Unmanned Systems Update
SPAWAR Systems Center Pacific

Hoa G. Nguyen, Head
Unmanned Systems Branch, Code 7171
16 March 2011

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
16 MAR 2011		**00-00-2011 to 00-00-2011**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Unmanned Systems Update SPAWAR Systems Center Pacific	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **SPAWAR Systems Center Pacific,Unmanned Systems Branch, Code 7171,San Diego,CA,92152**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES
Joint Ground Robotics Integration Team (JGRIT) meeting, San Diego, CA, March 15-17, 2011

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**10**	

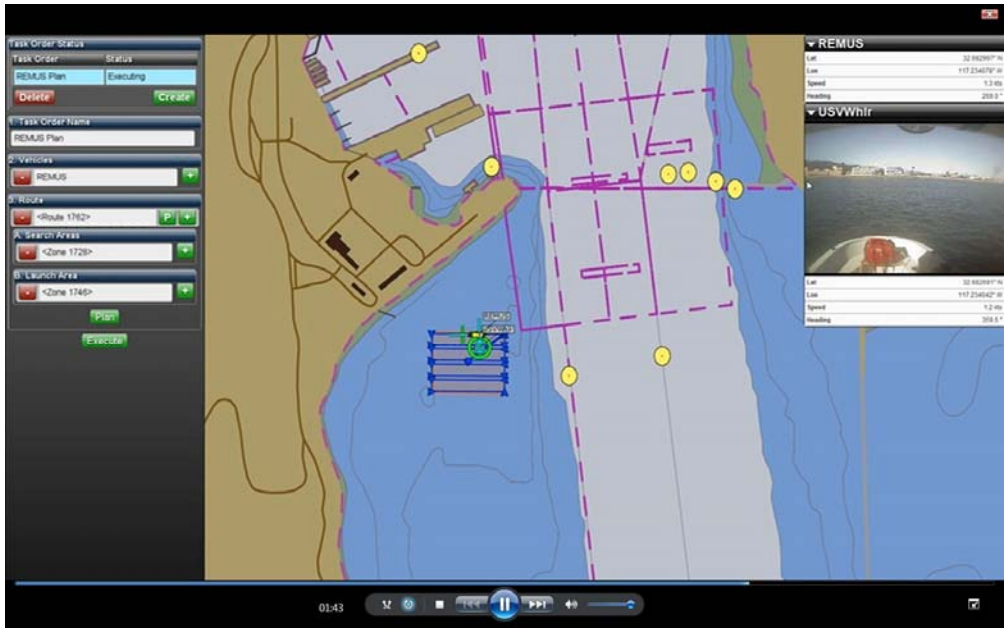
Introduction

- Unmanned Systems Branch
  - Provides robotics R&D for all Armed Services and other DoD agencies
  - 45 civilian scientists and engineers
  - Over 30 current projects

- Project updates (from last 6 months):
  - Multi-robot Operator Control Unit (MOCU): UUV integration
  - MOCU Human-Systems Interface (HSI)
  - Autonomous Capabilities Suite (ACS): EOD applications
  - Manually-Deployed Communication Relays
  - Tunnel Exploration UGV
  - Maritime Interdiction Operations UGV

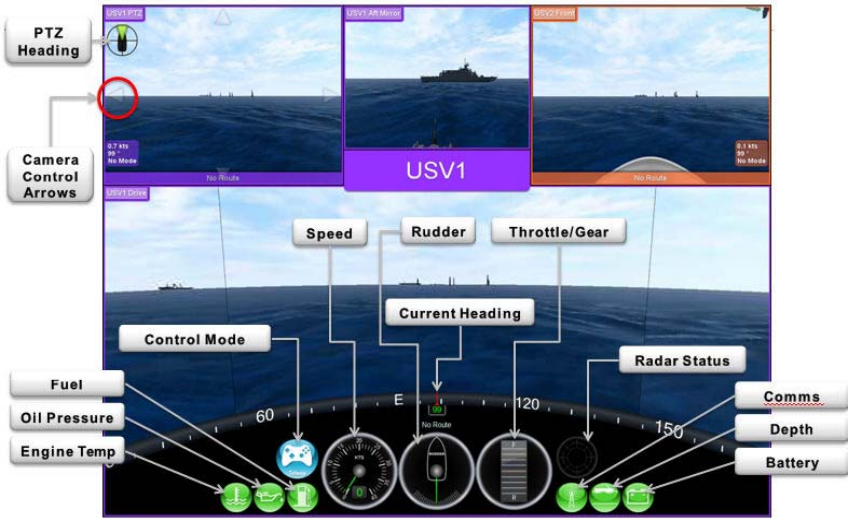
MOCU UUV Demonstration

- Funded by internal Naval Innovation Science and Engineering (aka Section 219)
- Scenario: Mine-hunting USVs deploying UUVs
- Composable ForceNet provided top-level C2
- MOCU provides low-level C2 of:
  - Remus UUV
  - Seadoo 2000 USV
  - Boston Whaler USV
- Way-point navigation (UUV performing lawn-mower mine-hunting pattern)



MOCU Human-System Interface (HSI)

- A Future Naval Capability project with transition agreement with PMS-420 for use aboard the Littoral Combat Ship (LCS) USVs
- Improves way-point navigation for current LCS USVs
- Concentrates on “muscle memory” using X-box controller
- Allows operators to navigate through simulated crowded harbors with significantly reduced stress (21% collision rate vs. 67% prev.)



