UNIVERSITY OF SUSSEX

1 Advertisement

Post Title: Research Fellow in Swarm Robotics
School/department: School of Engineering and Informatics
Hours: full time or part time hours considered up to a maximum of 1 FTE. Requests for flexible working options will be considered (subject to business need).
Contract: fixed term for 36 months.
Reference: 2875
Salary: starting at £33,797 to £41,526 per annum depending on experience and qualifications
Placed on: 3 December 2019
Closing date: 15 January 2020. Applications must be received by midnight of the closing date.
Expected Interview date: early Feb 2020
Expected start date: April 2020 or soon after

We are looking for a Research Fellow (post-doctoral researcher) to join the Interact lab at the School of Engineering and Informatics of the University of Sussex, to work in the the broader areas of swarm robotics and distributed computing.

The research fellow will be part of an ERC Advanced project exploring new forms of wavefront manipulation combining fabrication and phased arrays.

The primary goal of this fellow’s project is to design distributed platforms of synchronized bots which can act as spatial sound modulators to shape complex sound fields that can be used to create dynamic 3D physical shapes made of large collections of lightweight levitating objects that support haptic feedback and directional audio. This will also allow us to explore human-in-the-loop collaborations with these bots using various principles like game-theory.

Each bot in our project could include different types of sound manipulators such as a small acoustic phased array or some metamaterials (reflective/ transmissive). Our vision is to create a distributed, modular and scalable ensemble that operates according to fundamental swarm principles in order to enable new human-in-the-loop applications.

Within this project, the Research Fellow will be expected to

1. Extend existing bots (like Kilobots or Zooids) by mounting small speaker arrays on them to create a distributed system of speaker arrays.
2. Extend existing algorithms used in our lab (they work on a single tethered platform) to work on these distributed systems, retaining the critical time synchronization among speaker arrays (i.e. all bots need to operate under a common synchronized clock at 40KHz).
3. Apply multi-agent principles to support human-in-the-loop interactions with these bots and also interactions between these bots.

The position will involve a variety of tasks, such as the adaptation of algorithms for levitation to a distributed, time synchronized network of bots; integration of such solvers into resource limited nodes (e.g. FPGAs in each bot); exploring the novel possibilities for levitation, haptics and directional audio enabled by distributed networks of moving bots carrying speaker arrays; explore multi-agent principles for human-in-the-loop interaction with the bots (e.g., using game theory principles); and publishing these results in scientific venues. The applicant may also be expected to help in the teaching of related units.

The position would be suitable for someone with experience and interest in swarm robotics, real-time computing systems, distributed computing or related topics.

The research fellow will have considerable freedom in shaping the nature of the research project. So we seek a highly organised and motivated individual able to multi-task and work independently with minimal supervision while maintaining excellent attention to detail and bring energy and enthusiasm to a vibrant research group. Excellent written and communication skills are also essential.

The lab consists of three permanent members of staff led by Prof. Subramanian. Alongside these staff members it currently hosts four post-doctoral researchers, 7 PhD students and several visiting researchers. The work of lab members often attracts media attention and offers many public engagement opportunities. One of our successful lines of research is in the field of mid-air haptics and we would draw on our expertise in this topic to propel this area of acoustic levitation.

Employment will be subject to the right to work in the UK. You will work directly with Prof. Sriram Subramanian, with a base in the Department of Informatics. You can find more information about the group at www.interact-lab.com

For informal inquiries please contact Prof. Subramanian, Department of Informatics, University of Sussex, Falmer, Brighton BN1 9QJ, UK; sriram@sussex.ac.uk.

For full details and how to apply see our vacancies page

*The University of Sussex values the diversity of its staff and students and we welcome applicants from all backgrounds.*
2. **The School / Division**

The School of Engineering and Informatics covers the disciplines of computer, electrical and electronic engineering, mechanical, and automotive engineering, product design, digital media, computer science and informatics.

Distinctive characteristics of the School are: creativity, interdisciplinarity, strong links with industry, and an international outlook in both research and teaching. £10m (£4.9m from HEFCE) is being invested in a new **Computing, Robotics, Electronics and Mechatronics Centre (CREaM)** as a result of a 60% surge in applications for the School’s degrees.

The School offers a range of undergraduate and postgraduate degrees in its areas of expertise, often in collaboration with other schools at Sussex, to create a distinctive focus that addresses the needs of industry, commerce and society. Examples include joint degrees with the MSc in Evolutionary and Adaptive Systems (EASy) that includes modules from the Schools of Engineering and Informatics and Psychology; and the MScs in Engineering Business Management, and Management of Information Technology, which were developed in collaboration with the School of Business, Management and Economics.

