

Autonomous Underwater Vehicle Team 2011-2012

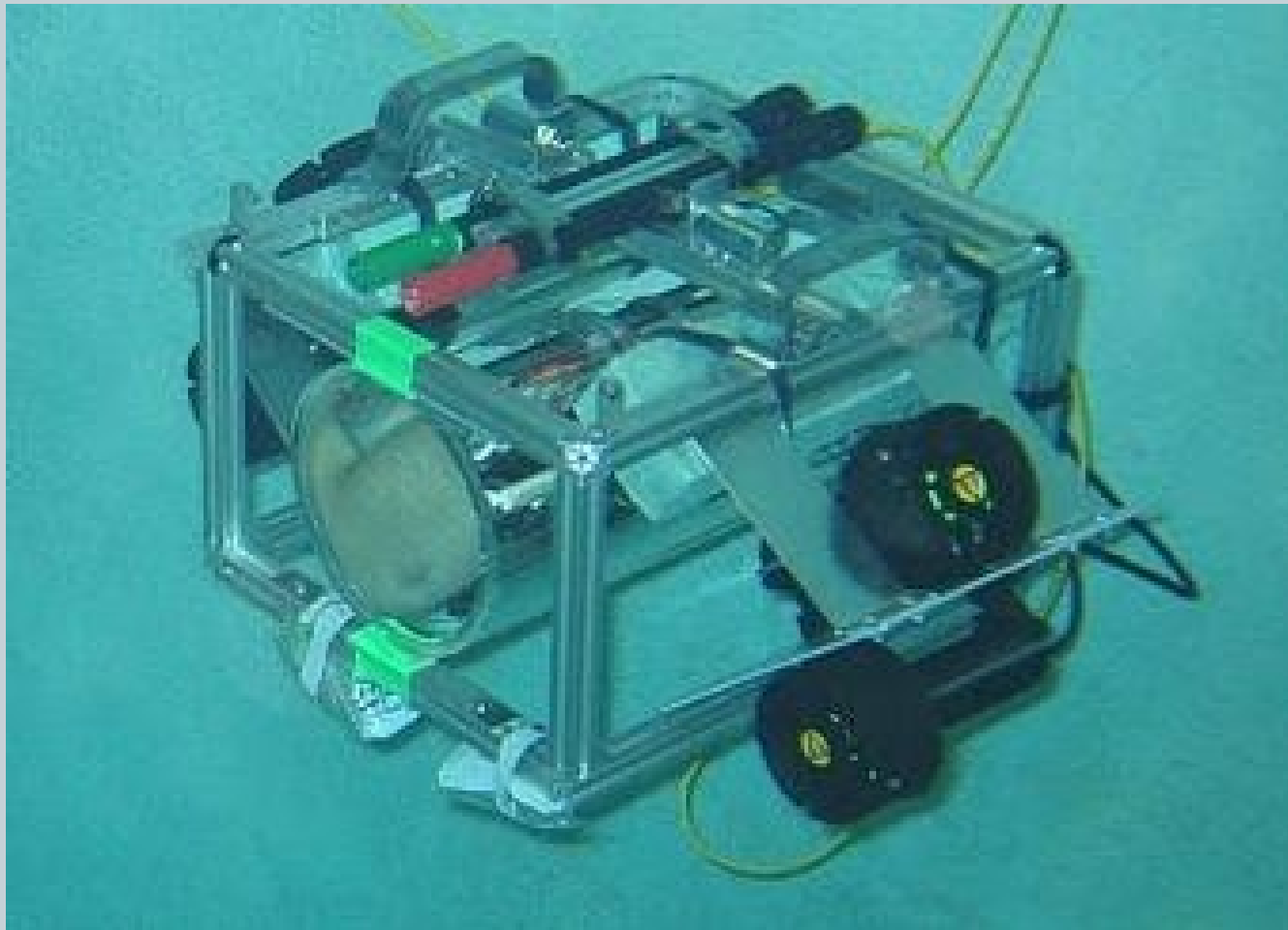


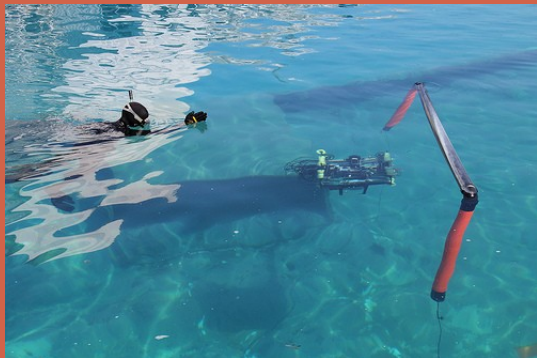
**Team Captain:
Madison Farruggia**

**Sub-team Leaders:
Shawn Furrow, David Gayman, Chelsea Mancuso,
Erin Mazza, Logan Sturm**



Our Vehicle: Mako





RoboSub Competition

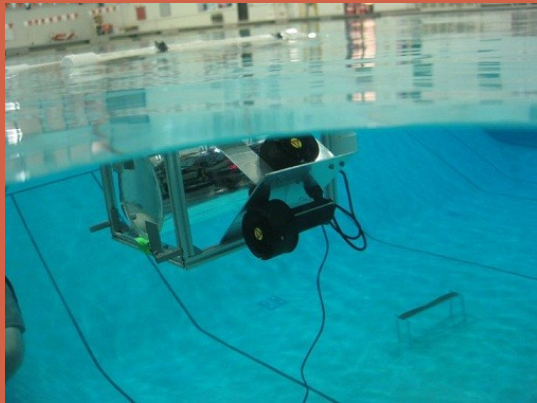


Event located at Naval Systems Warfare Center TRANSDEC, San Diego, CA



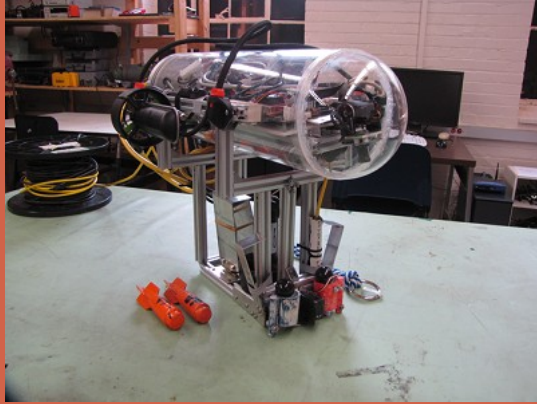
RoboSub Competition

- Hosted by the Association for Unmanned Vehicle Systems International (AUVSI) and Office of Naval Research (ONR)
