Department of Aeronautical and Automotive Engineering

Loughborough University

# Research Associate in Mobile Robotics

## *Project Title: Agricultural Robotic Lifelong/Multi-Session SLAM (Simultaneous localisation and Mapping)*

Job Ref: REQ250317

**As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.**

***Department of Aeronautical and Automotive Engineering***

## Project Description

*The success of accelerating and embedding robotics and autonomous systems within horticulture relies on a capable and robust navigation system for the robotic system to traverse and operate in a variety of agricultural/horticultural environments. By working closely with project partners, including leading Agri-robotic companies, farmers and a growing system manufacturer, this project aims to develop and deploy a low-cost, low-maintenance, yet reliable multi-session simultaneous localisation and mapping (SLAM) solution for robotic systems that face specific agricultural-related challenges, including variety in growing systems, changing vegetation appearance and illumination conditions across the growing season and the lack of communications infrastructure.*

## Job Description

**Job Grade:** Specialist and Supporting Academic Research Grade 6

**Job Purpose: We are seeking to appoint a passionate and highly qualified Postdoctoral Research Associate in Mobile Robotics to join the Loughborough University Centre for Autonomous Systems (LUCAS). This post is associated to a UKRI funded project on Precision Orchard Management for Environment (POME). You will work in a well-connected and diverse research team at LUCAS with state-of-the-art facility for robotic research. The post will provide an excellent opportunity to develop your knowledge and skills on autonomous mobile robotics with impactful applications in agricultural and horticultural industries.**

*To work efficiently in a project consortium and conduct research in the area of mobile robotics, you will manage own academic research and administrative activities, adapt existing and develop new methodologies in robotics, design working algorithms from theories, deploy and test algorithms on hardware as appropriate, and analyse data from a variety of sources and field trails. In addition, the more specific duties in this project require you to expand and augment existing graph-based SLAM methods to enable multi-session SLAM to be preformed in complex feature sparce agricultural environment. This is to enable consistent robotic operation and mapping throughout the year within an everchanging environment. Enabled through the use of IMU, Visual data or LiDAR sensors.*

*You must hold or close to complete a Doctorate degree in Control Engineering, Computer Science, Robotics, Autonomous systems or a related technical field, or a MSc/MRes degree with substantial working experience in relevant fields. Demonstrated ability to program in C/C++, Python and/or MATLAB to a high standard, experience with state estimation and factor-graph algorithms and working experience with the Robotic Operating System (ROS), track record of publications preferably in robotics or control engineering themed journals are essential. Experience in the use of inertial measurement units, Simultaneous Localisation and Mapping (SLAM) and Visual Inertial Odometry (VIO) and experience of field trials of mobile robotic systems would be desirable.*

**Job Duties**

The work entails, primarily, the following aspects under the direction and supervision of Prof Cunjia Liu and Dr Matthew Coombes:

- To conduct scientific and technological research independently into robotic lifelong/multi-session SLAM and navigation algorithms for horticulture/agricultural applications.
- To implement and translate the developed algorithms into software tools and deploy them on real robotic systems.
- To conduct experimental trails of the developed systems in real-world environments.
- To conduct the research in all the engineering related activities

Standard Duties:

- Be responsible for conducting the day to day running of the project to the agreed deadlines.
- To formulate detailed plans for the project based on broad guidance from the project team.
- To feed back to the project team on progress, to make recommendations for next steps.
- Write up regular progress reports and present outcomes to all Investigators and Collaborators.
- Travel to attend meetings and make presentations both within the project partners working group and to external stakeholders.
- To write research papers suitable for publication in high quality academic journals.
- To attend and contribute to conferences.
- To contribute to project promotion and public engagement events.
- Undertake other duties as may be reasonably requested and that are commensurate with the nature and grade of the post.

**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 entailed.

**Special Conditions**

All staff have a statutory responsibility to take reasonable care of themselves, others and the environment and to prevent harm by their acts or omissions. All staff are therefore required to adhere to the University's Health, Safety and Environmental Policy & Procedures.

