

May 2022

Welcome Message from Editor and Team!

Welcome to Spring 2022!

We welcome you to May issue of IEEE Newsletter, Toronto section.

Enjoy reading (Smart Cane) capstone project “Smart Navigation Guide for Visually Impaired People”. **(Page 3)**

Meet Dr. Muhammad Jaseemuddin in our IEEE supporters section. Enjoy his research achievements and appreciate his contributions to IEEE.

For the section upcoming events, please visit [New Events page](#).

You can find newsletter’s [previous issues here](#). You can explore our [Library](#) to access links to various newsletters, resources and chapter activities.

By launching this newsletter, we intend to cover IEEE achievements and success stories specific to the Toronto area.

If you have any questions, suggestions, or concerns, please address them to the editor; Fatima Hussain at fatima.hussain@ryerson.ca. We hope to hear from you, and we welcome your feedback!

Meet Our Distinguished IEEE Supporters

Dr. Muhammad Jaseemuddin

Muhammad Jaseemuddin (M ’98) received B.E. from N.E.D. University, Pakistan, M.S. from The University of Texas at Arlington, and Ph.D. from University of Toronto. He worked in Advanced IP group and Wireless Technology Lab (WTL) at



Nortel Networks. He is Professor and Program Director of Computer Networks Program at Toronto Metropolitan University (formerly Ryerson University).

He worked on Distributed Network Services Platform (DNSP) and UMTS VHE prototype for mobile service delivery at Nortel Networks. In DNSP, he led the initiative of using directory lookup (LDAP) for the distributed system. The DNSP was launched as a startup, Saraiede Inc. which was bought by InfoSpace Inc. He introduced Mobile Agent technology for UMTS VHE that was a novel approach for implementing mobile users' profile and seamless transfer of computing environment. He contributed to the development and implementation of Open IP suite of IP protocols for Nortel Open IP project.

He is leading Mobile Wireless Internet group in Wireless Communication and Networking (WICON) Lab at Toronto Metropolitan University. His team has been working on connectivity, access control, routing and application enabling to achieve power efficiency, mobility, and low latency in wireless access networks and edge cloud for IoT and multimedia services. They worked extensively on employing beamforming directional antenna in multi-hop wireless networks for reliability and power efficiency. They developed an analytical framework for modeling directional CSMA/CA protocols, which showed that deafness can severely limit the network capacity. They designed an Opportunistic Directional MAC (OPDMAC) protocol that enhances the spatial reusability and reduces the impact of the deafness. Using their analytical framework to characterize conflicts of wireless links for directional contention-based MAC protocols, they developed a heuristic algorithm for joint routing and admission control that can efficiently solve the QoS routing problem. They also developed a framework to evaluate the capacity gain when beamforming antennas are utilized instead of omni-directional antennas in multi-hop wireless networks, which is further extended to show that the capacity of heterogeneous multi-hop wireless networks can be significantly increased even with small fraction of directional nodes assuming random placement of directional antennas. Motivated by this, they formulated the problem of optimal antenna placement in wireless networks with heterogeneous antennas as a mixed-integer linear programming problem using an antenna-aware conflict graph. They published based on their work a Springer Research Monograph

on Beamforming Antennas in Wireless Networks with Multihop and Millimeter Wave Communication Networks.

His team also developed caching, computation offloading and mobile application middleware for mobile edge cloud. They developed mobile middleware using a P2P Reliable Ad Hoc Overlay Network (RAON) with cooperative caching support for power efficiency. Recently, they developed and implemented a prototype of MQTT pub-sub service for low latency notifications in vehicular information centric network. They published a book chapter, *Application Design and Service Provisioning for Multi-access Edge Cloud (MEC)*, in Springer's book on Mobile Edge Computing.

He has been a member of IEEE Communication Society. He has written more than 12 papers in IEEE Transactions and Journals and more than 50 papers in IEEE Conferences. He co-chaired several IEEE symposiums and special sessions in IEEE conferences. He regularly contributes to the technical program committees of flagship IEEE conferences.

His research interests include network automation; caching in 6G and vehicular information-centric networks; context-aware mobile middleware and mobile edge cloud; localization, power-aware MAC for Industrial-IoT.

Smart Navigation Guide for Visually Impaired People (Smart Cane)

Dr. Ning Zhu, Dr. Ameera Al-Karkhi, Mr. Jaspreet Singh, Miss Samira Parveen, Mr.

