James Alexander
Douthwaite

DOCTORAL RESEARCHER · COLLISION AVOIDANCE IN COORDINATED AERIAL SYSTEMS

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About Me

I have loved Engineering and Robotics since high-school. Over the years I have found myself drawn more towards Aerial Robotics and collaborative systems as I gathered experience in modelling of dynamical systems, multi-agent systems and autonomous systems. My passion for robotics in general, has led to the pursuit of numerous projects, both research and personal, with both theoretical and practical themes. Additionally, I consider myself to be a approachable and charismatic person and as a result, have greatly enjoyed representing academic institutions in teaching roles and outreach events. As i progress further in my career in research, I am looking for new challenges that will put the skills I have acquired so far to good use.

Education

An outline of my educational history and recent qualifications:

Ph.D Collision Avoidance in Coordinated Aerial Systems   *Sheffield, UK*

DEPARTMENT OF AUTOMATIC CONTROL & SYSTEMS ENGINEERING, UNIVERSITY OF SHEFFIELD (UoS)   *Sept. 2015 - Exp. Jan. 2019*

Supervisors: Prof. Lyudmila Mihaylova, Dr. Shiyu Zhao and Prof. Sandor A. Veres

MEng in Advanced Aerospace Engineering   *Liverpool, UK*

DEPARTMENT OF MECHANICAL ENGINEERING, UNIVERSITY OF LIVERPOOL (UoL)   *Sept. 2010 - Sept. 2015*

Award: (high 2:1)

A-Levels in Physics, Mathematics & Design Technology   *Leeds, UK*

FIELD-HEAD TECHNOLOGY COLLEGE   *Sept. 2008 - Sept. 2010*

Award: 3 A-levels (A-C)

GCSEs (including: Physics, Biology, Mathematics and Chemistry)   *Leeds, UK*

FIELD-HEAD HIGH SCHOOL   *Sept. 2003 - Sept. 2008*

Award: 11 GCSEs (A*-C)

Experience

A list of the positions I have held previously:

University of Sheffield   *Sheffield, UK*

RESEARCHER   *Jan. 2019 - May. 2019*

- Initiated the development of a collaborative robotics package based in Unity for the purpose of digital twinning.
- Developed a communication API between multiple simultaneous ROS networks, sensor and manipulators.
- Responsible for liaising technical information and documentation with several industrial partners and collaborators from various fields.

University of Sheffield   *Sheffield, UK*

GRADUATE FACILITATOR, TEACHING ASSISTANT AND PROJECT CO-SUPERVISOR (GTA)   *Sept. 2015 - Sept. 2018*

- Whilst completing my Ph.D I took advantage of several opportunities to develop my skills in interacting with students in an educational context.
- I have worked with students from each of the academic years (1-4), either in a co-supervisory, mentor or lecturing capacity,
- Each of these responsibilities has given me a great respect for teaching and helped me develop myself as a confident, effective, communicator.

Aerial Inspection Robotics   *Liverpool, UK*

SYSTEM ENGINEER   *Jun. 2014 - Sept. 2014*

- Operated as the principle engineer in a technical start-up using drones for the inspection of off-shore wind turbines.
- Gained invaluable experience working with a variety of commercial drone hardware(software) packages; including DJI, Pixhawk and Ardu-pilot.
- Inspired me to pursue a career in the technology behind unmanned systems.

University of Liverpool *Liverpool, UK*
PROGRAMMING SYLLABUS DEVELOPMENT *Jun. 2014 - Sept. 2014*

- Employed during my studies to help develop the C/C++ syllabus for undergraduate students entering the university mechatronics programmes in 2015.
- Developed a new lab introducing students to the Arduino development environment.
- The position gave me an excellent opportunity to impact the experience of future students through my skills in programming.

Ethica Resourcing Ltd. *Leeds, UK*
WEB-DEVELOPER & MARKETING RESEARCH ANALYST *Aug. 2013 - Jun. 2014*

- Began working at Ethica to help them analyse their place in the recruitment market.
- Provided detail reports on competitors, media coverage and road-map for new avenues in advertising.
- Designed their new commercial website as a result, using my knowledge of HTML, CSS, word-press and CMS'.

