



Cambridge Centre for Smart Infrastructure and Construction Student Placements 2015

1) Powering a wireless sensor network with different energy resources, such as wind turbine

CSIC is currently working on small-scale wind turbine and power management as an energy solution for wireless sensor network. In this project, the student is expected to deliver the smart controlled small-scale wind turbine and their power management system. We target to do a real site demo to power the low-power and small-scale wireless sensors such as cross-passage in a tunnel, which has the advantage of easiest site access, less size and safety constraint from Underground operators.

2) Distributed fibre sensor analyzers

CSIC has developed a stimulated Brillouin scattering (SBS) model for high-resolution, time-domain distributed sensing, which starts from the standard three-wave SBS equations. The model permits an accurate description of the Brillouin interacting for arbitrarily-shape pump pulses, and can be efficiently employed for improving the accuracy and the resolution of the Brillouin scattering based distributed FO sensors. The student is expected to work on the signal processing domain of the distributed fibre sensor analyzers utilizing the modeling result generated by CSIC researchers.

3) Portable accelerometer and microphone system

This project contributes to develop portable accelerometer/microphone system using wireless sensor network and mobile devices for practical engineering applications required by industrial partners, such as noise detection in smart hospital, vibration/impact detection in civil infrastructure and transportation vehicles. Along the project, the student will learn and get experience in hardware design of micro-controller, ADC and low power circuits, and software design for MCU and mobile devices. The student has the opportunity to apply his end product in the real application and work together with industrial partners.

4) System-level calibration of wireless sensor network

Wireless sensor nodes, especially in civil engineering applications, are deeply integrated in physical environments and hence often suffer from significant performance variations. To facilitate a meaningful interpretation of the monitoring data, it is essential to calibrate the sensing characteristics of each sensor prior to deploying. CSIC has been developing a calibration platform with Contiki Ipv6 code, displacement sensor and tilt sensor. Further development is undertaken to include CSIC WSN products (e.g. tilt sensor, displacement sensor, foil strain gauge and accelerometer). The student will be involved in the validation of the current calibration approaches and development of new calibration platform. This position will suit students with academic background in Civil Engineering and with interest in Wireless sensor network and experimental work.

5) Tunnel deformation analysis using 3D laser scanning data

CSIC has gathered laser scan point cloud data from Post Office tunnel in London as part of the new Crossrail project to investigate how the tunnel deformed before and after the construction of another tunnel underneath. This project proposes the use of cloud comparison, shape fitting and normal sectioning techniques on the laser scan data, to get a comprehensive understanding of how the tunnel settled and how its shape deformed in the process. This will complement the rich monitoring data gathered previously by other CSIC researchers with customized potentiometers, photogrammetric techniques and fibre optics, providing a rich source of comparison/validation. Analysis of laser scan data can reveal further information about the global settlements and overall shape changes of the segments. With this project, the student will get a chance to familiarize with multiple sensing technologies and learn software for movement detection from point clouds.