- Underwater obstacle course:
 - Validation gate
 - Path following
 - Buoys
 - Drop challenge
 - Torpedo target
 - Operation
 - Object retrieval



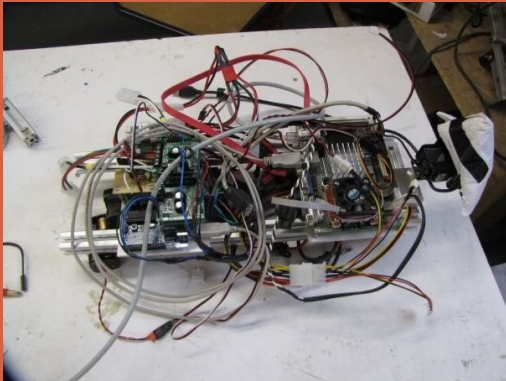
Mechanical Design

- Four thrusters
- Small, lightweight vehicle
- Modular – able to attach variety of external mechanisms and sensors
- Central hull mounted to an aluminum frame
- Single endcap – fewer seals increases reliability against leaks



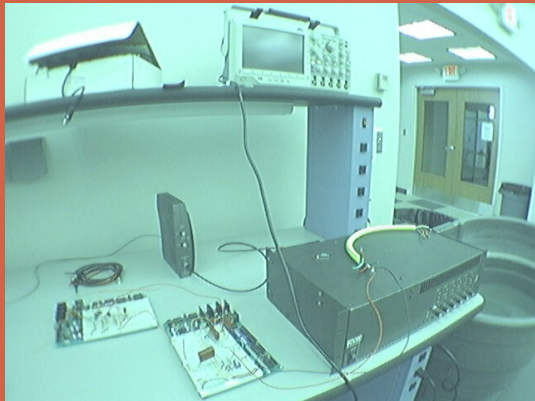
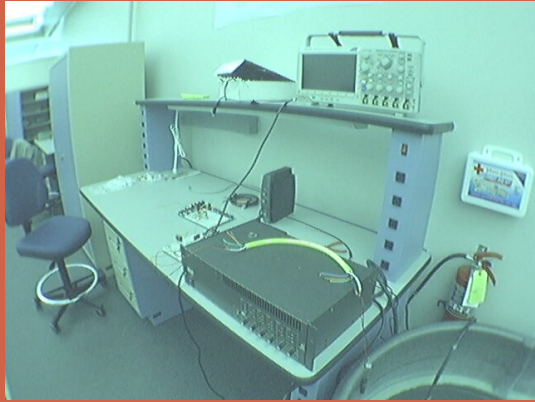
Mechanical Design

