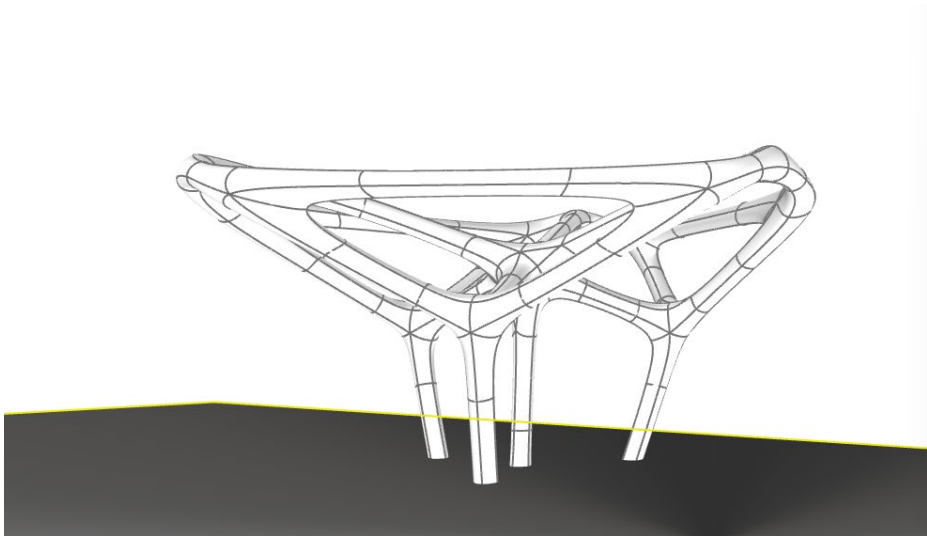
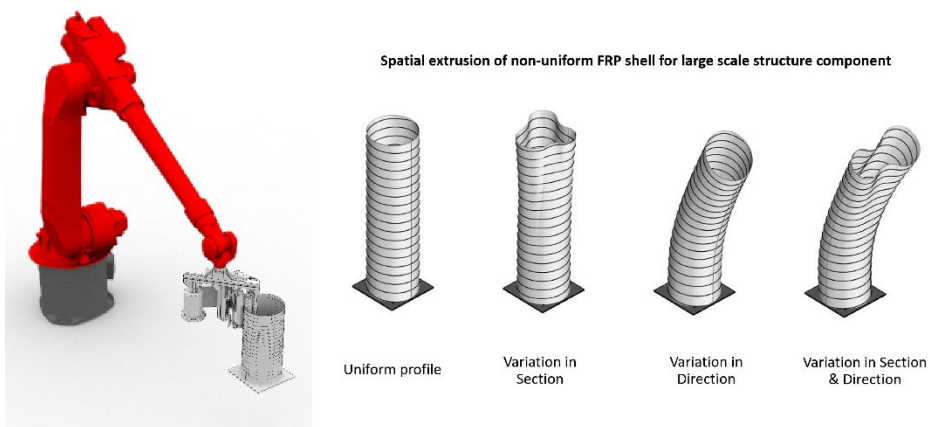


UQ Summer or Winter Research Project Description

Please use this template to create a description of each research project, eligibility requirements and expected deliverables. Project details can then be uploaded to each faculty, school, institute, and centre webpage prior to the launch of the program.

Project title:	Robotic FRP fabrication with a customized non-standard geometry
Project duration, hours of engagement & delivery mode	4 weeks <i>Onsite</i>
Description:	<p>Recent studies on topology optimization have found that material efficiency can be significantly improved by using irregular sections to replace the conventional sections in some structural members. The optimized structures are also tended to be with changing cross-sections along the member span or height, such as the tree-like structure used at the Qatar National Convention Centre and the Art Nouveau Apartment by Flying Concrete in San Miguel De Allende Mexico. FRP is found to be a promising material for the irregular profiles because of its high flexibility. However, as above mentioned, conventional manufacturing techniques have their limitations on irregular shapes</p> <p>The fabrication method proposed to investigate is developed inspired by the novel hybrid double-skin tubular arch bridge system developed in UQ, in which prefabricated FRP tubes are used both as formworks for concrete casting and as reinforcement to construct a hybrid bridge structure.</p>  <p>Based on this system of construction, our research is introduced to explore the potential to use robotic technology for robotic fabrication of structural members with greater formwork flexibility to reduce the cost of transportation and to increase the material and structural efficiency of the building structure.</p>

	 <p style="text-align: center;">Spatial extrusion of non-uniform FRP shell for large scale structure component</p> <p style="text-align: center;">Uniform profile Variation in Section Variation in Direction Variation in Section & Direction</p>
Expected outcomes and deliverables:	<p>Scholars may gain skills in basic industrial robot control, non-standard geometry design optimization, robotic fabrication path planning, prototype fabrication experience.</p> <p>The scholars are expected to deliver an adaptive path planning for robotic fabrication with non-standard FRP tube geometry. Design and fabrication of a joining system between robotic fabricated subassemblies will also be required. A final customized concrete-filled FRP tube prototype will be fabricated if applicable.</p> <p>There will also be an opportunity to generate publication based on the prototype geometry design pattern and the robotic fabrication method.</p>
Suitable for:	<p>This project is open to senior undergraduate and master students with a background of civil engineering or architecture. One for civil engineer and one for architecture are preferred.</p> <p>Students owning previous experience with FRP/concrete or rhino/grasshopper will be in higher priority. The students must gain access to the structure lab and industrial robotic arm by completing all relevant inductions before the research program.</p>
Primary Supervisor:	<p>Dan Luo</p>
Further info:	<p>Dan Luo d.luo@uq.edu.au Please contact the supervisor prior to submission</p>