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CRUSER Technical Reports

2018-04-18

Education: Robotics and Autonomous Systems

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NAVAL POSTGRADUATE SCHOOL

CRUSER

Education: Robotics and Autonomous Systems

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Overview

Current Programs

- Diverse set of robotics mission-oriented courses across NPS
- Short courses and tutorials. Developed in collaboration with SSC PAC

Under Development

- Robotics certificate
- Sustainable course offerings to support workforce needs

Multi Robot Control

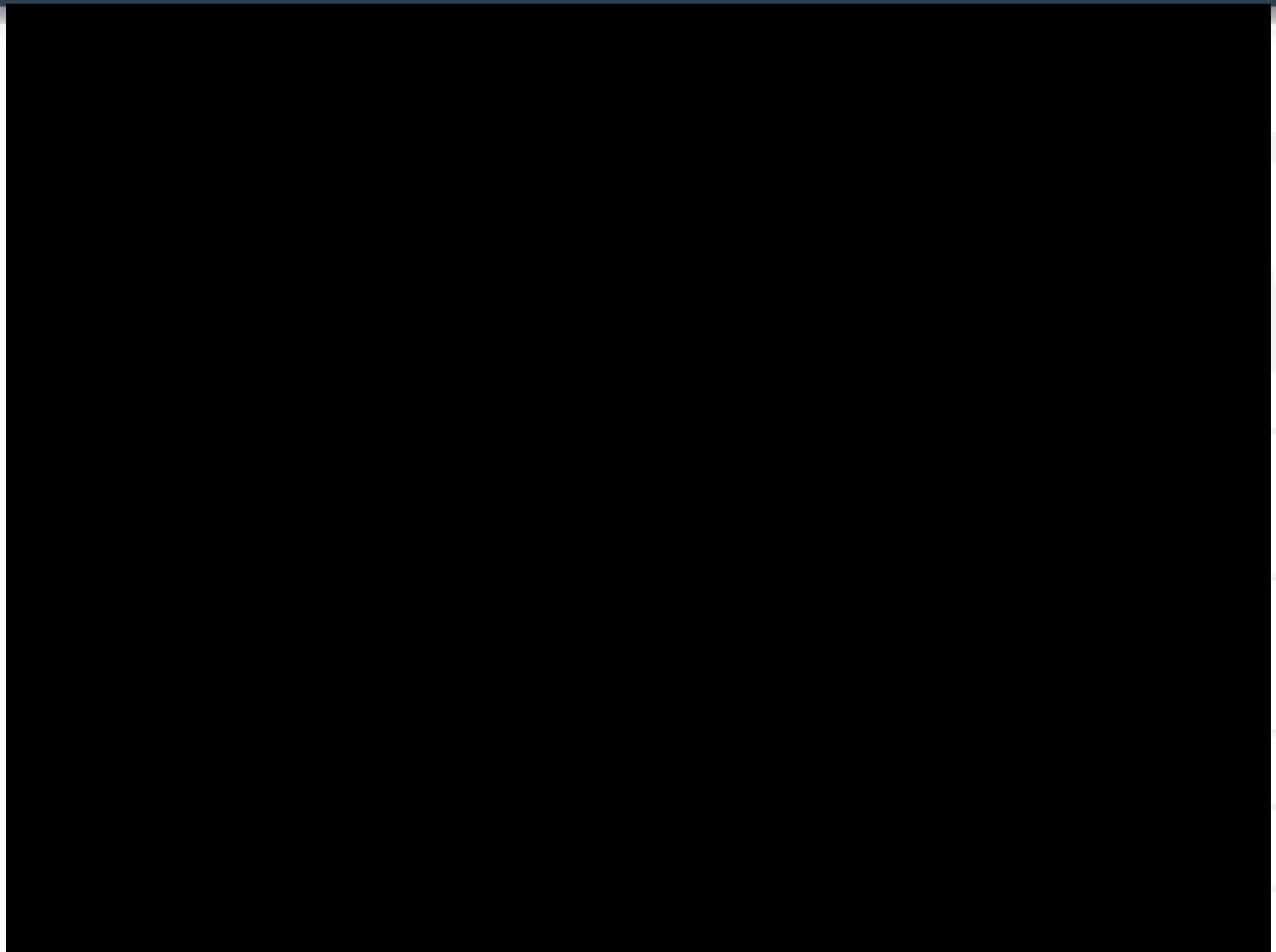
On Campus Course: ME4823

- ~15 students from MAE, PH, SE, ECE and CS
- Goals:
  Provide students with modern tools: Linux+ROS+Git
  Design challenge: autonomous “mine” hunting

