

UAS EDUCATION SUMMIT

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Virginia Modeling Analysis & Simulation Center
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Old Dominion University

Unmanned Systems Training

Possible View of Space

- ▣ Traditional vs. Specialized
 - Engineering/Computer Sci
 - Pilot/Operator
 - UAS specific curriculum
- ▣ Focus areas
 - Vehicle Operator
 - System Manager
 - User
 - Designer
- ▣ Cyber security is embedded in all



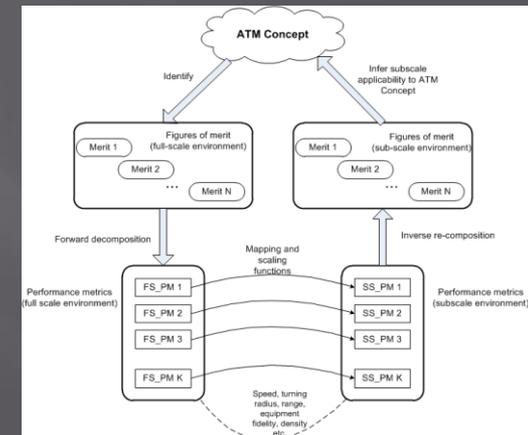
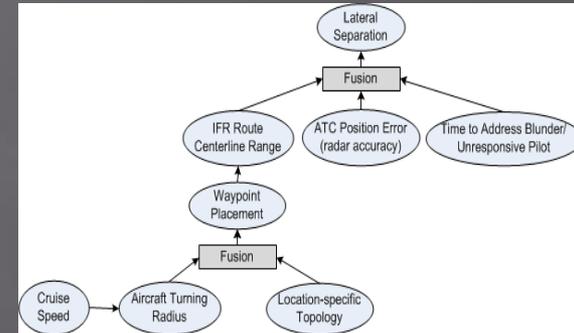
Old Dominion University

- ▣ Majority of colleges participate in some form of UAS/UMS
- ▣ Focus areas
 - UAS Designer – basic R&D
 - UAS System Manager
 - UAS User
- ▣ Cyber security emphasis independent of UAS
- ▣ ODU is member of MAAPS
- ▣ Close ties to US Navy warfare centers
 - Emphasis on unmanned/autonomous boats

Dr. Yiannis Papelis

Virginia Modeling Analysis & Simulation Center

- Use of UAS as proxies of full scale transports for studying NextGen concepts (NASA Sponsored)
- Human-Robot interaction using non-traditional interfaces
 - Focusing on eye-tracking & possibly EEG
 - Student thesis on use of eye-tracking for robot control



Classes & Laboratories

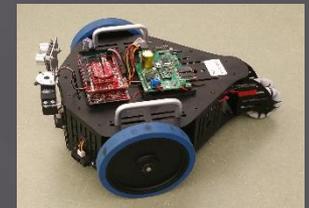
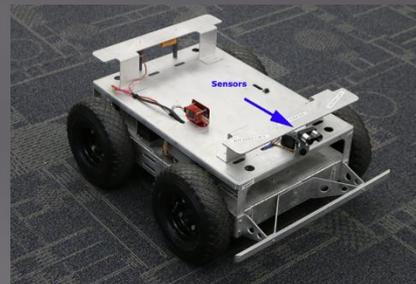
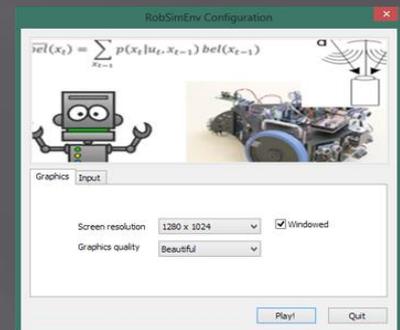
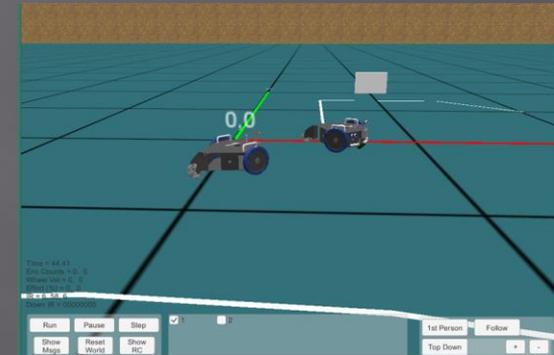
Modeling Simulation & Visualization Engr. Dept.

