Announcing the Final Examination of Nicholas Fernandez for the degree of Master of Science

Time & Location: November 1, 2019 at 3:00 PM in ENG-2 202-A
Title: Structural Analysis of Morphing Wings

Many natural flyers and marine swimmers can morph their wings during a number of unsteady maneuverings. With such wing morphing they are able to control the unsteady aerodynamic forces. A number of man made flyers, such as unmanned aerial vehicles and micro air vehicles, fly in comparable Reynolds number range, but they are yet to acquire similar morphing capabilities as natural flyers or swimmers. Moreover, the knowledge of fluid structural interaction (FSI) of such morphing wings is not well developed. Hence there is a need to investigate the FSI of morphing wings. In this thesis, a morphing wing was designed and its FSI was investigated. The wing was designed with the help of advanced 3D printing and the morphing capabilities utilized servo driven actuators. The design enabled the wing to execute spanwise bending, twisting and combined bending and twisting during a number of unsteady maneuverings. In the present work, the effect of gradual acceleration on the resultant unsteady forcing was investigated. FEA simulations were performed in order to gauge the response of the wing in different scenarios. A flat plate wing was towed in a 6-m-long towing tank and force data was collected using a 6-dof force sensor. With this method of morphing, future experiments can be performed for different unsteady cases. The analysis performed in this thesis will also be helpful in understanding more complex FSI problems applicable to morphing wings.

Major: Mechanical Engineering

Educational Career:
Bachelor's of Mechanical Engineering, BS, 2017, University of Central Florida

Committee in Charge:
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Jeffry Kauffman, Professor
Nina Orlavskaya, Professor

Approved for distribution by Samik Bhattacharya, Committee Chair, on October 14, 2019.

The public is welcome to attend.