This interdisciplinary approach also applies to our research, with current and recent externally funded projects with researchers in a wide range of other subject areas including: geomorphology, media practice, medical imaging, neuroscience, anthropology, English literature, epidemiology, geography, international development, mathematics, psychiatry, psychology and sociology.

The School has strong links with industry, and has an established Strategic Advisory Board. Innovative research across the School has led to a number of patents which are being commercialised including: novel electric potential sensors (EPS) licensed to Plessey Semiconductors and marketed as the EPIC sensor chip; and University spin-out companies, including TribeHive, which is deploying delay-tolerant networking to provide smartphone connectivity in large crowds, and TexRAD, which has developed software for the analysis of medical images and has recently demonstrated the ability to detect brain texture anomalies in Asperger’s Syndrome patients. These developments have been supported by the University’s Enterprise fund. The EPS sensor technology was awarded the IET Innovation award for ‘Measurement in Action’, and was shortlisted for two other IET categories and for a THES award.

The School is, for administrative purposes, comprised of two departments: the **Department of Engineering and Design**, and the **Department of Informatics**. Staff teach across the School, and undertake research on cross-School, as well as cross-University projects.

**The Department**

The Department of Informatics is highly rated for its teaching and research. Its researchers work in an environment that was deemed to be wholly 4*/3* (world-leading/ internationally excellent) in the REF 2014.
Sussex was ranked in the top 25 in the UK in The Guardian University Guide 2014. Our students are highly employable: in early 2014, 95% of our previous year’s graduates were employed, and of those, 100% were in professional or managerial jobs.

The Department maintains a strong emphasis on interdisciplinary teaching and research, and has substantive links with almost all other Schools of study at Sussex. Its research spans the theoretical and applied.

The Department’s research is organised into four groups:

- Cognitive and Language Processing Systems (www.sussex.ac.uk/calps/)
- Evolutionary and Adaptive Systems (www.sussex.ac.uk/easy/)
- Foundations of Software Systems (www.sussex.ac.uk/foss/)
- Creative Technologies Group (http://www.sussex.ac.uk/creativetechnology/), and also plays leading roles in cross-disciplinary research centres:

  - Sackler Centre for Consciousness Science (www.sussex.ac.uk/sackler/)
  - Centre for Computational Neuroscience and Robotics (CCNR) (www.sussex.ac.uk/ccnr/)
  - Centre for Cognitive Science (COGS) (www.sussex.ac.uk/cogs/)
  - Sussex Neuroscience (www.sussex.ac.uk/sussexneuroscience/).

The Department has long-standing collaborations with a range of external organisations including Animazoo, the Clinical Practice Research Datalink, and American Express, which has sponsored over 120 MSc students in Informatics over the past 10 years.

The Department currently has 33 teaching faculty, 420 undergraduates, 80 taught postgraduates, and 60 doctoral students. Detailed information about the Department can be found at www.sussex.ac.uk/informatics
CORE JOB DESCRIPTION

Job Title: Research Fellow in [subject]
Grade: Research Fellow I, Grade 7
School: [Engineering and Informatics]
Location: Falmer Campus
Responsible to: Sriram Subramanian through to Head of School
Direct reports: n/a
Key contacts: Members of Interact Lab, members of faculty within the School and University.

Role description:
Research Fellow I is an early career-grade research position. Post-holders will be expected to contribute to the work of the research team, and also to develop their research skills with support from more experienced members of staff.

The position will involve the creation of distributed, time synchronized network of bots that can act in unison to create complex sound fields. The applicant will also explore the potential of these systems for human-in-the-loop interaction.

PRINCIPAL ACCOUNTABILITIES

1. To engage in individual and/or collaborative research activity resulting in high-quality publications; and to develop research funding and knowledge exchange income individually or in collaboration with others, as appropriate, depending on the size and scope of the bid.

