

2022 School of EECMS Summer Internship Application Form

Main Supervisor	Siavash Khaksar
Is the main supervisor an ECR/MCR?	YES
Other supervisors (if applicable)	Dr Yifei Ren, Dr Hanieh Bakhshayesh
Project Title	Remote orientation and Mobility training of vision impaired people using non-invasive sensors
Duration of project (select between 4 and eight weeks)	8 weeks
Project Description	The aim of this project is to explore the possibilities of utilising audio signal processing and non-invasive to aid in the quality of life and health monitoring of a range of individuals by initially investigating the application of sensors in orientation and mobility (O&M) training of people with vision impairment. Guide dogs have been used in Australia for over 60 years, with their ability to guide vision impaired handlers held in high regard. Guide Dog handlers and their guide dogs moving to a new location often require training and guidance in the new surroundings. Guide dog trainers in Australia will often assist by flying out regionally and assisting the handler in the new surroundings. The problem is that flying those trainers out, paying for accommodation and other required services can result in a substantial economic cost. Australia is one of the least densely populated and spread-out population at 3.22 people / sq km and ranking 228th in the world. Any solution that could enable trainers to guide the handlers in a new location remotely would be a boon to guide dog training and assistance. With the rising popularity of VR, the viability of a solution implemented using live streaming and VR has great potential for use in regional Australia. The vision impaired population globally is growing (due in part to an aging population and complications arising from type 2 diabetes) and yet there is no unified established white cane/guide dog training system available. The use of guide dogs continues to be in demand but is an extremely expensive solution to vision impaired mobility. This project will use the data from inertial sensors placed on white canes/dogs along with the newly available lidar sensors within mobile devices, increased accuracy GPS, and live 360-degree video to establish, test and evaluate a remote O&M training system, facilitating instant feedback to the vision impaired person from a trainer located off site. Additionally, biosensors will be placed on the dog and/or client to monitor gait, vital signs, and other relevant environmental information to fully inform the trainer of the status/conditions at the remote location. Trainers will utilise a Virtual Reality headset

	to monitor the remote client in a realistic manner. This approach will not only reduce the O&M training costs but also make these services more readily available to people in remote and rural areas Live-streaming video data, along with other sensory data such as the dog's health, comes with its own problems. Bandwidth speeds in rural Australia is one of the lowest worldwide, with its connection speed averaging being around 11Mbps. The quality of this video also must be of high enough quality that a trainer could discern notable dangers or details from the video feed. The latency of this video is also a factor, and the stream should be as close to real time as possible, from both a safety and useability aspect. The selection of both the camera, the peripheral devices to handle the video data stream, and the VR headset are all considerations when creating this implementation. Extensibility of this the presented solution must be present such that additional information such as GPS, dog health and other information can be collected and displayed in whatever medium it is presented in within the virtual environment. The student will work on analysing audio signals that record stomach rumbles and breathing. They will need to implement techniques for classifying different stomach/gut sounds that could potentially show signs of different common diseases. The student will have the opportunity to work directly with guide dogs as well as other students who are currently working on different aspects of this project through other internships.
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