Candidate Information

Position:	Research Fellow
School/Department:	Civil Engineering
Reference:	24/111633
Closing Date:	Tuesday 5 March 2024
Salary:	£37,841 per annum
Anticipated Interview Date:	Friday 15 March 2024
Duration:	16.5 months

JOB PURPOSE:

To be a highly productive, ambitious and collaborative member of the multinational ARISE team (New York University, University of Texas San Antonio, University of Galway and Queen's University Belfast). To undertake research into the development of a process for robotically assembling structural steel connections. The specific aim will be to focus on development and delivery of computer vision and machine learning required to enable a robotic arm to assemble such a connection. This will be carried out collaboratively between the School of Electronics, Electrical Engineering & Computer Science and the School of Natural & Built Environment. The researcher will develop a scene simulation in which the structural steel components represented and the functionality of a robotic manipulator. They will be expected to interface with project partners in other universities accepting input data for the simulation. The researcher will work with colleagues to conduct scaled trial assemblies using a small manipulator and lightweight materials representing the structural steel with full scale assembly using a large manipulator (ABB IRB 6700).

MAJOR DUTIES:

1. Create a simulation of the assembly process of intermeshed steel connections developed by collaborators in a virtual reality ready environment using the Unity engine for the purpose of developing and testing computer vision processes.
2. Develop machine vision capabilities in the simulation which can recognise the components required to be assembled using a robotic manipulator imported into the test environment. Development of manipulator control software.
3. Create scaled components and connections from laser cutting and 3D printing to be assembled using a Kuka precision robotic manipulator. The manipulator will be mapped into the virtual environment, creating a mixed reality environment in which the scaled assembly process can rigorously evaluated.
4. Develop the MR environments to enable learning for the robotic systems by embedding artificial intelligence within the system so that the robot can either learn through observation of its human counterpart or learn through doing within a simulated environment. Once a pre-determined skill acquisitions is obtained this can be applied within a real-world test bed.
5. Carry out analyses, critical evaluations, and interpretations using methodologies and other techniques appropriate to area of research.
6. Present regular progress reports on research to members of the research group or to external audiences to disseminate and publicise research findings.
7. Prepare, in consultation with the grant holders, material for publication in national and international journals and presentations at international conferences.
8. Assist grant holder in the preparation of funding proposals and applications to external bodies.
9. Carry out routine administrative tasks associated with the research project/s to ensure that project/s are completed on time and within budget. These might include organisation of project meetings and documentation, financial control, risk assessment of research activities.
10. Carry out occasional undergraduate and/or postgraduate supervision, demonstrating or teaching duties within the post holder's area of expertise and under the direct guidance of a member of academic staff.
11. Read academic papers, journals and textbooks to keep abreast of developments in own specialism and related disciplines.

ESSENTIAL CRITERIA:

1. Normally have or be about to obtain a *relevant PhD. (* Electrical Engineering, Electronic Engineering, Computer Science, Mechanical Engineering, Civil Engineering). (NB ‘About to obtain’ is normally defined as within 3 months of application date.)
2. Relevant research experience to include:
   • Research into approaches and use of virtual reality and scene simulation.
   • Experience in the use of robotic manipulator and programming and control system.
   • Working effectively as part of a research team in the development and promotion of the research theme.
   • Strong publication record commensurate with stage of career.
3. Ability to contribute to broader management and administrative processes.
4. Contribute to the School’s outreach programme by links with industry, community groups etc.
5. Sufficient breadth and depth of specialist knowledge in the discipline and of research methods and techniques to work within established research programmes.
6. Practical problem-solving skills, independence of thought and initiative.
7. Ability to assess and organise resources.
8. Ability to communicate complex information in English effectively in oral and written format.
9. Ability to build relationships to develop internal and external networks.
10. Demonstrable intellectual ability.
11. Commitment to continuous professional development.

DESIRABLE CRITERIA:

1. Research experience in appreciation of structural engineering and construction sequencing.
2. Ability to work as part of an interdisciplinary team.
3. Participation in associated USI and UKRI projects.