2. To contribute to School teaching activities.
KEY RESPONSIBILITIES

1. **Research, Scholarship & Enterprise**
   1.1 Develop research objectives and proposals for own or joint research, at acceptable levels, with assistance if required.
   1.2 Conduct research projects individually and in collaboration with others.
   1.3 Analyse and interpret research findings and draw conclusions on the outcomes.
   1.4 Produce high-quality research outputs for publication in monographs or recognised high-quality journals, or performance/exhibition, as appropriate, and contribute to the School’s REF submission at acceptable levels of volume and academic excellence.
   1.5 Contribute to the preparation of proposals and applications to external bodies, for example for funding purposes.
   1.6 Individually or with colleagues, explore opportunities for enterprise activity, knowledge exchange income and/or consultancy, where permissible.
   1.7 Build internal contacts and participate in internal networks and relevant external networks in order to form relationships and collaborations.
   1.8 Continually update knowledge and understanding in field or specialism, and engage in continuous professional development.

2. **Teaching & Student Support**
   2.1 Undertake teaching duties, if required.
   2.2 Assist in the assessment of student knowledge and supervision of student projects if required.
   2.3 Assist in the development of student research skills, for example as part of a postgraduate supervision team.

3. **Contribution to School & University**
   3.1 Attend and contribute to relevant School and project meetings.
   3.2 Undertake additional duties, as required by the Principal Investigator and/or Head of School.

4. **Role-specific duties**
   4.1 Knowledge in robotics, distributed computing or game theory.
4.2 Strong mathematical background (linear algebra, vector analysis, complex numbers, regression approaches).

4.3 Programming experience with high performance, real time systems (C++, OpenGL, OpenCL, concurrency control, parallel programming).

4.4 Experience with building distributed hardware platforms that can interact with humans.

This Job Description sets out current duties of the post that may vary from time to time without changing the general character of the post or level of responsibility entailed.
INDICATIVE PERFORMANCE CRITERIA

- A PhD or equivalent scholarly or relevant professional activity
- Pursuing a line of independent research within a research group.
- Publishing research (either from a recently completed PhD or new original research).
- Other forms of externally recognised professional practice of creative output of a standing equivalent to regular publication of original research.
- Initiating, developing or participating in links between the University and external bodies such as business and industry, the professions, community organisations and policy-makers.
- Evidence of successful engagement in teaching or supervision.
PERSON SPECIFICATION

ESSENTIAL CRITERIA

1. Normally educated to doctoral level, or other equivalent qualification, or appropriate level of experience, as appropriate to the discipline (see role-specific criteria below).

2. Evidence of engagement in high-quality research activity.

3. Excellent presentation skills, with the ability to communicate effectively, both orally and in writing, with students, colleagues and external audiences.

4. Ability to work individually on own initiative and without close supervision, and as part of a team.

5. Ability to exercise a degree of innovation and creative problem-solving.

6. Excellent organisational and administrative skills.

7. Ability to prioritise and meet deadlines.

8. Excellent IT skills.

ESSENTIAL ROLE-SPECIFIC CRITERIA

1. Knowledge in robotics, distributed computing or game theory.

2. Strong mathematical background (linear algebra, vector analysis, complex numbers, regression approaches).


4. Experience with building distributed hardware platforms that can interact with humans.

DESIRABLE CRITERIA

1. Emerging track record of high-quality publications in reputable journals and other appropriate media of similar standing.

2. Experience of generating research or knowledge exchange income.

3. Emerging track record of high-quality publications in reputable journals and other appropriate media of similar standing.

4. Experience with ML/ computer vision/computer graphics.

5. Experience of generating research or knowledge exchange income.
# CORE JOB DESCRIPTION for Grade 8 appointment

<table>
<thead>
<tr>
<th><strong>Job Title:</strong></th>
<th>Research Fellow in [subject]</th>
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</thead>
<tbody>
<tr>
<td><strong>Grade:</strong></td>
<td>Research Fellow II, Grade 8</td>
</tr>
<tr>
<td><strong>School:</strong></td>
<td>[Engineering and Informatics]</td>
</tr>
<tr>
<td><strong>Location:</strong></td>
<td>[Falmer Campus]</td>
</tr>
<tr>
<td><strong>Responsible to:</strong></td>
<td>Sriram Subramanian through to Head of School</td>
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<td><strong>Direct reports:</strong></td>
<td>n/a</td>
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<tr>
<td><strong>Key contacts:</strong></td>
<td>Members of research group of Interact Lab, members of faculty within the School and University, academics in the field in other institutions.</td>
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## Role Description:
Research Fellow II is a career-grade research position. Post-holders will be expected to take a senior role within a research team, be able to demonstrate an established research portfolio, and a growing reputation in their field of study. They will also be expected to provide support and guidance to less experienced members of staff.

### PRINCIPAL ACCOUNTABILITIES

1. To engage in individual and/or collaborative research activity resulting in high-quality publications; and to contribute to obtaining research funding and knowledge exchange income as appropriate.

