Rik Williamson

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Education

University of Sheffield — Master of General Engineering (Mech) Predicted: First July 2024

- Studied Mechanical, Electrical, Systems & Control, Civil, Software and Aerospace engineering, providing a foundation for cross-functional collaboration and holistic problem-solving
- Combined breadth with a mechanical engineering specialization (Years 3 & 4), developing strong technical skills for in-depth problem-solving while retaining the flexibility to pursue interests across diverse engineering fields.

City of Norwich School — A-Levels: AAAB - Maths, Physics, EPQ, Chemistry June 2019

Projects

Thin-film Process Control and Optimisation with Reinforcement Machine Learning Oct 2023 – Present

- Developed a Deep Learning Neural Network to model a slot-die thin-film manufacturing process and applied Reinforcement Learning for control and optimisation using Python (ongoing dissertation)
- Developed proficiency with time-series LSTM Neural Network models, practically applying them to create a simulation environment for a Reinforcement Learning controller
- Gained experience training neural networks with realistic experimental data, whilst avoiding over-fitting

Design and prototyping of Fighting Robot to Compete in a National Tournament June 2023

- Designed a high torque, high resolution robot drive system using BLDC motors and belt driven gear reduction, whilst remaining within strict packing constraints and ensuring ease of disassembly
- Developed custom performance test rigs and procedures for stall torque and velocity reversal to fine-tune electronic speed controller programming and evaluate situation specific performance
- Created a professional engineering report detailing overall robot design, legal and standardisation concerns, quality management procedures as well as marketing and sustainability considerations
- Led group meetings, delegating tasks to group members while setting up frameworks for effective collaboration by avoiding duplicate work through time-efficient, focused meetings

Custom-PCB for embedded system Habit Reminder device Nov 2023 – Present

- Independently designed and prototyped a custom PCB using KiCad based on a bare ESP32 C3 module alongside studies, applying electronic design fundamentals to reduce noise and ensure device stability
- Researched and selected optimal components using datasheets, balancing cost, availability and performance while improving proficiency reading technical documentation
- Created firmware in C++ using Object Oriented Programming; integrating external ToDoist APIs, an NTP Client, Webserver, OLED display, NeoPixel LEDs and physical user input

Non-Linear FEA Model for new and aged Engine Mounts Nov 2023

- Created a non-linear FEA model for a multi-material elastomer-hydraulic engine mount, incorporating a novel strategy to account for geometric changes due to aging, resulting in improved accuracy
- Validated results against experimental data, critically analysing discrepancies and limitations in both FEA and experimental techniques
- Proposed design recommendations based on results, taking into account manufacturing and budgetary constraints, as well as the impact of material aging on performance

Autonomous MAV Aerofoil Specification and Optimisation Nov 2022

- Proposed an optimal aerofoil profile and aspect ratio for an electric MAV, meeting design requirements (speed, mass, wing area) through XFoil simulations and analytical validation

- Evaluated trade-offs between lift, drag, stability and maneuverability, selecting NACA profiles to achieve application specific performance goals
- Considered manufacturing constraints associated with thin and long low-drag aerofoils, researching wing spar manufacturing methods and similarly scaled air craft wing spans to determine feasibility

Backwards Step Numerical Simulation CFD analysis May 2023

- Built a CFD model to accurately represent the backwards facing step experiment, choosing an appropriate turbulence model through consideration of accuracy given specific flow dynamics
- Justified use of pressure-based solver and the Coupled algorithm through consideration of simplifications to terms in the Reynolds Averaged Navier Stokes equation and computational limitations
- Developed a MATLAB program to parse through raw experimental data and produce all required figures, allowing for rapid model development without figure re-formatting and insertion

Experience

Web Development Intern, Rent4Sure — Norwich July 2016

- Developed and published a News section for the main production site with PHP and SQL without prior knowledge of either language, solving problems through research of language fundamentals
- Worked effectively in a team, taking into account requirements of designers, management and marketers

Sales Assistant, Evans Cycles — Norwich Sep 2017 – April 2019

- Advised customers on the purchase of high-end road and mountain bikes tailored to individual use cases
- Developed efficient communication skills, approaching customers and developing rapport quickly

Skills

Design Tools: Fusion 360, KiCad

Simulation and Analysis: Ansys Fluent, Ansys Mechanical, XFoil

Languages: Python, C++, MATLAB, Java, PHP, SQL

Hobbies/Interests

Cycling: Competed in Downhill Mountain biking, commute by bike and explore with a Gravel bike

Climbing: Competed in Bouldering, placing 1st in several regional competitions. Continue to climb recreationally indoors and outdoors with frequent trips to the peak district to boulder

HomeLab: Maintain a local network, with a type-1 hypervisor virtualising multiple linux servers, a docker host, and a network file share

FPV Drones: Learned to Build, fly and maintain various form-factor FPV drones, learning PID tuning, BLDC motor drive optimisation and battery specification depending on thrust requirements