# Senthurbavan Kirubaharan

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## Research Interests

My research interest revolves around robotics, particularly in navigation, both classical and AI methods, and multi-robot coordination. I am currently working on navigation and have previous research experience on power optimization for ROS-based autonomous mobile robots.

## Education

**University of Moratuwa** — Moratuwa, Sri Lanka
*BSc., Electronic & Telecommunication Engineering with First class Honors* — *Feb. 2016 – Jan. 2020*
**GPA**: **3.81/4.2 (3.77/4.0)**

## Skills

**Languages**: English, Tamil
**Programming**: Python, C/C++, VHDL, MATLAB, LaTeX
**Libraries**: ROS, NumPy, TensorFlow
**Microcontrollers**: STM32, Atmel, EFM8, Arduino
**Others**: FPGA design, PCB design

## Research Experience

**Intellisense Lab, University of Moratuwa** — Moratuwa, Sri Lanka
*Research Engineer, E-consulate (Pvt) Ltd. Working in collaboration with Intellisense Lab*
*Supervised by Dr. Sulochana Sooriyaarachchi & Dr. Chandana Gamage* — *July 2021 – Present*

The Intellisense Lab focuses on building mobile robot systems for exploration of an unknown area. I am currently developing robust navigation components, and testing those with the simulation model I created for our custom-made robot in Gazebo simulation. The development is on ROS and C++.

**Electronic & Telecom. Engineering Dept., University of Moratuwa** — Moratuwa, Sri Lanka
*Undergraduate Research, supervised by Dr. Peshala Jayasekara* — *Feb. 2019 – Jan. 2020*

My research was on power optimization of autonomous mobile robot navigation in which I designed and developed hardware-software co-design architecture for optimizing computational power of local planner of ROS navigation stack with FPGA hardware accelerator. The resulting component is consuming less power to a degree of four and faster due to C++ implementation on Linux platform. This research is published at the ACRA 2020 conference, and I presented it as the first author.

## Working Experience

**Embedded Research Engineer** — August 2020 – April 2021
*SenzMate (Pvt) Ltd* — *Colombo, Sri Lanka*

During the pandemic, I worked on an initiative to serve the community by building an AI COVID-19 Wristband. It detects the handwashing pattern of the user using IMU data in real-time and compares it to that of the WHO standard, and reminds the user periodically to wash hands. The implementation was in C and Python.

**Research Intern** — June 2018 – December 2018
*SenzMate (Pvt) Ltd* — *Colombo, Sri Lanka*

We developed a peer-to-peer bidirectional wireless communication module based on the LoRa protocol. The module works as a remote controller and virtual serial link. I was involved in the development of communication protocol for multi-point to multi-point reliable communication and firmware development in C.

## Undergraduate Projects

**EEG Amplifier for Long-Term Brain Monitoring** 2019

- Final year group project supervised by *Dr. Simon Lind Kappel*
- Developed the digital front-end to acquire signals from the analog-to-digital converter and process them
- Developed firmware for high-speed signal acquisition, data storage, and Bluetooth communication with a mobile phone for real-time monitoring

**Processor Design for Image Downsampling** 2018

- Designed instruction set architecture for downsampling an image by factor 2
- Designed the microarchitecture of the processor and implemented it in FPGA

**Automatic Doorbell** 2018

- Designed a PCB with passive infrared sensors to detect heat radiation from humans and to eliminate ambient heat radiations

**GPS Navigated Robot** 2017

- Participated in a robotic competition, and built a robot with a microcontroller that should navigate through obstacles towards a GPS goal location, identify a box and get the ring placed inside
- Developed obstacle avoidance with 3 ultrasonic range sensors and built navigation component to reach the box

**Analog Line Following Robot** 2017

- Designed a mobile robot solely with analog electronic circuits to follow a white line on a black surface
- Employed IR emitter and receiver to detect the white line on the black surface
- Designed a PID controller with operational amplifiers for motor speed control

## Awards

Dean's List (2016, 2019)

Mahapola Higher Education Merit Scholarship (2016)

## Publications

**Senthurbavan Kirubaharan**, Peshala Jayasekara & Dilan Weerakkody. Low Power FPGA-based Hardware Accelerator for Autonomous Navigation of Mobile Robots. In 2020 *Australasian Conference on Robotics and Automation (ACRA 2020)*. Paper link

## Reference

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