Senthurbavan Kirubaharan

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Research Interests

My research interest revolves around robotics, particularly in navigation, planning, and multi-robot systems, and also interested in AI. 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 the 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 the Linux platform. This research was 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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