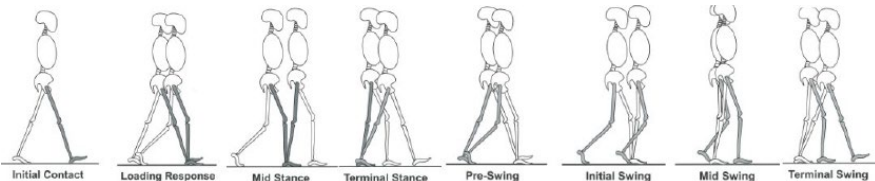


2025 EECMS Summer Internship Application Form

Main Supervisor	Dr Siavash Khaksar
Other supervisors (if applicable)	Dr Yifei Ren, Dr Nimalika Fernando
Project Title	Identifying human gait phase events and synchronizing with upper body posture utilising non-invasive sensor
Student location(s) for the project	Project Room in Building 207 or ICP
Duration of project	Eight weeks
Project Description	<p>This research investigates and demonstrates measuring and tracking human gait and upper body movement to synchronise and monitor joint attributes. The research investigates inertial sensors' integration of human leg movement data with upper body movement while using an object as an extension of the arm with the aim of developing a model of the correct body posture for utilising that object more efficiently. As a proof of concept, inertial measurement units (IMUs) will be used to model, monitor, and evaluate the gait and upper body movements of a white cane user.</p> <p>This research aims to increase the understanding of human gait, and its relationship to upper body movements and body posture. The testing environment of this project is on vision impaired people and their primary mobility aid; however, the result of this project may be applicable to other research areas such as sports, rehabilitation, and military training,</p> <p>Human gait refers to a person's manner of walking. The human gait cycle is a sequence of functions that a single foot takes while walking. Two phases are defined in this cycle: the stance and the swing. In the stance phase, while the reference foot is in contact with the floor, the other foot is in swing mode. The swing phase is opposite to the stance phase, meaning that while the reference foot is swinging near the floor the other foot is in contact with the floor. The human gait cycle is divided into eight sub phases. Figure 1 shows the stance has five sub phases: initial contact, loading response, mid stance, terminal stance and pre-swing, while the initial swing, mid swing and terminal swing are the three sub phases of swing.</p>  <p>Figure 1 – Eight Sub Phases of the Gait Cycle</p> <p>Gait analysis is the study of gait cycles measuring body movement and muscle activity during walking. For gait analysis, various parameters are required to measure human gait, such as the relative angles and positions of the body's limbs, walking speed, and step length. Evaluating individuals' gait status has been challenging since various parameters are needed to generate a reliable report. The most popular evaluation method in use today is based on visual inspections such as goniometry, Functional Ambulation Categories, Berg Balance Scale. Since these</p>

assessments are based on visual inspections, the results are considered inaccurate.

According to the WHO (World Health Organization) at least 2.2 billion people have vision impairment where at least 1 billion of them have moderate to severe vision impairment or blindness. Vision impairment is a term that refers to low or lack of eyesight which cannot be corrected with glasses or contact lenses. Vision Australia statistics show 357,000 people in Australia are vision impaired with this number predicted to grow to 564,000 by 2030.

Orientation is the ability to be aware of one's location and where you want to go, while mobility is the ability to move from one place to another safely and efficiently. There are three primary orientation and mobility aids vision impaired people can use: a human guide, a guide dog and a white cane. White canes are a widely used mobility aid for people with vision impairments. These canes are inexpensive, dependable, and straightforward, making them a convenient option for vision-impaired individuals. White canes enhance the sensory capabilities of those with vision loss, enabling them to better perceive and navigate their surrounding environment.



Figure 2 – Use of White Cane