Enabling the Internet of Things with smartphones

Professor George Roussos, Birkbeck College, has conducted research for over a decade in cyber-physical computing which is the foundation for the Internet of Things. These systems combine computational elements controlling physical entities and can be found in areas as diverse as aerospace, automotive, civil infrastructure, energy, healthcare, manufacturing, entertainment and consumer appliances. Professor Roussos has been able to apply his work in areas relating to healthcare, environmental sustainability, urban flows and transportation.

The latest smartphone technology is ideally suited to helping businesses which are taking steps to improve the local environment and inmidtown – a Business Improvement District in Bloomsbury - wanted to do just that.

Professor Roussos and the Pervasive Computing team worked with inmidtown to help realise its objectives to raise awareness of environmental initiatives, enhance the commercial viability of the area, and further strengthen the area’s academic reputation. This was through the development of a participatory sensing system providing evidence of carbon savings relating to green initiatives being co-ordinated by inmidtown.

Members of inmidtown (local businesses in their catchment area) have a large and diverse green portfolio, ranging from strong environmental policies and certifications to sustainable
architecture. Some projects, such as zero-to-landfill policies and beekeeping, which are shown on the app developed by the team, are provided to businesses by inmidtown. Inmidtown has been awarded two Environmental Excellence awards from Camden Council.

The team also developed an app that links the virtual and physical world by enabling the integration of a user’s actions and movements. Smartphones have become the main means to facilitate such participation in the production and consumption of local data and are the ideal vehicle for the delivery of these services. The systems collected tracking information from a sample of 3,000 volunteers from the 350,000 who work in the district. The software identifies patterns of users’ behaviour which are employed by inmidtown to inform the redesign of urban flows in the area, specifically aiming to improve the well-being of the population.

In a different context but remaining with environmental improvements, Professor Roussos was able to respond to a call from the Bat Conservation Society to develop a smartphone app which quantified bat populations. The app operated by identifying echolocation signals and it could be used by volunteer groups to infer ecosystem health. We believe that over 7,000 volunteers in 65 countries have deployed the app and the scale of this has enabled techniques for data collection to be improved and updated and the process is now far more cost-effective. This work was a medallist for Environmental Project of the Year at the 2011 industry awards.

In the context of travel, Professor Roussos was able to develop a mobile app to allow London commuters to optimise their travel expenditure. Working with London Underground, he was able to demonstrate, that any of the 22 million Oyster Card users who chose to download the app could save up to 20% on their monthly travel costs.

Finally to healthcare and here an enhancement to the assessment of Parkinson’s patients. Parkinson’s is a progressive neurological condition and people with Parkinson’s have insufficient levels of a chemical called dopamine because some nerve cells in their brain have died. Without dopamine, people can find that their movements become slower and they may also develop a tremor. The system developed by Professor Roussos has been applied to extend the standard Universal Parkinson’s Disease Rating Scale to assess the severity of Parkinson’s symptoms. The system employs advanced inertial sensors, audio and touchscreen of a smartphone to automatically capture motor performance indicators, which are then made available through secure transmission to the hospital for analysis and safe-keeping. The system has reduced the frequency of hospital visits for sufferers therefore improving their quality of life and has reduced NHS costs. The assessment is also more precise than the previous method.

Professor Roussos and the Pervasive Computing team has been able to demonstrate diverse uses for cyber-physical computing and with more digital time spent on mobiles, businesses are mindful of process and service improvements which can be deployed via apps and the market in this area continues to mature.