All staff should hold a duty and commitment to observing the University's Equity, Diversity & Inclusion policy and procedures at all times. Duties must be carried out in accordance with relevant Equity, Diversity & Inclusion legislation and University policies/procedures.

Successful completion of probation will be dependent on attendance at the University's mandatory courses which include Belonging and Inclusion, Health & Safety, etc.

**Organisational Responsibility**

Reports to Matthew Coombes.

## Person Specification

Your application will be reviewed against the essential and desirable criteria listed below. Applicants are strongly advised to explicitly state and evidence how they meet each of the essential (and desirable) criteria in their application. Stages of assessment are as follows:

1 – Application
2 – Test/Assessment Centre/Presentation
3 – Interview

**Essential Criteria**

| Area | Criteria | Stage |
|---|---|---|
| Experience | Background in robotics and autonomous systems, control engineering, state estimation or machine learning. | 1,3 |
| | Experience with popular programming language, e.g., Python, MATLAB/Simulink and ROS | 1,3 |
| | Experience with the experimental procedure of testing algorithms on robotic systems, including UAVs and ground robots | 1,3 |
| | Authoring original work for academic journal papers, conference papers or technical reports | 1,3 |
| | Experience in the use of inertial measurement units, vision sensors and 3D LiDAR. | 1,3 |
| | | |
| Skills and abilities | Experience operating robotic platforms | 1,3 |
| | Testing of intelligent algorithms in simulation environments | 1,3 |
| | Excellent written and oral communication skills | 1,3 |
| | Self-motivated with ability to meet deadlines | 1,3 |
| | Excellent interpersonal, and organisational skills | 1,3 |
| | Working knowledge of software packages | 1,3 |
| | Working knowledge of specific analytical, numerical methods in mobile robotics | 1,3 |
| | Ability to write project reports and make technical presentations to industrial and academic research groups | 1,3 |
| | Knowledge of relevant Health & Safety issues | 1,3 |
| Training | Demonstrate evidence of having undertaken further training | 1,3 |
| Qualifications | PhD (or near completion) in Engineering or Computer Science | 1,3 |
| Other | Commitment to observing the University's Equal Opportunities policy at all times. | 1,3 |

**Desirable Criteria**

| Area | Criteria | Stage |
|---|---|---|
| Experience | Familiar with common ROS packages and robotic operation in field environments | 1,3 |
| | Working within a large consortium | 1,3 |
| | Developing proposals for funding from external agencies | 1,3 |
| | Working in a high quality academic research environment | 1,3 |

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|---|---|---|
| | Experience of teaching and / or supervision of students in relevant areas | 1,3 |
| | | 1,3 |
| Skills and abilities | Authoring original work, in the highest quality refereed academic journals in robotic field. | 1,3 |
| | A strong publication track record | 1,3 |
| | Working experience with popular SLAM packages (e.g., GTSAM, LIO-SAM) | 1,3 |
| | | |
| Qualifications | PhD (or near completion) in Control Engineering, Computer Science, Robotics, Autonomous systems or a related technical field | 1,3 |
| Other | Travel / Able to travel Independently / Working patterns | 1,3 |

## Conditions of Service

The position is FULL TIME and FIXED TERM for 33 months. Salary will be on GRADE 6 £35,116 - £45,413 per annum, starting salary to be confirmed on offer of appointment.
The appointment will be subject to the University's Terms and Conditions of Employment for STAFF GRADES 6 AND ABOVE, details of which can be found here.

The University is committed to enabling staff to maintain a healthy work-home balance and has a number of family-friendly policies which can be found here.

The University offers a wide range of employee benefits which can be found here.

We also offer an on-campus nursery with subsidised places, subsidised places at local holiday clubs and a childcare voucher scheme (further details are available at: http://www.lboro.ac.uk/services/hr/a-z/childcare-information---page.html

In addition, the University is supportive, wherever possible, of flexible working arrangements.
We also 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. For further information on Athena SWAN see http://www.lboro.ac.uk/services/hr/athena-swan/

## Applications

The closing date for receipt of applications is 14th May 2025**.** Interviews will be held in May 2025.