRY PI : DC MOTOR

Jan 2019 – Apr 2019

GUIDE: DR. PRUTHVIRAJ U

- Created a web-based Python compiler for remote control of a DC motor using Raspberry Pi, facilitating seamless experimentation through an interactive virtual lab environment.
- Integrated a live video feed of the motor setup, enabling users to observe immediate code-driven changes.
- Created an interactive virtual-lab environment, enhancing accessibility for remote learning and experimentation.

TECHNICAL STACK: *Python, Django, HTML, JavaScript, CSS, Raspberry Pi, Motor Driver, DC Motor*

HOMEMAKER ASSISTANCE SYSTEM

August 2018 – April 2019

GUIDE: DR. JORA M GONDA

- Designed a Raspberry Pi-based interface tailored to the needs of disabled and visually impaired users, integrating GSM modules for seamless device control and enhancing accessibility.
- Integrated a GSM module, ESP8266, sensors, and actuators to support voice commands and display-based controls, improving accessibility.
- Implemented real-time notifications and alerts, providing immediate feedback for critical events within the home environment.
- Enhanced overall usability through iterative testing and feedback, ensuring the system met diverse accessibility needs.

TECHNICAL STACK: *Raspberry Pi, ESP8266, GSM Module, Sensors, Python, Django, HTML, JavaScript, CSS*

VOLUMETRIC FLOW ANALYSIS OF BLOOD USING HANDHELD DOPPLER

May 2018 – July 2018

GUIDE: PROF SUMMAN DAVID S, DR DEEPU VIJAYASENAN

- Analyzed handheld Doppler audio recordings to estimate blood flow velocity in perforators, providing quantifiable data for tissue health assessment.
- Implemented signal processing in MATLAB, measuring systolic energy levels within specific frequency bands to compare potential perforator diameters.
- Correlated highest energy bands with increased vessel diameter, facilitating identification of the healthiest perforator with greater accuracy and efficiency.
- Demonstrated a novel volumetric flow analysis technique, enhancing clinical interpretation through data-driven approaches.

TECHNICAL STACK: *MATLAB, Wiener Filter, Audio Signal Processing*

LINE FOLLOWING AND OBSTACLE AVOIDANCE ROBOT

Feb 2019

GUIDE: PROF. GANGADHARAN K. V

- Integrated an IR array sensor and an ultrasound sensor with an Arduino to create a robot capable of following a predefined path while avoiding obstacles.
- Implemented a Proportional-Integral-Derivative (PID) control system to optimize the motor's response for precise path tracking and smooth navigation.
- Dynamically adjusted the robot's speed and direction in real time, improving adaptability and efficiency for obstacle detection and avoidance.

TECHNICAL STACK: *Arduino, PID Control, IR Array Sensor, Ultrasound Sensor, Motor Driver (e.g., L298N), DC Motors*