- Classes
 - MSIM 463/563 “Modeling & Simulation of Autonomous Robotic Systems”
 - Covers traditional robotics content with emphasis on using simulation for performance characterization
 - Students develop algorithm on real robots and simulation environment

□ Laboratory Facilities

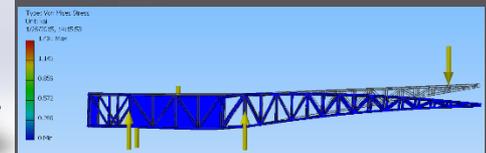
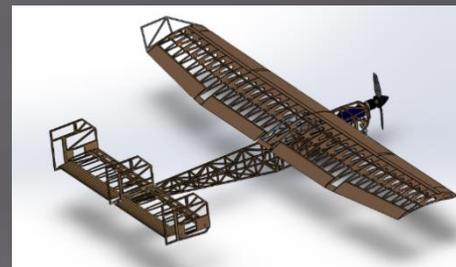
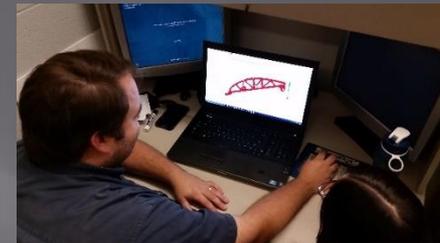
“Unmanned Collaborative Systems Lab”

- Ground robots / research focuses on interfaces, collaboration



Dr. Drew Landman Mechanical & Aerospace

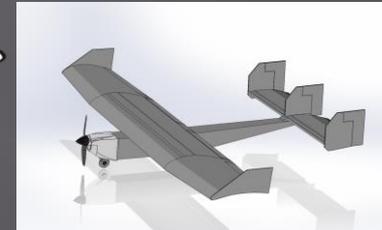
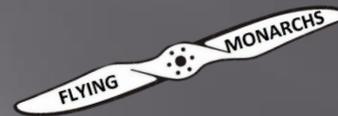
- Unmanned & Autonomous System Lab
 - 3D solid modeling in Inventor or Solidworks
 - Aerodynamic prediction with VLM and viscous codes
 - Flight data recording, in flight video
 - Aircraft inertia measurement rig
 - Jig and fixtures for precise wing and fuselage building
 - Full woodworking suite of tools
 - Laser cutter due in April 2016
 - ODU Lab Support
 - Low-speed wind tunnel testing
 - Propeller/motor test stand
 - CNC machine shop
 - 3D Printing
 - Shopbot CNC routin



