The ultimate goal of this work is to understand where and when CFD is useful for design of undulation based propulsion. This question has been heavily studied for aircraft design but not as vigilantly in the context of bio-inspired propulsion. Common outputs of previous studies have shown that high-fidelity numerical methods tend to be too costly in terms of time and that low fidelity methods can be used in lieu of high fidelity CFD for problems operating in the quasi-steady time domain. However, undulation based propulsion is clearly an unsteady mechanism which requires higher fidelity modeling methods to accurately predict performance. It is here that our main investigation takes place to determine how well high fidelity numerical simulations fare against lower order modeling methods. First, a verification and validation approach with respect to experiments is presented to establish simulation accuracy. Secondly, parametric studies are conducted on simplified undulating bodies to gain more understanding behind the fluid physics associated with undulating propulsion. Finally, a moment based approach is used to further interpret undulation-based propulsion performance.

Major: Aerospace Engineering

Educational Career:
Bachelor's of Aerospace Engineering, BS, 2018, The Pennsylvania State University

Committee in Charge:
Michael Kinzel, Chair, MAE
Samik Bhattacharya, UCF MAE
Andrew Dickerson, UCF MAE

Approved for distribution by Michael Kinzel, Committee Chair, on March 20, 2020.

The public is welcome to attend.