Title: Multiple drone audiovisual (AV) shooting and cinematography intelligence

Type of award PhD Research Studentship

Department Electrical and Electronic Engineering

Details £14,296 - £18,000 depending on student qualifications

Duration 24 months though funding may be extended up to 27 months

Eligibility Home/EU applicants only

Earliest start date 1 January 2017 (or project start)

Latest start date 1 October 2017 (or project M10)

PhD Topic Background/Description

In the framework of the H2020 R&D project MULTIDRONE (MULTIple DRONE platform for media production), the PhD stipend holder will be in charge of specifying, researching, implementing, integrating and testing novel algorithms on multidrone HW/SW platforms for media production, more specifically for Multidrone AV shooting and cinematography intelligence and multidrone visual information analysis, including:

a) Creation of a taxonomy of shot types for various scenarios, including novel techniques for shot composition, specific to multidrone applications.

b) Determination of the optimal shooting parameters (position/viewpoint, orientation, relative motion between platforms, camera parameters etc.) for a range of typical and new shot types.

c) Analysis of the quality of the shot data and determination of associated tolerances on the optimum parameters in (a).

d) Novel path planning and camera control techniques to ensure the ability of the drone team to follow prescribed cinematographic shooting rules and, e.g., avoid entering into each other’s principal camera field-of-view, in conjunction with target tracking.

e) Post-production and evaluation of the resulting video content from actual drone flights.

The focus of his/her work will be defined in by the supervisor and MULTIDRONE Principal Investigator, towards specifying, prioritising and executing R&D, integration and testing subtasks mentioned in (a-e above), according to the project needs and the profile of the R&D team. The project will require a mix of theoretical and programming skills. The post holder will specify, research, implement, evaluate the developed multiple drone SW algorithms and software and integrate/test them on the multidrone platform. He/she will attend regular (weekly) research team meetings at UoB. She/he will liaise with Multidrone partners for integration and testing. The post holder will also be occasionally required to be at partners’ site for data collection, research, integration and/or demonstration/testing of the work.

She/he is expected to produce research publications (possibly in cooperation with other R&D team members or project partners) at high impact conference and journal venues, be able to present research at international conferences and project meetings, develop software libraries and their related
documentation and support the activities of the VI-Lab, including contributing to the supervision of MSc Research Students.

He/she will be required to maintain accurate documentation of all the aspects of the work undertaken and provide progress reports of different levels of detail for project deliverables, reports and project milestones. He must handle issues related drone ethics, safety, security and legal requirements, according to the established project procedures.

The aim of H2020 project MULTIDRONE is to develop an innovative intelligent multi-drone team platform for media production to cover outdoor events (e.g., sports) that are typically distributed over large expanses, ranging, for example, from a stadium to an entire city. The drone team, having 4-10 drones, to be managed by the production director and his/her production crew, will have: a) increased multiple drone decisional autonomy, by minimizing production crew load and required interventions, (hence allowing event coverage in the time span of around one hour in an outdoor environment) and b) improved multiple drone robustness and safety mechanisms (e.g., communication robustness/safety, embedded flight regulation compliance, enhanced crowd avoidance and emergency landing mechanisms), enabling it to carry out its mission against errors or crew inaction and to handle emergencies. Such robustness is particularly important, as the drone team will operate close to crowds and/or may face environmental hazards (e.g., wind). Therefore, it must be contextually aware and adaptive, with increased perception of crowds and individual humans. Furthermore, as this multi-actor system will be heterogeneous, consisting of a) drones and b) the production director/crew, critical human-in-the-loop issues will be addressed to avoid decision errors or operator overload, towards maximizing shooting creativity and productivity, while minimizing production costs. The overall multiple drone system will be built to serve identified production (end user, i.e., broadcaster) needs. Namely, its innovative, safe and fast multiple drone audiovisual (AV) shooting will provide novel media production functionalities (e.g., production creativity towards rich media output, global event coverage, adaptation to event dynamics, high reaction speed to unexpected events). Both live (real-time) AV shooting and off-line productions will be considered.

Further Particulars
At Bristol, research will be performed on:

a) Multidrone adaptable/distributed/incremental/approximate semantic/3D world modelling (Pre-production semantic world modelling, On-line updating of the semantic world model),
b) Multidrone localization and tracking for intelligent AV shooting techniques (Multidrone (re)localization, Target localization/tracking, multiple drone AV shooting and cinematography intelligence),
c) Multidrone visual information analysis
d) Novel visual effects & media experiences from multiple drone cameras.

University of Bristol will also participate in Multidrone system specifications and design for media production, Cooperative intelligent planning and control for safe autonomous multidrone systems, Integrated MULTIDRONE system implementation, MULTIDRONE system validation and demonstration in experimental media productions, Exploitation and dissemination.
The project is a collaboration with several European Universities and industries.

At Bristol, we will be looking for several top-class candidates to join the team on this research challenge, who can demonstrate great potential and a high quality research track record. This post will be hosted by the Visual Information Lab (VI-Lab), Department of Electrical and Electronic Engineering at Bristol. All post
holders will collaborate under the guidance of the Principal Investigator, in cooperation with other academic staff members and in coordination with the other project partners.

Excerpts of MULTIDRONE technical description can be available to clarify the work to be carried out.

**Candidate Requirements**

Degree (or close to completion) in electrical/electronic engineering, computer science, mathematics, physics, other engineering, or similar numerate discipline.

Basic skills and knowledge required:

Essential:
- Interest in the development of image processing and computer vision methods and
- Experience in the development of C/C++ code (or other OOP language).

Desirable:
- Interest in developing and implementing visual drone image analysis, or robotic vision, or semantic world modeling, or SLAM or visual tracking.
- Interest in real time computer vision methods, visual analysis, under Linux, ROS.
- Knowledge of MATLAB, OpenCV.
- Interest in integrating computer vision methods with embedded hardware platforms, preferably on drone platforms.
- Interest in the development of visual algorithms implemented in software as well as its documentation.
- Interest in drone SW/HW system integration and testing.

**Scholarship Details**

Scholarship covers full UK/EU (EU applicants who have been resident in the UK for 3 years prior to application) PhD tuition fees and a tax-free stipend in the range £14,296 to £18,000, depending on student qualifications. Funding is for 24 months though it may extend up to 27 months. Funding is only available for this period. The successful applicant’s PhD registration will last for 3 years however, with a further year for writing up. Applicants must be prepared to cover the cost of tuition fees and living costs for the third year.

**Informal enquiries**

For informal enquiries please email Prof Ioannis Pitas, ioannis.pitas@bristol.ac.uk

For general enquiries, please email gsen-pgrs@bristol.ac.uk

**Application Details**

To apply for this studentship submit a PhD application using our [online application system](http://www.bristol.ac.uk/pg-howtoapply)

Please ensure that in the Funding section you tick “I would like to be considered for a funding award from the Electrical and Electronic Engineering Department” and specify the title of the scholarship in the “other” box below with the name of the supervisor, Prof Ioannis Pitas.

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