GERICO VIDANES

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OBJECTIVE

Applied researcher and computational engineer interested in developing technology to enable and accelerate STEM.

SKILLS

Machine Learning, Geometric Deep Learning, Python, C++, Linux, CAD, data science, git, mathematical modelling, Microsoft Excel

Research communication – writing and presentation.

Teaching communication – writing, lecturing, and one-on-one.

EXPERIENCE

PHD CANDIDATE

September 2021 – Present
University of Southampton – Rolls-Royce UTC for Computational Engineering & Design.

Researching the application of geometric deep learning to the interface between computer-aided design and computer-aided engineering / manufacturing. Developing communication and requirements analysis from close ties with industry sponsor.

Extensive use of Python– PyTorch and PyG for deep learning; Pandas, Polars, NumPy, and H5py for data handling and analysis. Some C++ for interfacing with Siemens NX and UGOpen.

One publication so far in '*Computer-Aided Design*' journal – '*Extending Point-Based Deep Learning Approaches for Better Semantic Segmentation in CAD*'.

Supporting the delivery of the 'Systems Design and Computing' module involving Arduino, electronics, and C++.

SIMULATION AND MODELLING ENGINEER

September 2019 – June 2020
Undergraduate placement at MBDA UK.

Worked in a team to develop hierarchical numerical models for system performance assessment, using MATLAB, Simulink, and C.

Received 'Reward & Recognition Award' for work done towards meeting a key model delivery milestone during the COVID-19 pandemic.

EDUCATION

MASTER OF AEROSPACE ENGINEERING - 2021

Queen's University Belfast

First Class Honors – highest mark in 4th year and overall.

Dissertation – '*Computational methods for generating distorted inlet boundary conditions for use with a CFD framework*'. Developed enabling technology with Python and OpenCV with some experience with SU2 simulation software.

Group Design Project – Design, manufacture, and testing of a 7kg autonomous fixed wing aircraft for a humanitarian aid mission. Aerodynamics team lead. Part of avionics, autonomy, and image recognition team. Involved extensive pitching of designs to judges.

NOTABLE PROJECTS

Neural Networks in Siemens-NX – C++ / Python

- Implemented the point-based NN approach from my PhD directly into the NX CAD environment using PyTorch/libtorch and NX UGOpen C++ APIs. Integrated into an existing proprietary RR C++ codebase.
- Supported running inference of a saved model trained in Python and serialized with TorchScript.
- Supported online learning directly in C++ from part currently open in the GUI.

Data Handler DLLs – C / MATLAB

- Implemented a DLL for a background process to be queried by a MATLAB/Simulink model for data, to replace MATLAB structures. This significantly reduced memory and computation overhead.
- Designed the data structure and implemented in C. C-Mex and S-Function code was also written for interfacing between the DLL and the MATLAB/Simulink model.
- Changes were integrated into the model which was delivered to the customer.

6 DoF Missile Dynamics Modelling and Simulation – MATLAB / Simulink

- A significant restructure was done to modularize an existing model plus additional functionality, in both the Simulink structure and the MATLAB code.
- The model simulated the trajectory of the body due to forces: passive aerodynamics from shape and changing atmosphere, active control aerodynamics, inertia, and thrust. Stage separations were also modelled. An active control system implementation was already present.

Virtual SwirlGenerator – Python

- Toolkit for creating arbitrary swirling inlet boundary conditions for use with a CFD framework (SU2).
- Swirl could be defined by superimposing multiple discrete vortices. The code also had the capability to translate contour plot images (from papers) into velocity values for the boundary condition.
- Some boundary layer modelling was also done to reduce the need for a buffer region to allow it to develop in the model.
- Code and technical report are available on github: https://github.com/GericoVi/virtual_swirlgenerator

Fixed Wing UAV

- Part of a team which designed, built, and flew a 7kg, 2.1m wingspan RC UAV with a 2kg payload – given constraints from a competition mission profile.
- A Pixhawk controller was also present. An autonomous waypoint mission was successfully flown.
- I designed the 'lifting body' fuselage and the main wing, and performed CFD analysis for cruise and take-off, accounting for the spinning propeller. I was also heavily involved in payload design. The payload container completed the aerodynamic shape of the fuselage, deployed a parachute, and absorbed impact.
- A camera system was also part of the requirements, for detection of a ground target. I wrote a Python algorithm for computing the target's GPS location given its position in the image and the aircraft's position and attitude. This ran on a Raspberry Pi inside the aircraft.