- CAD modeling
- Hull and frame design
- Electronics rack (E-rack) design
- Design of endcap, plates, other parts
- Manufacturing/building
- Prototyping, innovation



Electrical System

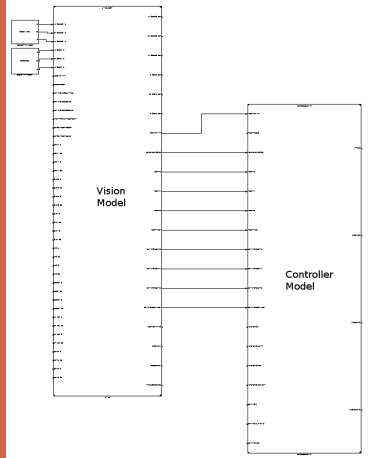
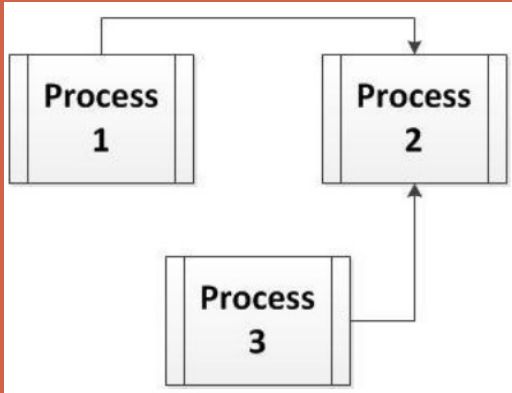
- Control provided by mini-PC
- Receive data from:
 - Depth sensor
 - Compass
 - Gyroscopes
 - Accelerometers
 - Sonar
 - Cameras
- Sends data to:
 - Thrusters
 - Mechanisms
- Electronics assembly, testing/debugging, soldering
- Serial device interfaces, C++



Sonar System

- Pinger broadcasts high-frequency signal
- Vehicle must find the pinger and hover over top, retrieving an object
- Designing and testing custom electronics board
- Low-level circuit design, testing, manufacture

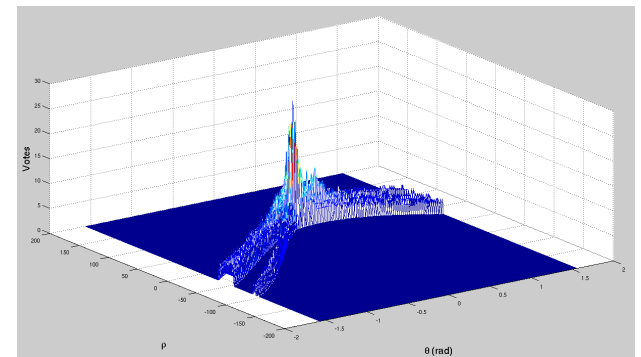
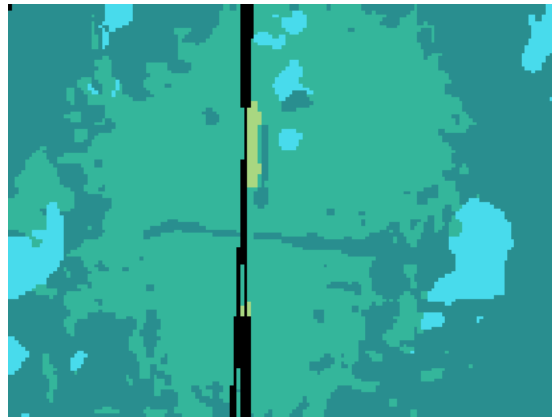
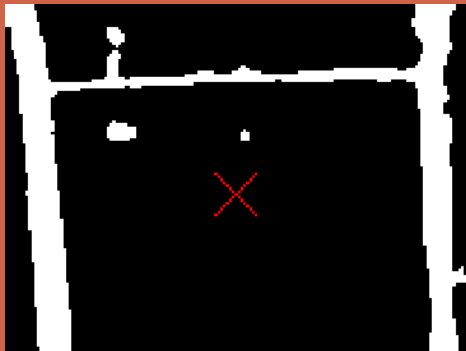
Software System



- Modular structure
- Communicates with sensors, motors and servos
- Operates vehicle autonomously
- AUV communicates wirelessly with remote computer
- Opportunities to learn about:
 - Software engineering
 - Real-time control system development
 - Application development
 - Computer networking
 - Serial device communication
 - Linux
 - Low-level programming
 - Compiling and linking processes
 - Website design