Harmanpreet Sidhu

Sheridan College/ Faculty of Applied Science and Technology

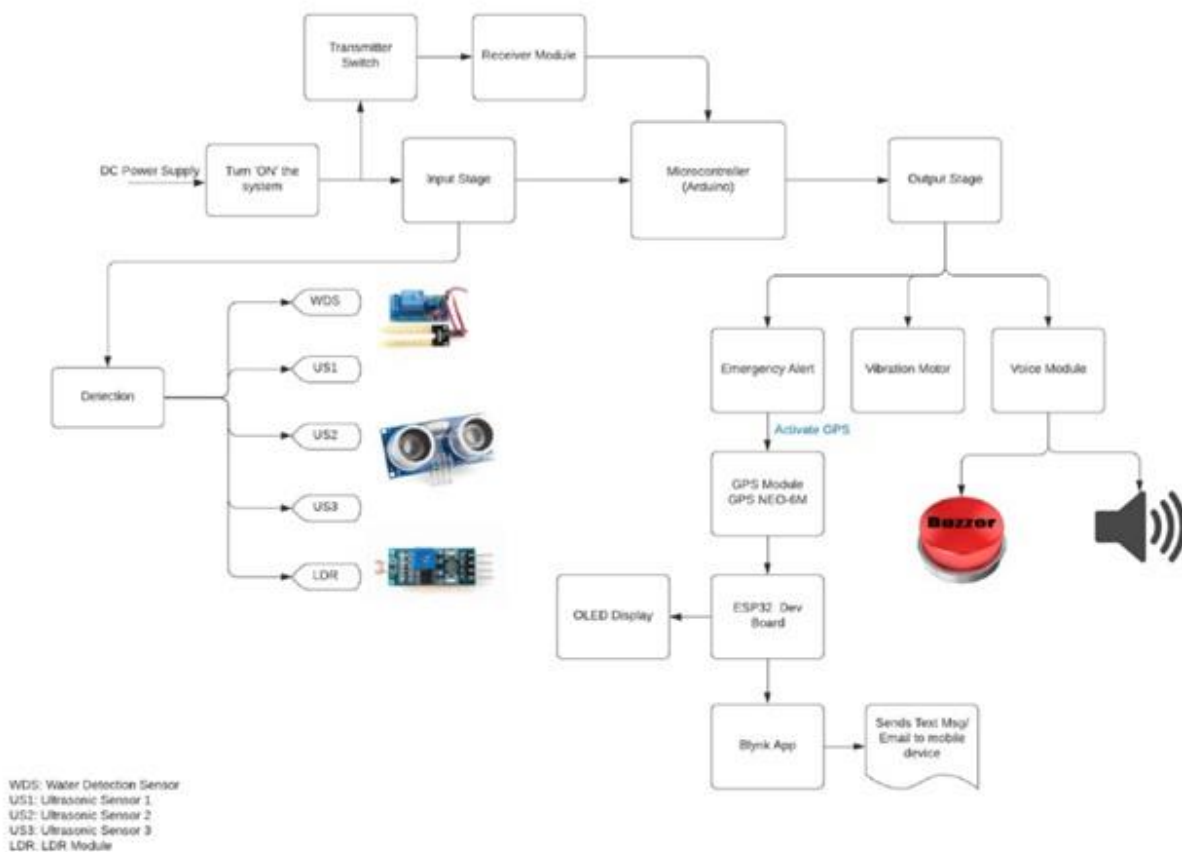
Each year at Sheridan college/School of Mechanical and Electrical Engineering Technology (MEET), over 35 student teams work together in capstone projects to design, build and showcase their projects that include advanced technologies such as Additive Manufacturing, Energy, Robotics, Automation, the Internet of Things and Advanced Electrical Devices. The Capstone projects provides the students with Hands-on learning transferable from the

classroom, lab or workshop to the workplace. In order to prepare them to respond to the rapidly evolving field of Information and Communication Technology. They experience hands-on learning in critical topics like information systems security, Robotics and automation, computer programming, software engineering, interactive media management, database development and internet communications technology. For each field, the School of Mechanical and Electrical Engineering Technology (MEET), nominated winners and one of the best winners from the last capstone showcase in the Electrical and Computer Engineering, the students designed and implemented **Smart Navigation Guide for Visually Impaired People (Smart Cane)**, the students researched many platforms regarding this topic, and found that this is very rarely available and has very limited knowledge about this project in Canada. They have researched the implementation of various sensors and the functionality of the different devices to build this project. They have researched various sources which could provide a unique approach and methods to complete this task with proper tools. During this research, they have learned about the working and purpose of electronic boards with different sensors and have made a list of the functionality of sensors that would work properly with the Arduino UNO/Nano boards including ESP32 module/ Raspberry Pi.

They have also gained information regarding the GSM/GPS module which will be a one of the main sections of this project. The group members decided to select a project which has some real advantages to the people especially to the disabled people with hearing or vision loss. They researched on different platforms regarding related topics and found this one is rarely available with limited knowledge, especially in Canada.

This project focus on a smart navigation guide system for visually impaired people to provide a real time guide in detecting obstacles around themselves using various sensors and microcontrollers which includes Arduino, ESP32 module. This project includes 3 ultrasonic sensors which detects the objects within the range between the visually impaired person and obstruction. Other active sensor works as, the Light Dependent Resistors (LDR) photosensitive module detects the dark surroundings resulting in activating a buzzer and speaker to alert the user along with vibration motor. The user can follow the instructions based on the sensor's

activities. In addition to this, this project also has the water detection module which alerts the user about the wet surfaces eventually helps to navigate carefully on wet surfaces.



Another important feature of this project is the tracking section which works with Global Positioning System NEO-6M module to provide the location coordinates of the user with microcontroller (ESP32 module) device via Wi-Fi Communication. The emergency switch allows the user to share their location by GPS module to their family members or to their own device. This feature provides emergency assistance to the visually impaired people whenever they encounter into dangerous situations.

The Blynk application displays the real time location of the user on map with a text message on the device (Cell Phone). Blynk is one of the most popular IoT interface which connects IoT devices to cloud and allows to build interfaces for controlling and monitoring hardware projects from smartphone (iOS and Android). This application allows to create a project dashboard and arrange buttons, sliders, graphs, and other widgets onto the screen to provide real time data.

Get Involved with Us!

IEEE Toronto section is looking forward to hearing from you. your contributions are welcome to this monthly newsletter. We invite our members to share and submit:

- Short Story (about IEEE members, WIE members)
- News items and Affinity group reports
- Technical Articles/Blogs (Brief discussions of cutting edge research, new technological tools, topics of your choice)

Submission

Articles should be submitted in Word format. Word count for News items, Affinity group reports is 50 to 200 words and for blogs/ articles is 500 to 800 words.

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