Wolfson School of Mechanical, Electrical and Manufacturing Engineering

Loughborough University

Research Associate Robotic Additive Manufacturing Control for Medical Applications

Job Ref: REQ260425

School/Department summary:

This post will support research into real-time control of additive manufacturing systems for medical and pharmaceutical applications, as part of a multidisciplinary project developing new approaches for patient-specific manufacturing. The wider project aims to develop materials, hardware, in-process inspection methods, geometric toolpaths and adaptive manufacturing workflows for high-precision multi-material 3D printed pharmaceutical tablets and related medical devices. At Loughborough, the work focuses on the development of additive manufacturing hardware, reconfigurable manufacturing procedures, directly designed toolpaths, in-situ inspection and real-time adaptation of the manufacturing process, using in-house additive manufacturing software including FullControl.

Project Description:

This post will support research into real-time control of additive manufacturing systems for medical and pharmaceutical applications, as part of a multidisciplinary project developing new approaches for patient-specific manufacturing. The wider project aims to develop materials, hardware, in-process inspection methods, geometric toolpaths and adaptive manufacturing workflows for high-precision multi-material 3D printed pharmaceutical tablets and related medical devices. At Loughborough, the work focuses on the development of additive manufacturing hardware, reconfigurable manufacturing procedures, directly designed toolpaths, in-situ inspection and real-time adaptation of the manufacturing process, using in-house additive manufacturing software including FullControl.

The Research Assistant will contribute to the practical development and control of an open, laboratory-scale manufacturing platform involving multiple pieces of independently controlled hardware. This may include a six-axis robot carrying a 3D printing nozzle, a second robot or motion system carrying an alternative tool or inspection device, and additional motion hardware such as a rotation stage, linear rail or positioning platform. The role will involve Python-based control, toolpath generation, hardware integration, fixture design, fabrication of custom components and experimental testing in a Linux-based research environment. The work will support the development of manufacturing procedures capable of producing intricate medical/pharmaceutical structures with high levels of control, repeatability and adaptability.

Job Description

Job Family and Grade: Specialist and Supporting Academic Research Grade 5

Job Purpose

To support the development, integration and testing of a real-time robotic additive manufacturing system for medical and pharmaceutical applications. The postholder will assist with Python-based control of separate hardware systems, robotic toolpath implementation, fixture and hardware design, experimental testing, and the development of open and adaptable manufacturing workflows for high-precision additive manufacturing.

Job Duties

- To assist with the programming of a real-time control system for robotic additive manufacturing involving multiple separately controlled hardware components, such as six-axis robots, printheads, auxiliary tools, rotation stages, linear rails and inspection devices.
- To develop and test Python scripts for controlling additive manufacturing hardware, robotic motion, tool actuation and supporting peripheral systems within a Linux-based development environment.
- To operate and test robotic and multi-axis additive manufacturing hardware, including systems based on six-axis robots controlled through manufacturer software.
- To assist with the design, manufacture and modification of hardware fixtures, end-effectors, brackets, adapters and experimental components using CAD, 3D printing and/or other appropriate manufacturing methods.
- To support with experimental trials to assess the performance, repeatability and limitations of the robotic additive manufacturing system and associated control workflows.
- To feed back to the project team on progress, to make recommendations for next steps.
- To contribute to project promotion and public engagement events.
- Always maintain confidentiality and ensure that intellectual property (IPR) agreements are not violated.
- Engage in training programmes in the University (or elsewhere) that are consistent with the needs and aspirations of the project and those of the Department.

Points To Note

The purpose of this job description is to indicate the general level of duties and responsibility of the post. The detailed duties may vary from time to time without changing the general character or level of responsibility outlined in the document.

Organisational Responsibility

Reports to Andy Gleadall

Person Specification

Your application will be assessed based on the essential and desirable criteria listed below.

Applicants are strongly encouraged to explicitly demonstrate how they meet each essential (and desirable) criteria at the application stage. The criteria that you need to demonstrate in your application will be listed as Stage 1 in the table below.

