Research Associate / Senior Research Associate in Swarm Construction

1 JOB DESCRIPTION

Faculty / School or Division: School of Engineering Mathematics and Technology
Faculty/School or Division Address: Ada Lovelace Building, BS81TW Bristol, UK

Job Family:	**Research and Teaching**		
Grade/Pathway:	**Grade I/J Pathway 2**	**Salary range:**	**Grade I £ 40,704 - £45,641 per annum** **Grade J £45,641 -£ 51,258 per annum**
Hours of work:	**35 hours per week**	**Contract type:**	**Open ended with fixed funding until 30/09/2029**
Work pattern:	**Full time (1FTE)**	**Vacancy Reference Number: ACAD108699**	

1.1 Main Job Purpose

We are looking for a Research Associate / Senior Research Associate to design, build and demonstrate robot swarms for timber construction, combining swarm robotics, algorithm design, hardware design and real-robot experimentation.

This role is part of SWIFT-BUILD (Swarm-based Inverted Fabrication for Timber Buildings), a €4M EIC project developing robotics and AI for inverted structural assembly (https://cordis.europa.eu/project/id/101306368). In SWIFT-BUILD, coordinated swarms of ground-based robots assemble timber structures from the top down, lifting the growing structure so that construction takes place at an accessible layer near the ground.

SWIFT-BUILD brings together a large international consortium with expertise in architecture, structural design, robotic manipulation, swarm construction, stability awareness, safety verification and responsible innovation. The project aims to demonstrate autonomous construction of a stand-alone multi-storey timber pavilion and large-span structural modules. Its focus on timber supports sustainable, modular and adaptable construction.

Your role will contribute to the design of heterogeneous swarm for construction, with a focus on developing modular mobile robots and distributed coordination algorithms for transporting, aligning and assembling timber components and lifting structures. You will integrate hardware and software, and evaluate the resulting systems through real-robot experiments, working with partners on fixing, inspection and stability control.

We are looking for a hands-on researcher with expertise in swarm robotics, algorithm design, hardware design and real-robot experimentation, who enjoys working in a multidisciplinary consortium and translating research into physical demonstrators.

The Hauert Lab (https://hauertlab.com/) engineers swarms across scales, from nanoparticles for cancer research to large robot swarms for environmental monitoring and logistics. You will be joining a vibrant and supportive community of cross-disciplinary researchers spanning, computer science, physics, life sciences, robotics, mechanical engineering and more. Support includes regular one-on-one meetings, weekly swarm lunches, training and teaching opportunities, and encouragements to pursue outreach activities. You will also join the Bristol Robotics Laboratory (http://brl.ac.uk/), one of the largest robotics labs in Europe with state-of-the-art facilities including workshops and dedicated technical support. The BRL houses the Testbed for Industrial Swarm Logistics, which will be used for this project (https://arxiv.org/abs/2203.13809).

1.2 Main Statement of Responsibilities

Research Responsibilities

- Design and evaluate swarm robotics algorithms that use local awareness and knowledge of the target structure to coordinate timber transport, assembly and lifting.
- Design, prototype and integrate modular robot hardware for construction tasks, building on the DOTS platform and the Testbed for Industrial Swarm Logistics.
- Plan and conduct real-robot experiments to evaluate coordination, reliability and construction performance, collaborating with partners on manipulation, inspection, stability control and safety verification.
- Prepare conference and journal papers for publication.
- Contribute to SWIFT-BUILD demonstrators, consortium meetings and project events.
- Participate in national and international conferences and workshops.

Administration Responsibilities

- Manage reporting on project results, outputs, and impact.
- Participate in relevant project meetings; prepare and present talks, posters, reports and online communication items to disseminate the results of the research.
- Manage progress of the project workplan, including meeting the specified milestone deadlines.
- Assist in the smooth running of the project, including planning, public engagement and dissemination.

Teaching Responsibilities

As this role is a Pathway 2 (Research) role, there are no formally specified teaching duties required of the role-holder. However, other commitments permitting, the role-holder may be given development opportunities to undertake activities such as teaching on Masters and Doctoral programmes and/ or supervising MSc dissertations within the School of Engineering Mathematics and Technology (e.g. MSc Robotics, Biorobotics), as appropriate.

1.3 Relationships

Line manager: Sabine Hauert

1.4 Organisation Charts

N/A

1.5 Job Hazards/Safety Critical Duties (Pre-employment health screening)

The following duties are an intrinsic part of the role and any offer of employment will be conditional upon satisfactory health screening by the University Occupational Health Service:

- Complete safety assessments for robot experiments, hardware prototyping, lifting and construction demonstrations, and ethics applications where required, in line with University guidelines.