Lab Project Support

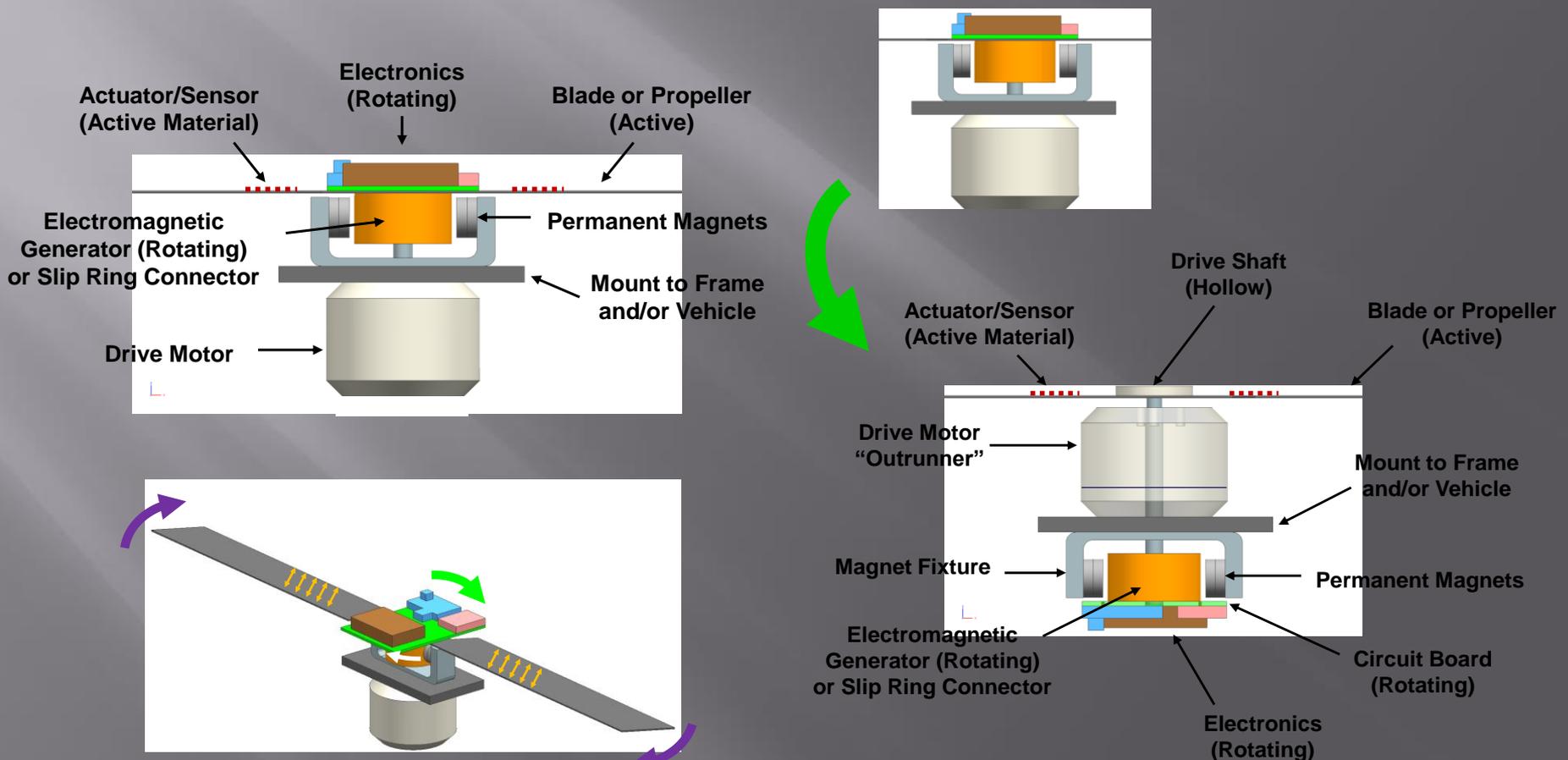
▣ SAE Aero-Design East Project

- International competition
75 universities
- Students design and build an RC aircraft as “Intro to UAV design”
- Objective is to maximize payload capacity, currently lifting 20 lbs.
- Limited size and electric power, 1000 W maximum



Drs. Thomas Alberts/Onum Bilgen Mechanical & Aerospace

UAS R&D – Solid-State Rotor/Propeller/Turbine Blade

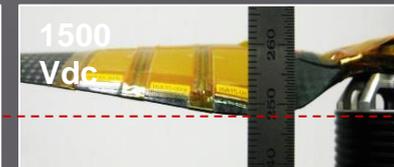
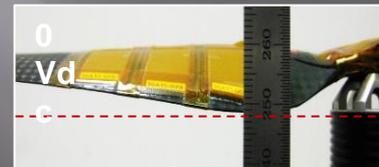


Activities

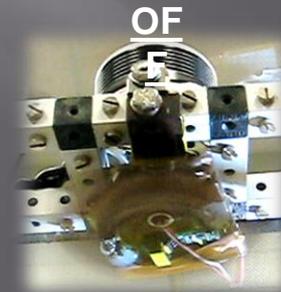
- ▣ Fabricated & tested
 - ▣ Response to static excitation shows 3.6% thrust increase



**PIEZOCOMPOSITE
BLADES:**



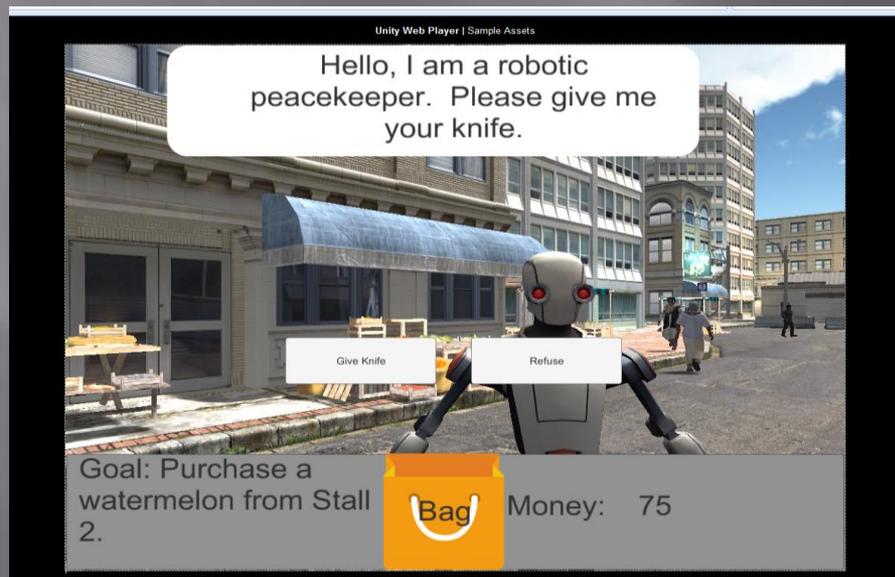
**ELECTROMAGNETIC
GENERATOR and WIRELESS
RX/TX:**



