QUB - Mechanical and Aerospace Engineering
PhD Project Description

Title: Human robot collaborative assembly

Theme: Manufacturing

Project description:

Within the context of Industrial 4.0, manufacturing enterprises are striving to improve their productivity by deploying smart technologies. Human robot collaboration has been identified as a possible to enhance productivity and flexibility. Robot is good at repetitive tasks but not excel in recognition and decision, while human operators have great recognition and reasoning ability but lack of precision and consistency. Combining the merits from both parties will maximise the system efficiency and adaptability. For this aim, this project is to develop a human-robot cooperation method for hybrid assembly systems for future factory of aircraft production. Advanced virtual reality (VR) technologies will be investigated to be integrated with modern robotics technologies. A case study with real engineering data will be employed to validate the developed methodology.

Aims and Objectives:

- Comprehend existing processes in aircraft assembly
- Propose an allocation method for assigning suitable operations and co-operations to both human and robot
- Design a decision making strategy in between human and robot
- Develop a compliance control method to implement human robot collaboration
- Create a method to integrate VR to ensure the accuracy and productivity
- Develop a demonstrator via virtual and physical experiments
- Conduct cost/time benefit analysis to compare with current processes

Key skills required for the post:
- degree in Engineering (Mechanical/Aerospace Engineering, Manufacturing, Mechatronics, or relevant)
- knowledge of robot programming, control, or VR is considered as advantage but not compulsory
- Time management skills
- Oral and written communication skills

Key transferable skills that will be developed during the PhD:
The student will get comprehensive training on robot control and programming, simulation and VR techniques, which are highly sought after by industry today. The student will benefit from the usage of real engineering data on real industrial examples, so as to develop his/her understanding of real engineering business. Specifically, the researcher will gain the following skills:
- Innovative thinking in design the human-robot assembly system
- Robot programming and control method
- VR technology
- Simulation software
- Method for cost benefit analysis
- Project and time management training to ensure milestones of the project are delivered.
- Effective dissemination of research findings through presentation at international conferences and publication in high quality technical journals.
- Interpersonal skills within a multidisciplinary team including academics and industrialists

Lead supervisor:	Dr Yan Jin, email: y.jin@qub.ac.uk
Other supervisor(s):	TBC
Funding mechanism:	Yet to be secured / UK only / UK and EU / UK, EU and International
Application closing date:	until suitable candidate appointed.
Guaranteed stipend:	This can include a basic stipend and any guaranteed top-up (if available). N.B. Stipend for 20-21 is not yet confirmed. Base stipend for 19/20 is £15,009.
Conditional top-up available:	£3000 per year, dependent on the recommendation of the interview panel.
PhD students in the School may have the opportunity to apply to be demonstrators on undergraduate modules. Compensation for this can amount to in excess of £2,400 per year.	

Queens University Belfast is a diverse and international institution which is strongly committed to equality and diversity, and to selection on merit. Currently women are under-represented in research positions in the School and accordingly applications from women are particularly welcome.