

3D generated wing models improving aerodynamics of micro vehicles



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Researchers have prototyped and experimentally analysed a bio-inspired wing to improve the aerodynamic performance of future micro vehicles for use in security, traffic or disaster management.

Investigating the complex micro-sized corrugations found on a dragonfly wing, postdoc researcher Dr Nasim Chitsaz, from the University of South Australia has used a non-destructive photogrammetric method to record the corrugations and characteristics of 80 different dragonfly wing 3D models from regions around the world.

The collection was made available to Nasim through the South Australian Museum and her efforts have generated a publicly available, unique digitised dataset to support further research in insect ecology.

Capturing the exotic aerodynamic surface shapes from her wing collection, Nasim compiled and reconstructed 3D models of several of the wing designs. She learned computational fluid dynamics to analyse her models and discovered one species was best suited for a micro vehicle.

Nasim fabricated several wings and, following her supervisor's advice, compared the accuracy of her 3D generated wing models using micro X-ray Computer Tomography (XCT) equipment available through the South Australian

Node of the Australian National Fabrication Facility (ANFF-SA).

"I would not have been able to validate and publish my novel photogrammetry method without using ANFF-SA's micro-XCT," said Nasim. "Comparing my reconstructed 3D model against ANFF-SA's micro-XCT imaging confirmed my model is accurate and reliable and I am truly grateful for ANFF-SA's assistance."

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**Dr Nasim Chitsaz,
postdoc researcher,
University of South Australia**

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Nasim was trained by ANFF-SA's professional and friendly staff and she says easy on-campus access, low-cost and flexibility were amongst the many positive advantages of working with the ANFF-SA team.

"Having access to ANFF-SA was crucial especially when I needed to be

on campus for my other experimental work. If I had to go to other facilities, the efficiency of my work would have been severely affected."

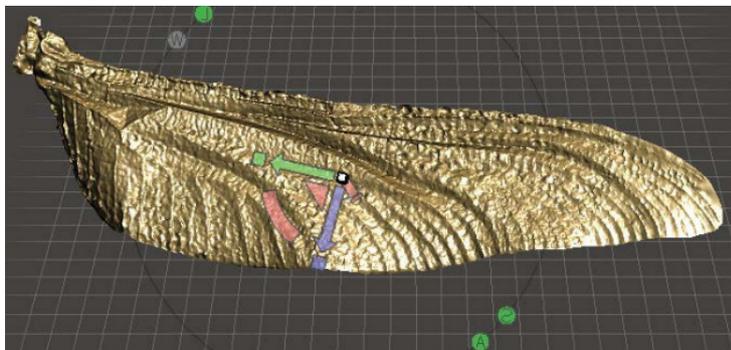
After validating her 3D generated wing models, Nasim flew to Canada to investigate the flow around her fabricated bioinspired wings, with experimental analysis demonstrating a substantially improved aerodynamic performance and higher lift to drag ratio compared to references to existing models in the literature.

Acknowledging further work is required to optimise her model for a more complete aero-structural analysis, Nasim is excited to be contributing meaningfully to her field of research and the application opportunities a flexible and maneuverable micro vehicle could support.

Co-located at the University of South Australia and Flinders University, ANFF-SA specialises in microfluidics, organic electronics, biomaterials, novel semiconductor materials and characterisation.

Providing leading-edge research capabilities, equipment and expertise, ANFF-SA is an open access facility for researchers, academics and industry which supports excellence in world-class science research and collaboration.

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Three dimensional reconstruction of a Petalura Ingentissima hindwing.

South Australian Node of the Australian National Fabrication Facility

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