New Initiatives of the Autonomous Systems Lab

Mark Patterson, mrp@vims.edu

• New approach to exploring the deep sea
• Roboboat 2011 - Virginia Beach
• AUVSI North America 2011
• Re-commercializing W&M’s AUV
• Frank Roberts - in memoriam
Marine science has a problem

- Ocean changes faster than we have the ability to observe
- HMS Challenger (1872) sail, stop, dip, repeat
- Most data are undersampled, a problem known as aliasing
The Deep Sea: the final frontier

Benefits:
- Understanding biodiversity
  - drug discovery
- Geological hazard survey
- Understanding climate change
- Resource protection
  - oil & gas
  - mining
Problems with current technology = short visits, high costs
NDE Lab Mark Hinders

- Walking speed robotics
- Sensor fusion
- Optical methods
- Wavelet fingerprinting
Our Vision

• Goal: Transform the exploration of the deep sea

• Method: Combine the expertise of our labs to develop a new kind of robotic swarm

• Solution: Persistent surveillance of the deep sea leading to new discoveries
Stage 1: A new kind of AUV

Need: Low probability of failure

Achilles Heels: Connectors, wire harness, penetrators, dive planes and rudders, computer crash

- wireless inside = no wire harness
- no control surfaces except rear flap
- only two connectors thru hull
- sapphire viewport = largely optical
- uses entire hull as sensor
- iPhone flight computer
- software a collection of iPhone apps
- antenna doubles as salinity sensor
Stage 2: The swarm

- NSF, ONR, NOAA, DARPA targeted funders
- Six vehicles, with energy harvesting
- AUVs provide fixes for each other while surveying
- They recharge using solar and wave bobbing
- Call home via the Iridium cell network
- Repeat for months to a year
- Eventually come home, as gliders, when high density memory (video, side scan sonar) is full
- Interest from industry
decision by Keck next month
Roboboat 2011

- www.roboboat.org
AUVSI 2011

Re-Commercializing Fetch

• “AUVs are here at last.” - ON&T
• Underwater robots in energy sector $1.27B in 2010
• All small AUVs developed in last decade acquired by defense contractors ($25-88M)
• Developing plan for re-commercialization
• Start-up could be housed in JCC Incubator
• W&M owns IP & inventory
• Business school provides student and faculty talent
• Incentivize small team to find capital
• Revenue stream during growth phase to W&M
• M&A exit strategy
Frank Roberts, CAPT, USN (ret.)

- Frank Roberts, a retired Navy captain, was the first executive director of the Hampton Roads Military and Federal Facilities Alliance, serving from 2006 to 2010. He was a 13-year member of AUVSI. Frank founded Robot Venture, a community of interest that tirelessly promoted unmanned systems, sensors, and modeling as an economic engine for Hampton Roads.
Unmanned maritime systems, though, already have a toehold – if not a footprint – here in Hampton Roads. The longest continuously operating autonomous underwater vehicle, “Fetch,” was developed right here. Its inventor lives and works here. William and Mary’s Virginia Institute of Marine Science Autonomous Systems Laboratory is heavily engaged in marine research using early Fetch platforms.
The Navy Combatant Craft Division at Little Creek leads the Navy’s autonomous maritime navigation program, which has already demonstrated totally autonomous surface vehicle operations in a force protection environment. In 2009 the Office of Naval Research and the Association of Unmanned Vehicle Systems International, or AUVSI, conducted the second annual student competition in Hampton Roads for autonomous surface vehicles. The June 2010 competition doubled in size to 13 teams from as far away as Taiwan. The fourth competition is scheduled for June 2011 in Virginia Beach.
With the above, and the presence of Department of Homeland Security, Coast Guard Sector Hampton Roads and the Virginia Port Authority, the foundation to turn Hampton Roads into a center of excellence for research, development, experimentation, manufacture and integration of unmanned systems capabilities focused on the port and harbor security mission is in place. As The Pilot editorial charges, “regional leaders should be planning, with… urgency.”