ROLE PROFILE

Job Title: Research Associate/Fellow
School/Department: School of Computer Science
Job Family and Level: Research & Teaching Level 4/4a
Contract Status: This post will be offered on a fixed-term contract for 15 months
Hours of Work: Full-time (36.25 hours per week)
Location: School of Computer Science, Jubilee Campus
Reporting to: Dr Jason Atkin

Purpose of the New Role:
To contribute to a cross-institutional research project which is developing a high level controller for use in More Electric Aircraft, and ensuring safe and efficient operation of this controller. This role will contribution towards the optimisation, computer science and programming aspects of the project.

This role is situated within the Automated Scheduling, Optimisation and Planning research group within the University of Nottingham. The group have a long record of world leading research in the solution of real world optimisation problems, such as systems to help air traffic controllers in airports, to aid logistics companies, or to improve timetabling and rostering. The group’s research often involves working with practitioners to understand the constraints and objectives for a problem, to formulate one or more models for problem under consideration and to use mathematical or algorithmic approaches to find acceptably good or provably optimal (where possible) solutions. This project involves the development of a controller for power systems within an aircraft, to ensure safety, while optimising power requirements. The successful candidate will work with our partners within and outside the University to fully understand the objectives and constraints for the problem, to model it and to find the best way to ensure that decisions are made which are always (provably) safe, while reducing overall power requirements.

Traditional aircraft systems are increasingly being replaced by electrical equivalents, reducing weight and fuel consumption as well as enabling easier maintenance, better control and the potential to reconfigure aircraft systems to run in fault-tolerant modes. This role is for a researcher to join the ENIGMA project, a Horizon 2020–funded collaboration between partners in the UK, Ireland and Italy which will deliver a Supervisory Controller for Enhanced Electrical Energy Management on board Aircraft. Increasingly, obtaining good solutions for real world problems is requiring cross-disciplinary teams and the Institute for Aerospace Technology (IAT) at the University of Nottingham has been instrumental in bringing together teams to tackle a number of these real world problems. Teams from Electrical Engineering and Computer Science at the University will work together on this project, in collaboration with partners elsewhere.

Since this project is cross-disciplinary and involves multiple partners, good communication and team-working skills are essential. Accurately capturing and modelling the requirements will involve working closely with partners at Nottingham, as well as liaising with partners elsewhere. One of the responsibilities of this role will be to constantly review and refine the mathematical models, in conjunction with the partners in electrical engineering, ensuring that they are fit for purpose. Another will be to produce new, or utilise existing, optimisation approaches to solve the problems described by the model, as well as to generate controllers to solve them real-time for use on aircraft.

For safety reasons, the controllers which are running on an aircraft must be provably correct. The candidate will need strong programming skills and must be able to show experience in writing correct and tested code. In addition, understanding and/or experience of automated code generation and/or controller synthesis may be beneficial. Ensuring that the final controller is correct, by thorough testing and/or by construction will be an essential part of this role.
### Main Responsibilities

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<td>1. To initiate, innovate and undertake research within the consortium. This involves mathematical modelling, programming, development and use of optimisation techniques and the generation of software for controllers.</td>
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<td>2. To write research papers in order to disseminate the research findings. To support further dissemination of results through presentations at local / international meetings, conferences and seminars.</td>
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<td>3. To be involved in research activities and work collaboratively with other researchers within the consortium. To attend and contribute to consortium meetings as required by the academic research team.</td>
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### Knowledge, Skills, Qualifications & Experience

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<th>Essential</th>
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<td>Qualifications/Education</td>
<td>PhD (or equivalent) or near completion in Computer Science, Mathematics, Optimisation, Operational Research, or closely related discipline.</td>
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| Skills/Training | Strong (particularly object oriented) programming skills.  
Ability to produce and adapt mathematical optimisation models to match problem requirements.  
Understanding of Research approaches including developing new research ideas / methodologies.  
Good interpersonal and communication skills. | Strong and proven ability with Java or C++.  
Skills/experience with MILP models and solvers.  
Understanding/experience of real-time decision making, such as from state-based controllers.  
Ability to understand and modify MATLAB SIMULINK models.  
Experience with MATLAB STATEFLOW.  
Understanding/experience of electrical power systems, their design and constraints.  
Understanding/experience of automated code generation.  
Understanding/experience of automated controller synthesis. |
| Experience | Experience of a variety of decision making and optimisation algorithms/approaches.  
Writing reports and research papers.  
Oral Presentation of research findings. | Working independently and as part of an international team.  
Working with non-computer scientists, to correctly capture requirements for models. |
| Other |  | Willingness to travel within Europe (particularly to Italy and Ireland). |

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