

QUB - Mechanical and Aerospace Engineering PhD Project 2019-2020

Title: Biohaviour: Novel geometric modelling methods for 3D printing bioinspired designs.	
Project description:	
<p>Biohaviour (biohaviour.com) is a bioinspired design system created and developed in QUB. It aims to observe the rules nature uses when designing the world around us, and to capture these in a system where they can be applied to engineering design problems. It is envisaged that by doing so it will be possible to design and manufacture innovative products, free from the constraints imposed on the designs of today by existing design processes.</p> <p>There are currently two Biohaviour projects ongoing, investigating different aspects of this exciting area and contributing to the research which feeds into this exciting system. We are seeking an enthusiastic person to join the team. Current CAD systems (e.g. Solidworks and CATIA v5) were primarily developed for preparing manufacturing drawings and are not optimised for the bioinspired design system being investigated in Biohaviour. We would like to recruit a PhD student who will investigate what geometric modelling approaches should be used in Biohaviour to represent the resulting designs, and how the parameters being defined by the design system are reflected in, and are able to control, the geometric model of the design that is created. For the most successful approaches which are identified their applicability to advanced manufacturing approaches which Biohaviour aims to exploit (e.g. 3D printing) will be evaluated.</p> <p>In this PhD project the appropriateness of a range of different geometric modelling approaches (e.g. digital geometry, level sets) will be evaluated for this application, along with tests on the different methods of parametrisation that can be applied to each. The most appropriate approach will be implemented in a prototype framework where it will be controlled via the bioinspired rules being researched by other members of the team.</p>	
Aims and Objectives:	
<p>The aim is to determine the most effective geometric modelling approach for Biohaviour.</p> <p>The objectives are to:</p> <ul style="list-style-type: none"> - Identify the different geometric modelling approaches that are available - Identify the different parameterisation strategies that can be used with each geometric modelling approach - Evaluate the different geometric modelling approaches in terms of their ability to be adapted as part of a bioinspired design system - Evaluate the different geometric modelling approaches in terms of their ability to be manufactured using innovative manufacturing approaches - Prepare a prototype geometric modelling environment for use in biohaviour 	
Key skills required for the post: Interest in geometric modelling, interest and aptitude for programming	
Key transferable skills that will be developed during the PhD: Project management, Knowledge of Design systems, advanced knowledge of CAD/CAE.	
Lead supervisor:	Dr Trevor Robinson, t.robinson@qub.ac.uk
Other supervisor(s):	Prof Mark Price, Dr Declan Nolan.
Guaranteed stipend:	Approx. £14,925
Conditional top-up available:	To be discussed
PhD students in the School have the opportunity to apply to be demonstrators on undergraduate modules. Compensation for this can amount to in excess of £2,400 per year.	

Queens University Belfast is a diverse and international institution which is strongly committed to equality and diversity, and to selection on merit. Currently women are under-represented in research positions in the School and accordingly applications from women are particularly welcome.