Skills

An outline of the skills I have acquired thus far:

Research	Multi-Agent Systems, Flight Dynamics and Control, 3D Modelling & Physical Simulation, Linear and Non-linear Systems, Model Predictive Control, Machine Learning, Data Analysis
Programming	MATLAB, Python, C/C++, C#, LaTeX
Web	HTML5, CSS3, C#, Wordpress
Databases	MySQL, PostgreSQL
OS	Windows, GNU/Linux
Soft-skills	Communication, Collaboration, Leadership, Problem solving, Public Speaking, Teaching, Motivating, Networking

Peer-Reviewed Publications

During my career as a young researcher, I have made several contributions to the scientific community in the form of journal and conference submissions; these are outlined below:

Velocity Obstacle Approaches for Multi-Agent Collision Avoidance *Journal Article*
UNMANNED SYSTEMS *January 2019*
James A. Douthwaite, Shiyu Zhao and Lyudmila S. Mihaylova

A Comparative Study of Velocity Obstacle Approaches for Multi-agent systems *Conference Paper*
THE 12TH INTERNATIONAL CONFERENCE ON CONTROL (UKACC) *September 2018*
James A. Douthwaite, Shiyu Zhao and Lyudmila S. Mihaylova

An Interval Approach to Multiple Unmanned Aerial Vehicle Collision Avoidance *Conference paper*
THE 11TH SYMPOSIUM ON SENSOR DATA FUSION: TRENDS, SOLUTIONS & APPLICATIONS (SDF) *October 2017*
James A. Douthwaite, Allen De Freitas and Lyudmila S. Mihaylova

Enhancing Autonomy in VTOL Aircraft Based on Symbolic Computation Algorithms *Conference paper*
TOWARDS AUTONOMOUS ROBOTIC SYSTEMS (TAROS) *June 2016*
James A. Douthwaite, Lyudmila S. Mihaylova and Sandor M. Veres

Presentations

I have had the chance represent the university in a scientific setting, by disseminating results and giving technical presentations. A summary of these activities is below:

The 12th International Conference on Control (UKACC) *Sheffield, UK*
PRESENTER FOR WHITE PAPER SUBMISSION *Jun. 2018*

- Presented the survey article submitted to UKACC in June 2018.

The 11th Symposium on Sensor Data Fusion: Trends, Solutions & Applications (SDF) *Bonn, Germany*
PRESENTER FOR WHITE PAPER SUBMISSION *Oct. 2017*

- Gave a presentation to the sensor fusion community regarding our recent publication on optimal avoidance trajectory estimation.

10th Summer Workshop on Interval Methods, and 3rd International Symposium on Set Membership Applications, Reliability and Theory (SWIM-SMART 2017) *Manchester, UK*
PRESENTER FOR SUBMITTED ABSTRACT *Jun. 2017*

- Delivered a short demonstration of the theory being employed in our recent paper about to be submitted to SDF2017.

The 17th Annual Conference Towards Autonomous Robotic Systems TAROS 2016 *Sheffield, UK*
Presenter for white paper submission *July. 2016*

- Presented the content of the recently submitted paper of quadcopter modelling and control using symbolic procedures.

Teaching

I have also pursued numerous roles in order to gain experience as an active representative of the University of Sheffield. An outline of my various teaching responsibilities is seen below:

Undergraduate and postgraduate module facilitation roles:

Engineering You're Hired (EYH) Project Facilitator *University Of Sheffield*
Module Facilitator *Jan. 2018*

- Responsible for individually delivering course material to a class of 2nd year students for the duration of the EYH project week 2018.
- Furthered my skills in hosting presentations, providing feedback and evaluating student performance.
- Received excellent feedback from the students both following and during the week.

Global Engineering Challenge (GEC) Project Facilitator *University Of Sheffield*
Module Facilitator *Jan. 2017*

- Students entering year their first year in STEM programs participate in the GEC week.
- Guided a class of 40 students through material on project management, design processes including learning how to present their work.
- All students successfully completely their introduction to the university, citing having enjoyed the weeks activities and it's delivery.

Engineering You're Hired (EYH) Project Facilitator *University Of Sheffield*
Module Facilitator *Jan. 2017*

- Responsible for delivering course material to a class of 2nd year students for the duration of the EYH project week 2017.
- Students participate in group projects, give presentations and finally submit reports to be evaluated.
- Developed my skills in public speaking, delivering content and effective communication.