Stages of assessment are as follows:

1 – Criteria measured at Application
2 – Criteria measured at Test/Assessment Centre/Presentation
3 - Criteria measured at Interview

Essential Criteria:

Area	Criteria	Stage
Experience	Experience of additive manufacturing, robotics, mechatronics, automation, machine control or a closely related engineering area. Practical experience may have been gained through academic projects, research activities, placements, employment or other relevant activities.	1,3
Experience	Experience of programming, preferably using Python. Practical experience may have been gained through academic projects, research activities, placements, employment or other relevant activities.	1,2,3
Experience	Experience of designing, building, modifying or testing experimental hardware, fixtures, mechanical assemblies or laboratory rigs. Practical experience may have been gained through academic projects, research activities, placements, employment or other relevant activities.	1,3

Skills and abilities	Good written and oral communication skills	1,3
Skills and abilities	Self-motivated, organised and able to manage time and tasks effectively.	1,3
Qualifications	Have or soon to have a Bachelor's or Master's degree in Mechanical Engineering, Manufacturing Engineering, Mechatronics, Robotics, Control Engineering, Electronic/Electrical Engineering, Computer Science, Physics or a closely related discipline.	1
Other	Uphold and actively contribute to the University's commitment to Equity, Diversity and Inclusion.	1,3

Desirable Criteria:

Area	Criteria	Stage
Experience	Experience of controlling robotic arms or similar hardware. Practical experience may have been gained through academic projects, research activities, placements, employment or other relevant activities.	1,3
Experience	Experience with material extrusion additive manufacturing, printhead control, G-code, direct toolpath generation or process parameter control. Practical experience may have been gained through academic projects, research activities, placements, employment or other relevant activities.	1,3
Skills and abilities	Awareness of automation concepts for experimental workflows.	1,3

Conditions of Service

The appointment will be subject to the University's Terms and Conditions of Employment relevant to the job grade.

Shared University Responsibilities

As a member of the Loughborough community, you are expected to:

- Take reasonable care of yourself, others and the environment, and to prevent harm by your acts or omissions. All staff are therefore required to adhere to the University's Health, Safety and Environmental Sustainability Policies & Procedures.
- Support and contribute to the University's commitment to Equity, Diversity, and Inclusion (EDI), while carrying out all duties in a way that respects these principles and upholds the right to free expression. Further information about EDI at Loughborough and our strategic aims is available on our website

Our Purpose, Vision, and Values

Our purpose, Vision and Values underpin all that we do and shape how we work together at Loughborough.

We're proud to promote our values: **Adventurous**, **Collaborative**, **Creative**, **Authentic** and **Responsible**. Our people bring these values to life every day, and they are central to the positive and supportive culture that makes Loughborough unique.

If you join us, you'll be encouraged to bring these values to life in your own work and contribute to the positive, supportive culture that makes Loughborough unique.

Read more about our **vision and values**.

Our Accreditations

We strive to create a culture that supports equality and celebrates diversity throughout the campus. The University holds a Bronze Athena SWAN award which recognises the importance of support for women at all stages of their academic career.

We are proud to be a Race Equality Charter Member. The Charter aims to improve the representation, progression and success of all minority ethnic staff and students within higher education and address issues of racism within higher education institutions (HEIs).

We are proud to be a Disability Confident Employer and have adopted a proactive approach to employing disabled people and to creating a more diverse workforce. We ensure that our recruitment processes are inclusive and accessible. We guarantee to offer an interview to all applicants who have declared themselves with a disability, provided they meet the essential criteria for a role. We proactively anticipate and provide reasonable adjustments and support existing employees who acquire a disability or long-term condition to thrive in the workplace.

We are a real living wage employer, and our Living Wage Employer Mark shows our commitment to paying our staff according to the cost of living.

We are proud supporters of the City of Sanctuary movement and delighted to be recognised as a University of Sanctuary. This national network brings together, university staff, lecturers, academics and students, who together work to make Higher Education institutions place of safety, solidarity and empowerment for people seeking sanctuary.

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.