- ▣ Dr. Alberts facilitating class – team-taught from JMU
 - ▣ 4-VA – school consortium
 - ▣ class sharing; scheduled shared course from JMU on drones

Dr. James Bliss Psychology

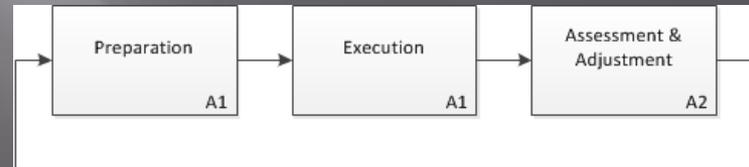
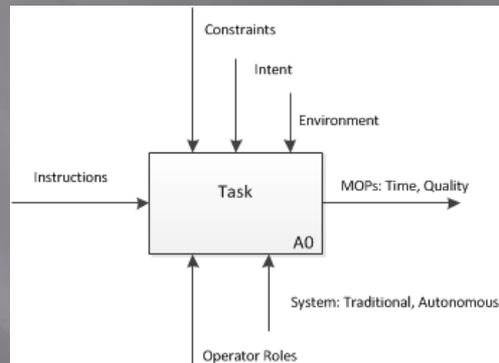
- ▣ Research on trust in human-robot interaction
- ▣ AirForce office of scientific research (AFOSR) project
“Examination of trust exhibited by members of different cultures toward robotic peacekeepers wielding nonlethal weapons”
- ▣ Multi-cultural study (US, Japan, Israel, China)



Dr. Holly Handley

Systems Engineering

- Research on human-robot interaction
 - “Designing the Changing Role of the Operator”
- Levels of system autonomy
- Human roles, team tasking, and user workflows must be designed to accommodate unexpected changes and maintain performance.

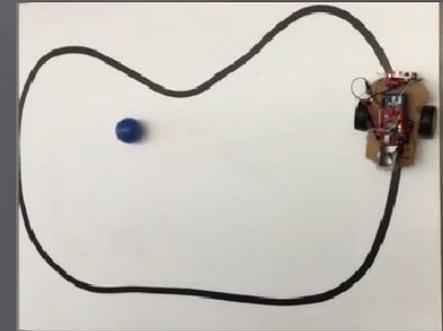
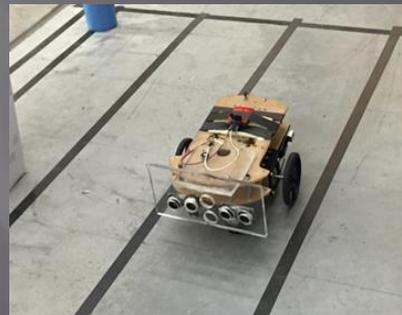


- This planned study will use both a “hand’s on” and a “hand’s off” version of an everyday appliance to determine the requirements for designing adaptable human roles.*
- The outcomes from the study can be directly applied to the Manpower, Personnel and Training (MPT) domains for autonomous systems.*

Dr. Gene Hou

Mechanical & Aerospace

- MAE/ECE 495 – Intelligent MACHines
 - Overall design and integration of an unmanned system, arduino-based.
 - Project-based, cross-departmental, senior capstone projects on UAV and ASV.
 - Topics covered, sensors, motors, batteries, hardware/software interface, communication protocols, embedded systems, system integration.
- Team of two from different department to build two vehicles to complete three projects
 - Path Tracking – Arduino programming and PID control
 - Path Tracking and Traffic Light Recognition – Computer Vision and Image Processing with openCV
 - Object Avoidance and Path Finding – Path Planning and Machine Learning



Dr. Mecit Cetin

Civil & Environmental

Transportation Research Institute

▣ Research

- Exploring use of LIDAR data from Autonomous Cars for Estimating Traffic Flow Parameters and Vehicle Trajectories
- Collect sample LIDAR data under different traffic conditions on freeways and urban arterials in Hampton Roads
- Develop algorithms to detect vehicles around a LIDAR-equipped car and classify them based on vehicle size
- Develop algorithms to track other vehicles while within LIDAR range



▣ Education

- CEE 495/595: Autonomous Vehicles and Urban Transportation
- Civil Engineering Department for the first time
- Covers the transportation and traffic engineering aspects of the urban transportation problem & impacts and implications of the advancement of autonomous vehicles and driver assist technologies



Summary

- ▣ ODU faculty actively engaged in activities supporting UAS workforce development
 - Current focus is Designer/System Manager/User
 - There have been some efforts towards formalizing support for operator training, outreach

- ▣ Thank you