

Unobtrusive Welfare Monitoring System

Stephen J. Spikings*, Bashir M. Al-Hashimi, Nick R. Harris

*email: sjs05r@ecs.soton.ac.uk; web: <http://www.ecs.soton.ac.uk/people/sjs05r>; tel. +44 (0)23 8059 4996; fax. +44 (0)23 8059 2901
Pervasive Systems Centre, School of Electronics and Computer Science, University of Southampton, SO17 1BJ, UK

Project Aims

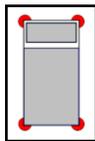
To develop and demonstrate a **pervasive** home welfare monitoring system using **unobtrusive** sensors for early detection and automated reporting of deteriorating physiological health parameters and enabling **independent living**.

Unobtrusive Sensing

Implementation of sensors to obtain information equivalent to obtrusive and invasive technologies, allowing for **minimal impact** on user lifestyle. Implemented sensors are demonstrated in a **comparative study** with their invasive counterparts.



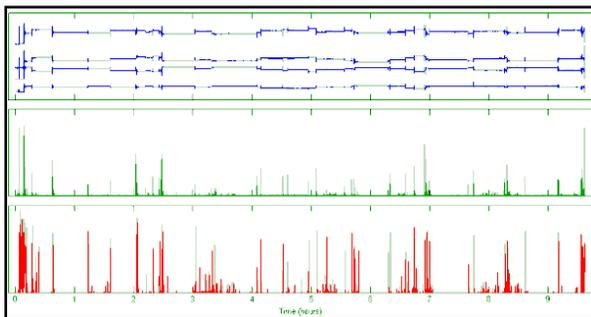
Load Cell



Load Cell placement under bed

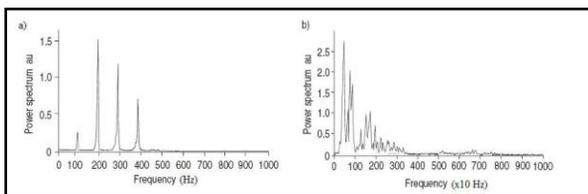


Actigraph



Comparison of (a) raw Load Cell data, (b) changes in Load Cell data, and (c) Actigraph data

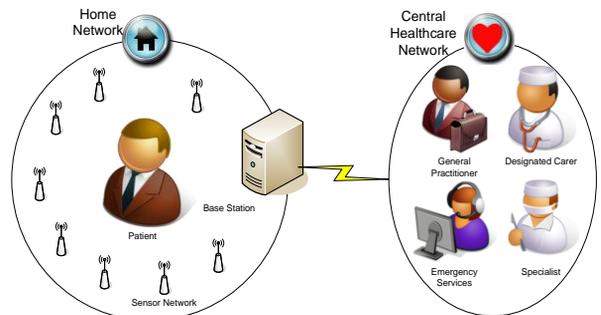
Finding new ways of determining health through **non-invasive sensing** of accessible symptoms. Sensing of previously unused symptoms will replace symptoms only sensed through invasive methods.



Power frequency spectrum of (a) a simple snore and (b) an apnoeic snore from a microphone

System Structure

Sensors **integrated into the living environment** of the person being monitored. Sensors communicate with a central base station for evaluation. **Data fusion** to combine information from many different sources to overcome reduced sensor mobility.



System architecture of the unobtrusive home welfare monitoring system

Remote sensors communicate with a base station in the home network, where data fusion is used to determine the state of health of the individual. The base station will send reports to a healthcare network, such as regular updates or emergency alerts.

This system allows the health care system to be **proactive** with a faster response time by not being dependent on the individual seeking care. The system will also **improve efficiency** by expanding healthcare to outside of specialist facilities and allocating time of healthcare professionals to those in most need.

Long Term Monitoring

Detecting patterns over a period of time allows for the **observation of behavioural changes** which may indicate illness. Illness **affects behavioural patterns**, so it can be inferred when a noticeable deviation from the normal behavioural pattern occurs. The system would learn the normal behavioural pattern for an individual through **lifestyle monitoring** and use this as a reference to detect significant deviations.

Acknowledgments

This work is being undertaken in co-operation with Southampton General Hospital.