- Outcomes:
  Students have a toolkit for completing a thesis in robotics

- Note: Not directly funded by CRUSER

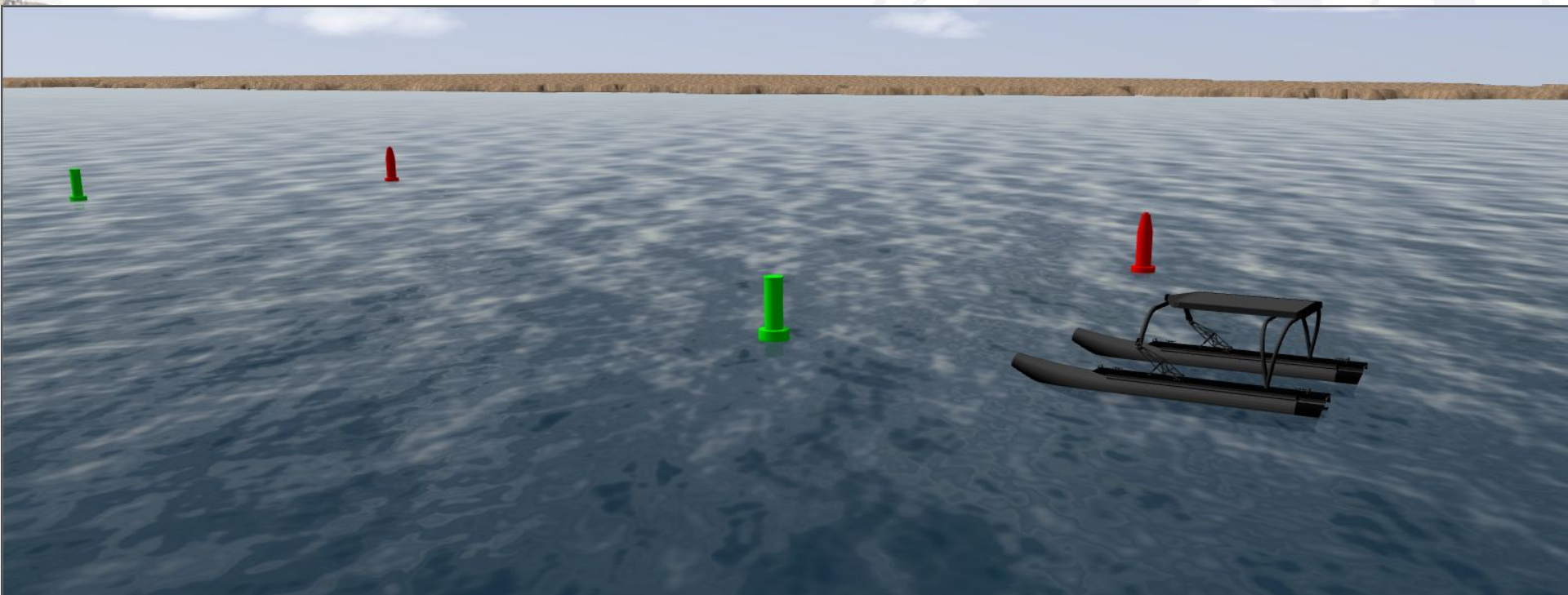
Final Project



NAVAL POSTGRADUATE SCHOOL

SSC PAC Short Course

- Champion: Mike Tall
- Compress 12-week course to 3-days
- Pilot: CoIL; Deployment: Cloud
- Expose practicing engineers to new tools and capabilities
- Variable student backgrounds
- Content: Linux+ROS+Git, with focus on sensor integration



Robotics Certificate

Goals

- Meet civilian workforce needs as a precursor to degree program (SSC, NUWC, NAWCAD/WD)
- Be specific to naval concerns
- Coordinated, cross-cutting curriculum

Preliminary Design

- Four course sequence
  - Foundations: Programming and Introduction
  - Applications: Sensor Integration and Mission Application
- Hybrid distance learning
  - Majority of course work is DL and cloud-based
  - Two, one-week hands-on laboratory sessions on campus (or at remote site)

Robotics Certificate

Four Courses: Parallel with on-campus

- Foundations
  1) AE MATLAB or CS Python
  2) ECE Introduction to robotics (math review, coordinate frames, simple control and path planning)
- Applications
  3) MAE Multi-Robot Control (ROS, multi-robot theory and practice, mission-based design challenge)
  4) Sensor Integration

Implementation

- $2.7-3.2K per course + lab fee
- Participants support their own travel
- Lab weeks (on campus or remote) every other quarter

Next Steps

Customer Feedback

- Continue to assess how NPS can support DoD/DoN civilian workforce

Organization

- Create certificate program
  - Funding model
  - Academic structure (transfer credit, etc.)

Sustainability

- Finding the right mix of instructional modes
- Allowing maximum flexibility with cloud-based tools