Joshua Elsdon

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www.researchgate.net/profile/Joshua_Elsdon/

EDUCATION

Imperial College London *October 2014 - May 2019*

PhD in Robotics, James Dyson Foundation Scholar

Summary: Development of shared control handheld robots with Augmented Reality (AR) feedback for spraying applicaitons. Design,construction and evaluation of multiple prototype robots with different degrees of freedom.

Topics: Augmented reality, online path planning, human robot interaction, shared control, position estimation

Thesis: Shared Control for Hand-Held Robots.

Publications: Augmented Reality for Feedback in a Shared Control Spraying Task, ICRA 2018
Head-Mounted Augmented Reality for Explainable Robotic Wheelchair Assistance, IROS 2018
Augmented Reality Instructions for Shared Control Hand-held Robotic System, ICRA Workshop 2018
Assisted Painting of 3D Structures Using Shared Control with a Hand-held Robot, ICRA 2017
Total citations = 64. More details, videos and pre-print copies can be found at www.elsdon.io/research/

Supervisor: Professor Yiannis Demiris, Personal Robotics Lab.

Imperial College London *October 2010-2014*

MEng in Electronic and Electrical Engineering - 1st class

Thesis project: Tool path generation for 5 axis 3D printing. Award won: Eric Laithwaite Prize for Innovation.

Key modules: Optimisation, Predictive Control, Stability and Control of Non-Linear Systems.

EXPERIENCE

Microsoft Mixed Reality September 2019 - Present
Senior Software Engineer (March 2021), Software Engineer II (Sep 2019) *Zurich, Switzerland; Redmond WA USA*

· **Technical lead of "Moving Platform Mode" on HoloLens 2.** Press release, Technical Docs.

. Lead technical development of a large feature from incubation to release. Worked across organisations to ship successfully on a tight timeline, with demanding customers.

. Delivered public facing lecture to developers, driving a virtuous feedback loop between internal product team and external developers. *"HoloLens in Vehicles: Moving Platform Mode"*, Microsoft Developer, YouTube.com

. Developed and maintained key industry partner relationships (European auto manufacturers)

. Have developed software that works across all levels of abstraction within Hololens (User, API, Driver, ASIC etc)

Patents:

. Pending: Tracking in a moving platform US20220375105A1

. Three further patents are submitted in the fields of: signal filtering, mixed reality map management, motion characterisation.

· **Incubated Novel Marker Technologies.**

. Proposed and defended multiple novel methods of LED marker design and detection.

. Constructed electrical/mechanical/software prototypes to demonstrate marker features, accelerating decision making.

. Marker types: Synchronous coded LEDs with base-band tracking; Low SNR long-range LED markers; Semi-passive time domain coded markers for permanent installation with small batteries.

Elsdon Engineering - *Portfolio available at www.elsdon.io/portfolio/* December 2011 - 2020
Freelance Prototyping Engineer *London, UK*

· Contracts primarily consist of lab automation and aides, including designing and building robotic apparatus and custom rapid prototyping tool sets.

· Independent development of projects for education in robotics and wearable electronics for potential commercialisation.

Key clients:

1. London Centre for Nanotechnology: layer-by-layer nano-coating robot, (paper)
2. Polymer and Composite Engineering group (PaCE): Carbon fibre tow management robot.
3. Rheon Labs: Direct from granules large format elastomer 3D printer.

Bespoke Robotics Tutoring June 2015 - September 2018
Freelance Tutor *London, UK*

- Developed extensive curriculum of advanced robotics and circuit design content for highly ambitious 13-17 year olds.
- Confidence in my work was shared by Imperial College London, as I was personally recommended to work with a VIP donor, whom I worked with for 2 years.
- Demonstrated ability to transfer enthusiasm, client invited me to provide residential teaching while the family travelled.

Imperial College Robotics Society October 2012 - October 2017
Positions held: President, Chief Lab Manager, Sponsorship officer. *London, UK*

SKILLS

Software Development

- C++ (Advanced, 9 years experience) also confident with Python (5 years).
- Experienced with practical implementation on Xtensa multi-core embedded systems.
- Practical experience implementing extensions to Windows drivers/APIs/DDIs etc.
- Designed hardware accelerated code (OpenCL) for simulation-in-the-loop path planning algorithms.
- Experienced in the use of ROS (Robotic Operating System) (4 years) including integration with custom, low level hardware.
- Proficient user of Linux and Windows operating systems.

Sensor Specification and Characterisation

- Holistic insight in sensor selection, including IMU, cameras etc.
- Extremely comfortable extracting detail from data sheets and proposing circuit level implementations.

Coordinate Systems, Kinematics, Mathematics

- Confident in the mathematics necessary for describing kinematic systems.
- Daily interaction with complex Kalman Filters used in object tracking.

Circuit Design

- Experienced in independently specifying and executing electronic designs.
- Experience with fine pitch SMD packages, flexible PCBs, custom shaped electrical potting.
- Knowledge of power optimisation, including projects that operate at under 1μA.
- Extensive use of STM32 parts and the associated libraries.
- Proficient with Altium products, primarily use KiCAD personally.

Key projects: Ultra small mobile robot platform, Ultra low power clock in wedding ring format, LED marker demos.

Robotic Design, Repair and Maintenance

- All my research work has taken place on custom hardware, allowing for novel concepts to be explored.
- Provided long term repair and modifications on custom robotics for clients, with the longest serving robot being used since 2011 continuously. (last confirmed Summer 2019)
- Assisted with the maintenance of intricate robots, such as the 54 degree of freedom ICub humanoid robot.
- Supported post-doctoral researchers and graduate students in their research by assisting their hardware development, including robotic wheelchairs, customised grippers and low level electronic interfaces.

Teaching

- Taught in a range of settings: ticketed events, private homes, university courses and robotics society organised events.
- Travelled internationally, including robotics sessions taught in Italy, and advanced origami sessions delivered in Japan.
- Developed custom robotics with students using their specifications, demonstrating flexibility and confidence in design work.
- Finalist in university wide 'Best Graduate Teaching Assistant'.

Subjects taught: Robotics, circuit design, electronics engineering (national syllabus and custom), origami.

Rapid Prototyping / Computer Aided Design

- Highly competent user of 3D printing, CNC milling and laser cutting in a wide range of materials.
- Quick turnaround design and testing routinely used in employment, contract work, research and independent projects.
- Proficient in Autodesk CAD software, some experience with Solidworks and FreeCAD.
- I have designed customised rapid prototyping equipment.

Prototyping innovations: First 5 axis FDM 3D printer, direct from granules large format elastomer printer.

REFEREES

Salim Sirtkaya. Tracking Lead, Microsoft Mixed Reality, Redmond; Current manager. (Email Removed)

Prof. Marc Pollefeys. Director of Mixed Reality and AI Lab, Zurich; Manager 2019-21. (Email Removed)

Prof. Yiannis Demiris. Director of the Personal Robotics Lab, Imperial College, PhD supervisor. (Email Removed)