Postgraduate Studentships Queen's Doctoral Training Programme on Secure Connected Intelligent Design and Manufacturing

School of Electronics, Electrical Engineering and Computer Science

PhD Studentship 2020/21

Proposed Project Title: DTP: Precision Location of Tooling Using Wireless Methods

Principal Supervisor: Prof Vincent Fusco and Dr Muhammad Ali Babar Abbasi	**Research Area** Wireless Technologies and Intelligent Manufacturing Techniques
Contact Details: Queen's University of Belfast Northern Ireland Science Park, Queens Road, Queen's Island, Belfast BT3 9DT **Tele No:** +44 (0)28 9097 1806, +44 (0)28 9097 1810 **E-Mail:** v.fusco@ecit.qub.ac.uk, m.abbasi@qub.ac.uk	**Proposal open to other School (indicate area of Interest)** School of Mechanical & Aerospace Engineering Prof Mark Price

Degree linked to ELE (delete as appropriate)

This project is part of the Queen's Doctoral Training Programme in Secure Connected Intelligent Design and Manufacturing. Many of today's industrial approaches require transformative changes to ensure long term societal, economic and environmental resilience and sustainability. PhD projects in this programme explore the potential of emerging digital technologies, such as artificial intelligence, robotics, and the Internet of Things, to transform the way we design, manufacture and operate products and services.

The programme offers a bespoke research and training programme that aims to develop students into cross-disciplinary, industry-conscious thinkers and leaders who will influence the roadmaps of future advanced manufacturing technologies and their applications. They will have a balanced understanding of ICT (security, communications and data analytics) in the context of their application to Advanced Manufacturing and High Value Design.

Project Description:

Mechanical tools involved in industrial machining require accurate and precise location identification. Before machining process, tools are properly calibrated, however this calibration deviates as the machining process begins. Re-calibration or manual re-configuration often require excessive time and cost, eventually impacting the overall productivity.

This project aims to design and develop high-precision location monitoring for industrial tooling using small-scale localized microwave antennas. The technique involves active/passive antennas co-located with the machine head, sensing critical variables like size and gaps during the machining and tool-changing processes. Antennas also operate as wireless sensor nodes, making real-time feed-back system that enhances the location precision. This project integrates the latest aspects of information and communication technology (ICT) with the classical industrial manufacturing processes to enhance the machining accuracy and productivity.

Objectives:
1. Understanding the classifications and operations of wireless technologies
2. Investigating the frequency and power ranges of sensor antenna nodes
3. Understanding the industrial machining standards
4. Investigating precision location methods using antenna(s)/array antenna and performs experiments
5. Investigating the common communication protocol between wireless nodes and tooling system
6. Developing feed-back control system and integrate with the tooling
7. Completing field-trials

Academic Requirements:

A minimum 2.1 honours degree or equivalent in Computer Science or Electrical and Electronic Engineering or relevant degree is required.

GENERAL INFORMATION
This 3.5 year PhD studentship, potentially funded by the Department for Employment and Learning (DfE), commences on 1 October 2020.

Eligibility for both fees and maintenance (approximately £15,000) depends on the applicants being either an ordinary UK resident or those EU residents who have lived permanently in the UK for the 3 years immediately preceding the start of the studentship. Non UK residents who hold EU residency may also apply but if successful may receive fees only.

Applicants should apply electronically through the Queen's online application portal at: https://dap.qub.ac.uk/portal/

Further information available at: https://www.qub.ac.uk/schools/eeecs/Research/PhDStudy/

Closing date for applications: 15 March 2020