Unmanned Systems Update
SPAWAR Systems Center Pacific

Hoa G. Nguyen, Head

Unmanned Systems Branch, Code 7171

16 March 2011

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)
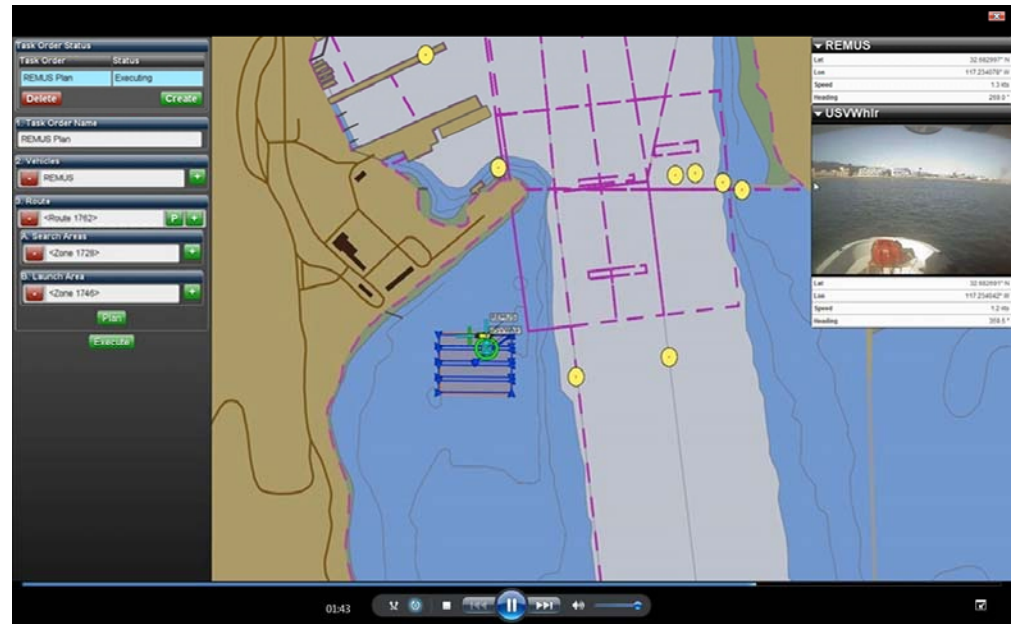
MOCU Human-System Interface (HSI)

▼ 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.)
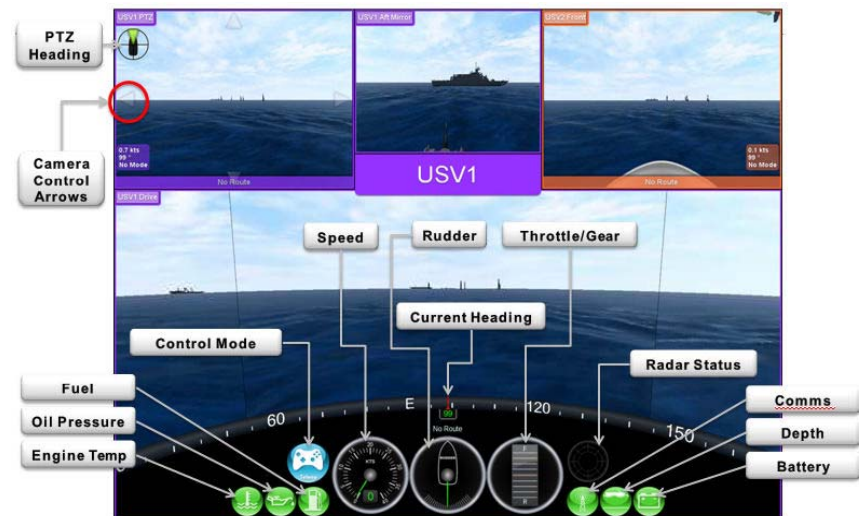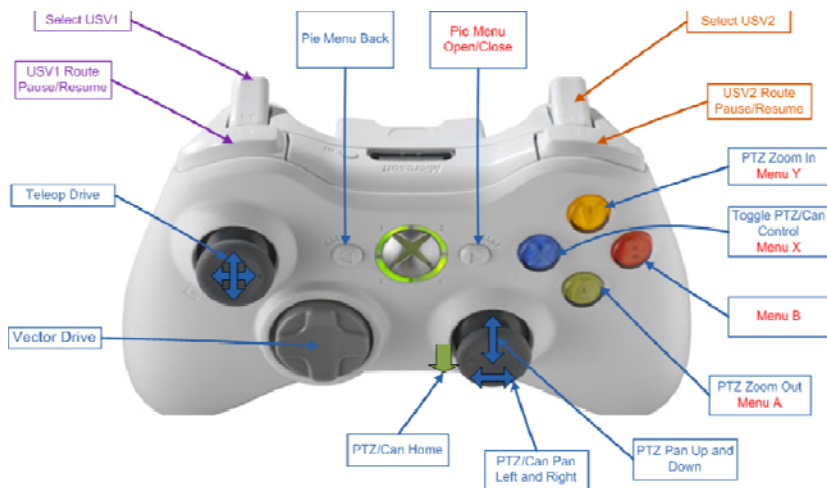
ACS EOD Applications

▼ 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
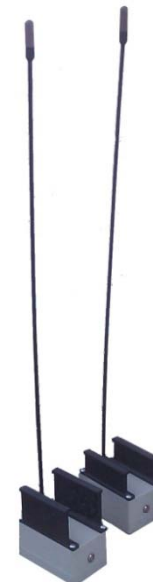
Tunnel Exploration UGV

▼ **Objectives:**

- Can be inserted and retrieved through 8" borehole
- Can travel 400m and localize with less than 1m error
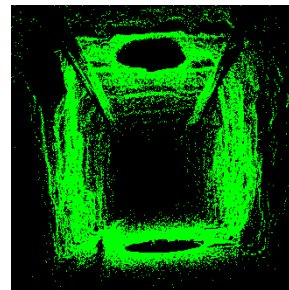
▼ **Joint AFRL/SPAWAR effort (2010-2014):**

- AFRL: UGV, borehole insertion apparatus
- SPAWAR: Localization, mapping, characterization
- Localization: real-time 3D SLAM (2011-2012)
- Characterization: 3D modeling (post processing)

GDRS
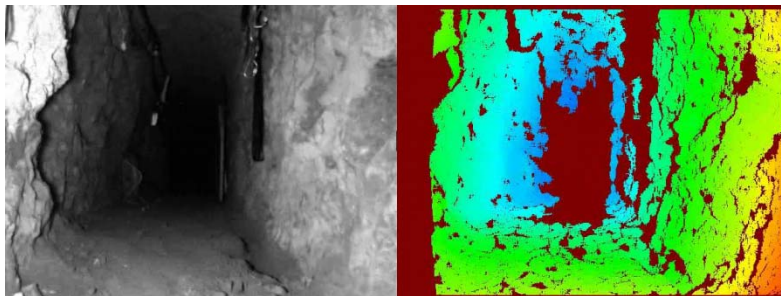
JPL   CMU   SARCOS

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
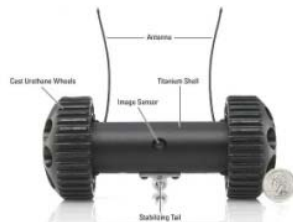
For further information, contact:

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

QUESTIONS?