2. To contribute to School teaching activities.
KEY RESPONSIBILITIES

1. Research, Scholarship & Enterprise

1.1 Contribute to the development of School research strategy and themes.

1.2 Develop research objectives and proposals for own or joint research at acceptable levels.

1.3 Conduct research projects individually and/or in collaboration with others.

1.4 Assess, interpret and evaluate outcomes of research, and develop ideas for their application.

1.5 Produce high-quality research outputs that have impact in the field, for publication in monographs or recognised high-quality journals, or performance/exhibition, as appropriate, and contribute to the School’s REF submission at acceptable levels of volume and academic excellence.

1.6 Lead small research projects and/or identified parts of a larger project, including supervising the work of others and managing or monitoring a research budget.

1.7 Make presentations at conferences, or exhibit work in other appropriate events of a similar standing and identify ways to disseminate research outputs informally via the internet, the media and other forms of public engagement.

1.8 Identify sources of funding and secure or contribute to the process of securing bids.

1.9 Identify and secure opportunities for enterprise activity, knowledge exchange income and/or consultancy where permissible.

1.10 Actively build internal and external contacts, and play a key role in internal networks and relevant external networks in order to, for example, identify sources of funding, secure student placements, and build relationships for future activities.

1.11 Contribute to a relevant national professional body or recognised events.

1.12 Continually update knowledge and understanding in field or specialism, and engage in continuous professional development.

1.13 Conduct risk assessments, and take responsibility for the health and safety of others, if required.

2. Teaching & Student Support

2.1 Contribute to teaching and learning in the School, including delivery of teaching if required.

2.2 Supervise postgraduate research students, for example as part of a postgraduate supervisory team.
2.3 Assist in the development of student research skills.

3. Contribution to School & University

3.1 Attend and contribute to relevant School and project meetings.

3.2 Mentor less experienced colleagues, supporting them in developing their research techniques, and advising on personal development.

3.3 Undertake additional duties, as required by the Principal Investigator and/or Head of School.

4. Role-specific duties

4.1 Knowledge in robotics, distributed computing or game theory.

4.2 Strong mathematical background (linear algebra, vector analysis, complex numbers, regression approaches).

4.3 Programming experience with high performance, real time systems (C++, OpenGL, OpenCL, concurrency control, parallel programming).

4.4 Experience with building distributed hardware platforms that can interact with humans.

This Job Description sets out current duties of the post that may vary from time to time without changing the general character of the post or level of responsibility entailed.
INDICATIVE PERFORMANCE CRITERIA

- Regular published output of original research at international level (referred journal papers, monographs, book chapters, text-books).
- Other evidence of original research contribution to the field, such as through invited conference contributions, membership of editorial panels etc.
- Evidence of successful co-supervision of doctoral students.
- Evidence of the successful supervision of others within the research group.
- Evidence of contribution to the process of obtaining competitive/peer reviewed research support funding or collaboration in significant research projects with institutions of equivalent standing.
- Involvement in the creation, transfer and use of the results of research through a range of knowledge exchange activities.
- Success in transferring research results to commercial, professional, public sector or other practical use.
- Evidence of successful engagement in teaching or supervision.
PERSON SPECIFICATION

ESSENTIAL CRITERIA

1. Normally educated to doctoral level, or other equivalent qualification, or appropriate level of experience, as appropriate to the discipline (see role-specific criteria below).

2. Evidence of significant independent contribution to the design and execution of research.

3. An emerging track record of publications in reputable journals and other appropriate media of similar standing.

4. Excellent presentation skills, with the ability to communicate effectively, both orally and in writing, with students, colleagues and external audiences.

5. Ability to work individually on own initiative and without close supervision, and as part of a team.

6. Ability to exercise a degree of innovation and creative problem-solving.

7. Excellent organisational and administrative skills.

8. Ability to prioritise and meet deadlines.

9. Excellent IT skills.

ESSENTIAL ROLE-SPECIFIC CRITERIA

4.5 Knowledge in robotics, distributed computing or game theory.

4.6 Strong mathematical background (linear algebra, vector analysis, complex numbers, regression approaches).

4.7 Programming experience with high performance, real time systems (C++, OpenGL, OpenCL, concurrency control, parallel programming).

4.8 Experience with building distributed hardware platforms that can interact with humans.

DESIRABLE CRITERIA

1. Experience of generating research or knowledge exchange income.

1. Experience of supervising postgraduate research students.