AYODEJI BODE-OKE

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PROFESSIONAL SUMMARY

- Proactive engineer with 5 years of experience using computational modeling and simulation to investigate bio-inspired mechanical systems.
- Strong problem solver, excellent team player, and builder of prolific collaborations, evidenced by 13 scientific co-authored publications.
- Self-motivated individual with a bias for project ownership and adaptability to new workflows, delivering high-quality results in an innovative environment.

EDUCATION

University of Virginia (UVA)
Ph.D. Mechanical and Aerospace Engineering - 'Unsteady aerodynamics and mechanics of force generation in insect free flight' 2019
B.S. Aerospace Engineering 2015

SKILLS

TECHNICAL: Physics based modeling, CFD, Multi physics simulation, FEA, Experimental design, CAD, First-principles, Problem formulation, Data analysis, HPC
TOOLBOX: Fortran, MATLAB, Vicar3D (CFD research code), Python, C++, Tecplot, MAYA, Solidworks, Unix
COURSEWORK: Fluid Dynamics, CFD, Heat Transfer, Thermomechanics, FEA, Mechanics of Materials, Flight Dynamics, Aerospace Design
SOCIAL: Oral and written communication, Leadership, Project management, Collaboration, Adaptability, and Organizational skills

EXPERIENCE

National Science Foundation and Air Force Office of Scientific Research (UVA), Aug. 2015 - Aug. 2019, Dec. 2019 - Current
PhD Candidate, Research Associate
- Initiated 8 projects, developed experiments and designed simulations to investigate flight physics and aerodynamics of 4 different biological fliers.
- Encoded motion data from 200K images captured during experiments into CAD models leveraging 3D image reconstruction.
- Performed physics analysis using CFD and low order models, created FORTRAN and MATLAB codes to quantify kinematics and simulation data, automated workflow with bash scripts, and visualized results with Tecplot.
- Discovered novel aerodynamics generalized across species, and clarified body dynamics influence on modulating wing aerodynamics and function to enhance maneuverability during different flight modes (takeoff, turns, forward and backward flight).
- Authored 8 publications, delivered 8 technical presentations and secured 2 grants, improving collaborative, project management, and communication skills.

Office of Naval Research - Multi University Research Initiative (UVA), *Graduate Researcher* Jan. 2016 - Jan. 2018
- Improved 3D reconstruction method for deformable structures and developed codes to extract data from swimming animals for simulations.
- Investigated the hydrodynamic efficiency of prosthetic propulsors in improving the performance of swimmers with damaged flukes.
- Developed kinematics and propulsor models to clarify physics regarding wake breakdown and optimal shape resulting in 4 publications.

Flow Simulation Research Group (UVA), *Research Intern* June 2013 - April 2015
- Designed experiments, capturing 20K images from 20 flight maneuvers to investigate body dynamics adjustments through airframe morphing.
- Modeled insect as a 2-link dynamic system in MATLAB, posing optimization problem to minimize energy expenditure.
- Discovered similar postures from experiments and optimization results which showed 30% energy savings benefits, resulting in 1 publication.

PROJECTS

Computational Simulation of the Unsteady Aerodynamics of Insect Flight Aug. 2015 - Aug. 2019
- Simulated flight maneuvers on HPC clusters, and showed for the first time, evidence of upstroke lift production in low Re flight, to enhance maneuverability.
- Elucidated facultativeness of wing function and aerodynamics and its dependence on body motion during maneuvers resulting in 4 publications.

Computational and Experimental Optimization of Foil Shapes for Efficient Unsteady Propulsion May 2018 - June 2019
- Developed codes for bio-inspired kinematics and shape parameterization models (Singular Value Decomposition and Class Shape Transformation) using data from UIUC airfoil database and integrated them into in-house CFD code with gradient-based optimizer.
- Authored 2 papers showing shapes that minimized unsteady drag by 15% and enhanced efficiency by 30%, validating simulations with experiments.

Modeling Body Configuration and Deformation Effects on Dynamic Stability of Bio-Inspired Aerial Systems Oct. 2015 - June 2016
- Modeled bio-inspired flier as a multi-body system and derived equations of motion accounting for body deformation and variable mass.
- Showed that body deformation only, without wing input, modulates dynamic stability by modifying moments of inertia and stability derivatives and introducing inertial torque, resulting in 1 publication and 1 presentation.

Optimized Body Deformation During Aerial Maneuvers of Bio-Inspired Aerial Systems Nov. 2014 - March 2015
- Developed new method for estimating the moment of inertia of an irregular and deformable shape with high accuracy via infinitesimal slicing.
- Modeled body dynamics as a 2-link multibody, and constructed optimization problem to investigate the role of airframe morphing in flight maneuvers.
- Showed energy savings benefits (up to 30%) due to airframe morphing and published findings in 1 publication, winning 2 awards for publication.

Design of a Four-Place All-Electric General Aviation Aircraft Aug. 2014 - April 2015
- Designed batoid inspired electric aircraft concept with distributed propulsion, for 2020 operation, publishing thesis for NASA competition.
- Performed stability analysis, body design, and control surface sizing using analytical methods, CFD, and CAD, iterating with propulsion/performance teams.

AWARDS

Scott Award for Research Excellence in Fluids Mechanics and Related Areas - *University of Virginia* April 2019

Zarem Award for Distinguished Achievement in Aeronautics - *American Inst. of Aeronautics and Astronautics* Aug. 2015