Rik Williamson

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Education

University of Sheffield – Master of General Engineering (Mech) Predicted: First		July 2024
City of Norwich School – A-Levels: AAAB - Maths, Physics, EPQ, Chemistry		June 2019

Projects

Thin-film Process Control and Optimisation with Reinforcement Machine Learning

- Developed a Deep Learning Neural Network to model a slot-die thin-film manufacturing process and used Reinforcement Learning for control and optimisation (on going)

Open-source hardware Habit Reminder

- Independently developed custom PCB using KiCad based on a bare ESP32 C3 module alongside studies
- Specified components using data sheet attributes, taking into account availability, cost and performance
- Created firmware in C++ using Object Oriented Programming; integrating external ToDoist APIs, an NTP Client, Webserver, OLED display, NeoPixel LEDs and physical user input

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

- 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
- Designed custom performance testing setups for stall torque and velocity reversal to fine-tune ESC programming, ensure component suitability and evaluate situation specific performance
- Created a report detailing overall robot design, legal and standardisation concerns, data management, quality management, marketing and sustainability

Non-Linear FEA Model for new and aged Engine Mounts

- Created a non-linear FEA model for a multi-material elastomer-hydraulic engine mount
- Developed mesh refinement studies to determine most computationally efficient areas of geometry to refine whilst retaining sufficient model accuracy
- Validated results against experimental DIC, discussing reasons for discrepancies and limitations of FEA models as well as experimental uncertainty arising from Imaging techniques
- Proposed design recommendations based on results, taking into account manufacturing and budgetary constraints, as well as changing material properties due to age

Autonomous MAV Aerofoil Specification and Optimisation

- Proposed an optimal aerofoil profile and aspect ratio for an electric Autonomous MAV, given a design specification detailing speed, mass and wing area using XFoil and analytical techniques
- Compared Lift and Drag with Angle of Attack for varying NACA profiles and made recommendations balancing conflicting requirements for stability, maneuverability and aircraft range
- 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

- 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 Developer 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 with production database, observing strict data privacy policies
- Worked effectively in a team, taking into account requirements of designers, management and marketers

Skills

Design Tools: Ansys Fluent, Ansys Mechanical, Fusion 360, KiCad, 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