

# Complexity Science mini-project proposal 2011-12

**Project title:** Detecting activity signatures in human behaviour through the analysis of actimetry recordings from a wrist worn-device.

**Background:** The objective analysis of human behaviour is useful for the diagnosis and assessment of a number of health conditions including mental health, obesity, behavioural issues in children, Chronic Fatigue Syndrome (CFS), etc. In order to measure behaviour unobtrusively and continuously over long periods of time in an individual, wherever that individual may be, implies the need for a system that is wearable and which infers behaviour through one or more measurable parameters. A wearable device (a watch) has been recently developed in our group (based on the Texas Instruments ez430 chronos development tool [1] – a watch based development platform) that samples activity through tri-axial accelerometers and stores this data for wireless retrieval to a PC after a few days' worth of recordings. These actimetry measures are to be used to assess human behaviour over a near continuous 24 hour period of many weeks.

**Objectives:** The objectives of this project are to: a) further develop the usability of these watches; b) field trial a watch and retrieve data; c) analyse the data dealing with missing or dropped data, noise and other issues, with a view to detecting patterns of activity over 24 hour periods; d) analyse the effectiveness of the watch to detect activity signatures of note and note any usability issues.

## What the student will do:

- a) Part develop firmware on the watch to enhance the on-watch data-processing ability (watch firmware has already been developed so no major development is required here).
- b) Develop a simple data retrieval system (on-line) for data extracted from trial watch using in-house volunteer.
- c) Develop data analysis algorithms to de-noise the data from multiple trials over multiple 24 hr periods and interpolate missing/ dropped data, etc.
- d) Develop pattern analysis algorithms to search for activity signatures in the data.
- e) Visualise activity obtained through analysis of the data for self-assessment of behaviour.

## Possible PhD project:

There is much scope for continuing this project into a PhD, the activity signatures obtained through the watch (via accelerometry) could be complemented using other signals acquired through other wearable technology (such as smart phones with access to triax, GPS, phone use, etc.). This would allow ubiquitous assessment of behaviour through analysis of complex data available through off-the-shelf technology.

## References

[1] <http://www.ti.com/corp/docs/landing/mcu/index.htm?DCMP=MSP430&HQS=Tools+OT+ez430>