ACS EOD Applications

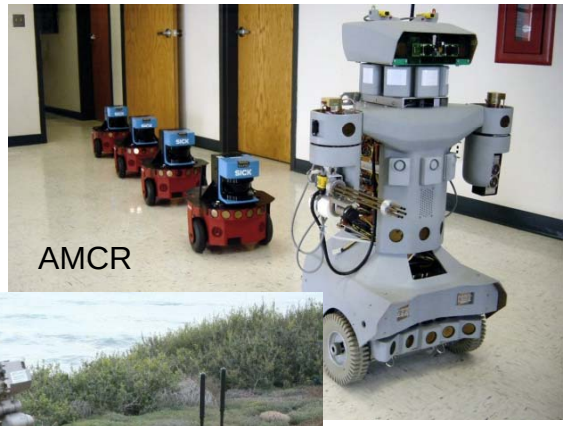
- Funded by JIEDDO to improve operation of EOD robots
- Same autonomy boxes for both PackBot and Talon
- Autonomous Capability Suite (ACS) software on both
- Implemented Extended Kalman Filter using IMU, GPS, rate gyro
- Uses 2D ladar for obstacle avoidance when available

ACS EOD Applications (cont.)

- Demonstrations:
  - Basic retro-traverse (with or w/o route optimization)
  - Retro-traverse upon loss of communications
  - Retro-traverse to rally point
  - Retro-traverse to actively moving OCU
  - Waypoint navigation
  - Tele-operation in reverse
  - Human-robot leader-follower or robot-robot leader-follower
  - Talon remote re-start
  - Ahura chemical detection
  - Plug-and-play detection of laser/Ahura/Mk I/Mk II
  - Simple installation/field servicing
  - Control PackBot from Talon OCU (running MOCU) with PackBot radio
- User demonstrations during week of March 28 at NAVEODTECHDIV, followed by in-theater testing
- Part of MTRS Improvement Program
- To be incorporated into AEODRS (part of the Autonomous Behavior Module)

Manually-Deployed Relay Nodes

- Response to JUONS CC-0412
  - Extend range between robot and OCU
  - Allows non-line-of-sight operations
- Off-shoot of AMCR/ADCR/APDS
- CREW test at China Lake 9/2010
- Targeting:
  - PackBot 500 EOD (MTRS Mk 1 Mod 0)
  - PackBot 510 (MTRS Mk 1 Mod 1, FasTac)
  - PackBot 310 (SUGV, MiniEOD)
- 10 systems to be delivered in July for CONUS and in-theater testing


AMCR

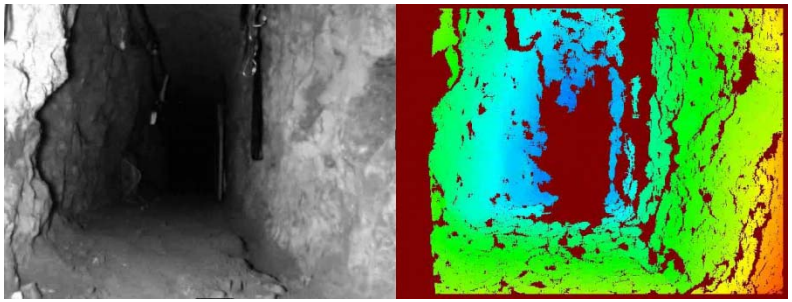

ADCR


APDS

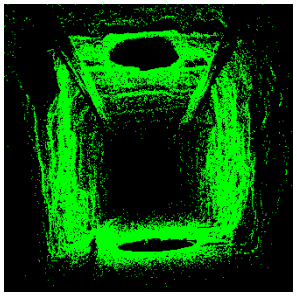
Tunnel Exploration UGV

- Objectives:
  - Can be inserted and retrieved through 8” borehole
  - Can travel 400m and localize with less than 1m error
- Joint AFRL/SPAWAR effort (2010-2014):
  - AFRL: UGV, borehole insertion apparatus
  - SPAWAR: Localization, mapping, characterization
  - Localization: real-time 3D SLAM (2011-2012)
  - Characterization: 3D modeling (post processing)

GDRS



JPL



CMU

SARCOS

Maritime Interdiction Operations UGV

- Goals:
  - Identify desired features and specifications for MIO UGVs
  - Develop prototype meeting those specifications
- Market survey completed. Six systems lined up for Navy/USMC VBSS evaluations:
  - Span spectrum of size, weight, functionality
  - ODF Eyeball, MacroUSA Armadillo, Recon Scout, Omnitech Toughbot, Prototype A, Prototype B (to be unveiled at NDIA GRCC)
- RFP for follow-on 9-month development effort to be issued in April/May




SPAWAR Systems Center PACIFIC

For further information, contact:

Hoa G. Nguyen
hoa.nguyen@navy.mil
619-553-1871

QUESTIONS?