ECTE451/8 - THESIS sample topics for 2015

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If you are interested in the topics below, email me to set up an appointment and we can discuss it further. Topic deviations or own ideas are also welcome, however there must be true research potential identified in any suggested topic. This list is also available at http://www.uow.edu.au/~montse/topics/2015.pdf

Real Time Human Body Kinematics using Wireless IMUs.

The Xsens MTw wireless IMUs provide real-time inertial measurements in 6DoF. They have widely been applied to various industries including CGI entertainment, robotics and biomechanics. A particular application of interest is the identification of body joint angle parameters for the analysis and control of vehicular human body vibrations. The objective of this Thesis is to investigate the kinematics of the human body using multiple wireless IMUs. This will involve collecting the inertial data from developing real-time algorithms that can estimate the body linkage positions and/or joint angles.

The traditional approach to solving this problem would be to apply a Kalman Filter [1, 2]. Emerging research in this area has applied Double Stage Kalman filters and Gradient Descent Algorithm [3]. Possible avenues to explore are to improve the accuracy and robustness of the aforementioned algorithms with the incorporation of computational intelligence methods and to develop an algorithm that will visualise the results in real-time. This project would suit a student interested in embedded sensors, application programming, signal processing, and related areas.

Body Motion Pattern analysis using a Parallel Robot and IMUs.

The Stewart platform is a type of robot that consists of a 6-DoF slave manipulator that is parallel to the ground. It has seen applications in research that involves experimentally synthesised motions such as vehicle simulations and manufacturing. The Xsens Mti motion capture suit provides real-time sensor readings for 17 points on the body and has been used in the entertainment industry to generate CGI for movies and games. It can also be used to monitor and classify behaviour based on observed sensor readings. It outputs full 6DoF, raw accelerometer and gyrosopic data of every sensor at a maximum rate of 120Hz.

The objective of this Thesis is to investigate which of the body sources contributes the most towards overall movement classification of a person during the exposure to vehicular vibrations. This will require principle component analysis (PCA) of the accelerometer data as well as the application of one or two more classification algorithms. The results of this project will be a reduced subset of sensors that can effectively identify human movement and posture, as well as identify human body model parameters in real-time. This project would suit a student interested in embedded sensors, data collection and signal processing.

Sign Language Gesture Recognition using Leap Motion Infrared Skeletal Recognition and the Encog Neural Network.

The Leap Motion controller is able to detect the skeletal motion of a hand using infrared imaging. Encog is a Java based Neural Network that can be used for gesture recognition. The aim of this Thesis is to investigate which of the body sensors contribute the most towards overall movement classification of a person during the exposure to vehicular vibrations. This will require principle component analysis (PCA) of the accelerometer data as well as the application of one or two more classification algorithms. The results of this project will be a reduced subset of sensors that can effectively identify human movement and posture, as well as identify human body model parameters in real-time. This project would suit a student interested in embedded sensors, data collection and signal processing.

Low-Cost Static Input or Motion-Sensing Input Controlled Dynamic Shape Display.

Low-Cost Static Input or Motion-Sensing Input Controlled Dynamic Shape Display is a recent technique that could be investigated, or additionally any lossy basic or image algorithms could be studied. The student would implement these on standard program benchmarks such as SPECint2006. This project would suit a student who wishes to do a Thesis entirely in simulation.

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Compressive sensing is a recent technique that could be investigated, or additionally any lossy basic or image algorithms could be studied. The student would implement these on standard program benchmarks such as SPECint2006. This project would suit a student who wishes to do a Thesis entirely in simulation.