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2 PERSON SPECIFICATION

2.1 Relevant Experience, Skills and Knowledge

Essential

- Experience in swarm or multi-robot systems.
- Experience in algorithm design, implementation and evaluation for robot coordination.
- Experience in robot hardware design, prototyping and integration.
- Experience designing and conducting real-robot experiments, including testing algorithms on physical robots and analysing performance.
- Evidence of publication or dissemination of research outputs.
- Experience working in collaborative environments.
- Experience independently planning and delivering robotics research, developing methods and resolving technical challenges (for appointment at Grade J level).
- A track record of original research contributions and responsibility for delivering publications or robotic demonstrators (for appointment at Grade J level).

Desirable

- Experience in robotic construction, timber assembly or collective transport and manipulation.
- Experience with robot perception, sensing, communication or feedback control for coordinated physical tasks.
- Experience integrating robotic systems into physical demonstrators, including assessment of reliability and safety.

2.2 Relevant Qualifications

Essential

- Candidates for a Grade I and J position should have or be working towards a PhD in Robotics, Engineering, Computer Science, Maths or closely related discipline (e.g. social science applied to technology) or equivalent professional qualification/experience to a PhD.

2.3 Communication and Interpersonal Skills

Essential

- Ability to present work externally in public and academic settings.
- Excellent written and spoken communication skills and the ability to explain and share concepts and techniques with colleagues.
- Contribute to the life of the laboratory.

Desirable

- Ability to work well in large cross-disciplinary teams.
- Ability to work well with stakeholders including industry, local communities, and policy makers.
- Expertise with outreach and public engagement.

3 CAREER PATHWAY AND OTHER RELEVANT INFORMATION

3.1 Career Pathways

All members of academic staff have a clear career pathway involving a series of levels with distinct role profiles, each with its unique requirements. Each profile sets out what is expected of an academic at the particular level. The role profiles also set out a collection of competencies expected for each level. Progression or promotion to the next level will occur after these competencies have been attained and where a role at the higher level is available.

The academic pathways are as follows:

Career Pathway One - academic roles that combine teaching, research and administrative duties.

Career Pathway Two - academic roles focusing on research and associated administrative duties.

Career Pathway Three – academic roles focusing on teaching and associated administrative pathways

This post is located on Pathway Two. Role Summaries setting out what is expected of an academic at each particular profile level on pathway two can be found below. Please note that an appointment may be made at any level of the pathway.

A schematic diagram of the career pathways can be found at http://www.bristol.ac.uk/hr/grading/academic/.

For Pathway Two roles progression to the next level will only occur where a role has been identified as being eligible for progression, having reached the relevant point on the salary scale and after the relevant competencies have been attained. A progressable role is a role at Level b or Level c that has been determined as being eligible for progression by the Head of Department, based on departmental needs, priorities and funds. Individuals in progressable roles at Level b or Level c are expected to develop their skills, knowledge and experience in order to ultimately progress to Level c or Level d, as applicable. A non-progressable role is one either at Level a (which are not subject to formal progression arrangements, although there may be opportunities to develop into a Level b role, based on departmental needs, priorities and funds), or at Level b or c for which the Head of Department has identified an ongoing need at that particular level. Movement to Level e will be by promotion only.

3.1.1 Role Summaries

Research Associate (Level a)
Role holders at this level are concerned with *assisting* an individual research leader or team to conduct a particular study (or group of studies). They will generally be involved in data generation and/or collection using standard and well-defined methods developed by others. They will be working under close supervision by, and direction from, a more senior researcher, who will be ultimately responsible for the project. This may be the entry level for some staff who are expected to train and/or develop to take on more senior researcher roles. Role holders will be provided with academic and pastoral support within the department (including counselling on realistic career opportunities) and training

will be available designed to develop their competences and to prepare them to take on more responsibilities associated with a higher grade.

Senior Research Associate (Level b)
Role holders at this level will be experienced and professional researchers (or have considerable professional experience) and will be specialists in a particular area or methodology, drawing upon knowledge gained from postgraduate research and/or working within a Level a role. They will be *associated* with a particular project (or projects) and will contribute ideas, and/or enhancement of techniques or methodologies. They will be expected to do some writing for dissemination outside the Department. They will still be working under supervision, but will be expected to take significant initiatives in their work and consult with the Principal Investigator over the details of the project. They may, where practical, contribute to the department's teaching, through supervision of projects, overseeing practical classes, or taking small group classes. They will be provided with academic and pastoral support within the department and training will be available designed to develop their competences (including counselling on realistic career opportunities) and prepare them to take on more responsibilities associated with a higher grade.

3.2 **Additional Statistical Information.** This can also include any other relevant contextual or specific role or team information not included elsewhere

3.3 **Relevant Physical and Environmental Information**

3.4 **Key Contacts**

For informal enquiries, please contact: Prof. Sabine Hauert, sabine.hauert@bristol.ac.uk