Graduate teaching assistant roles:

Module: ACS330 Group Project *University Of Sheffield*
Graduate Teaching Assistant (GTA), **Module Coordinator:** Dr. Jonathan Aitken *Nov. 2017*

- Students completing their final year projects on providing a automated solution resembling an assembly process.
- Acted as a representative for technical questions on the objective, Linux, Arduino and interactions with packages in ROS.
- Provided hardware help for students and problem solving support in group sessions.

Module: ACS324 Aircraft Dynamics & Control *University Of Sheffield*
Graduate Teaching Assistant (GTA), **Module Coordinator:** Prof. Lyudmila S. Mihaylova *May. 2016*

- Students completing the flight laboratory course study the flight dynamics of a real-life flight test at Cranfield University.
- Provided feedback for students submitting their reports for the module.
- Gained professional experience in evaluating and marking coursework in the presence of prominent deadlines.

Undergraduate and postgraduate project co-supervision roles within the Department of Automatic Control & Systems Engineering (ACSE):

2018-2019	**Project co-supervisor (Master's thesis),** Zeyu Shi, **Project:** *Collision avoidance within multi-agent systems.*	*M.sc. student (1)*
2017-2018	**Project co-supervisor (Master's thesis),** Qimeng Wang, **Project:** *Collision Avoidance using a 3D velocity obstacle formulation* Qinxin Xai, **Project:** *Simulation of multi-agent systems for collision avoidance*	*M.sc. students (2)*
2016-2017	**Project co-supervisor (Master's thesis),** Nijat Ibrahimov, **Project:** *Collision Avoidance with teams of UAVs*	*M.sc. thesis (1)*
2016-2017	**Project co-supervisor (Bachelor's thesis),** Nayden Yurukov, **Project:** *Application of the YOLO algorithm for the purposes of conflict detection*	*B.sc. student (1)*
2015-2016	**Project co-supervisor (Master's thesis),** Luke Cowan, **Project:** *Collision Avoidance of UAVs using Velocity Obstacles* Andrew Metcalfe, **Project:** *Quadcopter navigation using SLAM*	*M.Eng. student (2)*
2015-2016	**Project co-supervisor (Bachelor's thesis),** Yazan Freij, **Project:** *Control of a micro-quadcopter UAV* Jaber Kazhaz, **Project:** *Intelligent path-planning in autonomous systems* Panagiotis Belesiotis, **Project:** *Control of a micro-quadcopter UAV*	*B.sc. students (3)*

Honors & Awards

A short summary of the grants and honours i have been awarded:

GRANTS

2015-2018 **Doctorial Scholarship,** Engineering and Physical Sciences Research Council (EPSRC)

University Of Sheffield

AWARDS

2015 **"Best Institutional Research Project",** Institution of Mechanical Engineers (IMechE)

University Of Liverpool

Projects

Aside from my works at various institutions and companies I have pursued a number of personal and academic projects:

IMechE Unmanned Aerial Systems (UAS) Competition 2015
Liverpool

TEAM LEADER & AVIONICS ENGINEER
Sept. 2014 - Jul. 2015

- Participated in the first year of the challenge, with our entry SPIRO, as project outside of our studies. This followed a successful series of sponsorships from approached industrial partners.
- I took on the role as avionics engineer, responsible for the design and integration of the electronic flight systems.
- System flew on the competition day and we were presented the award for best manufactured aircraft.

3D Printing (Custom Delta System, Prusa Mendel Mk3)
Sheffield

PERSONAL PROJECT
Nov. 2012 - PRESENT

- Have being designing and building 3D printing hardware for several years now, for 3D printing, laser engraving and Cartesian plotting.
- Projects originally conceived to better future projects by creating more sophisticated tools.
- Gained expertise in practical problem solving, robotics, 3D design and rapid proto-typing.

Quadcopter Control Test-bed
Sheffield

PERSONAL PROJECT
Sept. 2016 - PRESENT

- Designed and developed a number of quadcopter aircraft for experience and experimentation.
- Implemented several control techniques applied during my Ph.D.
- An active pursuit to improve my knowledge on UAS systems, embedded systems, Raspberry Pi and Arduino.