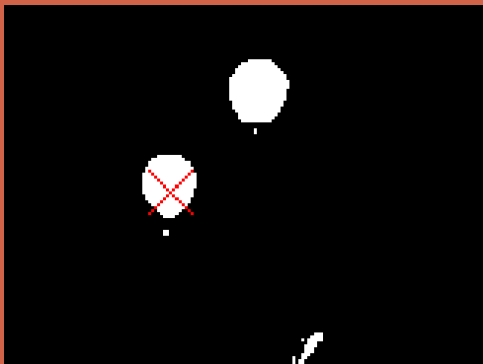
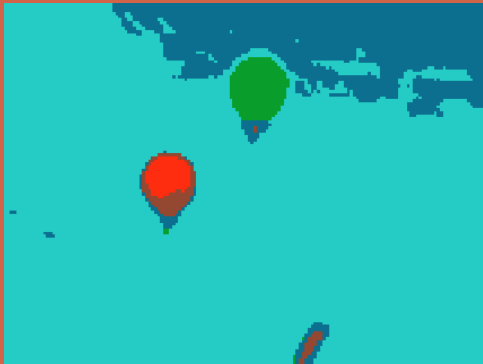
Computer Vision

- Needs to identify objects in different lighting conditions, from different angles
- Processes images from camera
- Returns target information to control system



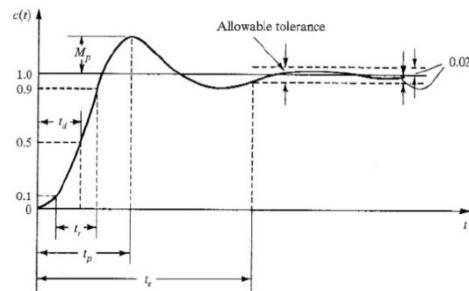
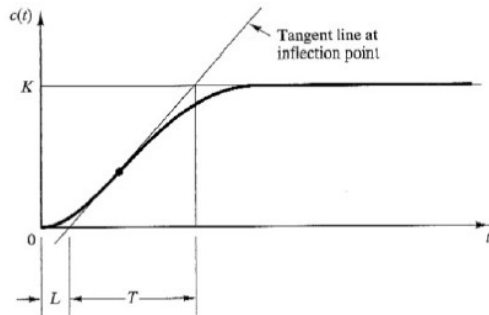
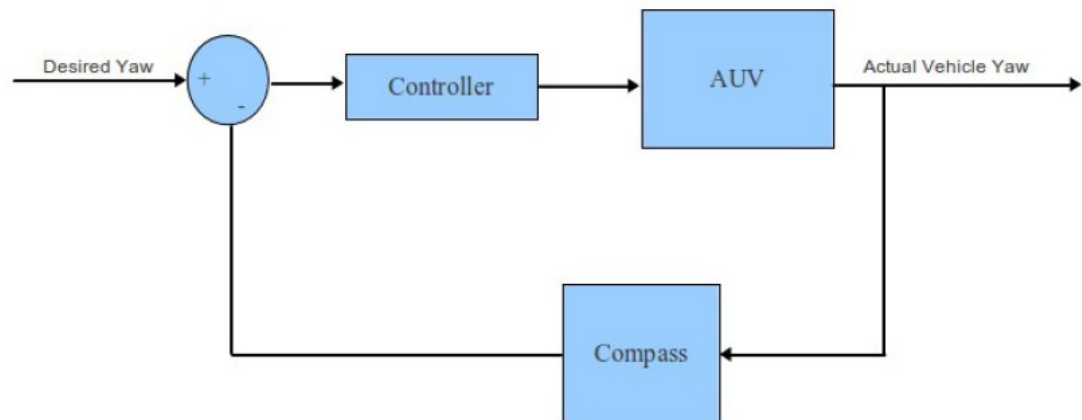
Computer Vision

- Opportunities to learn about:
 - C++ programming
 - Image processing algorithms
 - Advanced mathematics
 - Basis for understanding facial recognition software, motion tracking (Kinect), stereo vision
 - Speed-optimized computer algorithms
 - Neural networks and machine learning



Controls Software

- Software controller implementation
- Simplified mathematical model of vehicle dynamics
- Applying principals learned in actual engineering classes



Academic/Professional Development

- All aspects of the vehicle must be taken into account
- Some team members involved in ensuring different aspects of the design work synchronously
- ECE 4984- Senior design credit
- Future academic opportunities?
- Resume experience





Engineering majors:

- Electrical
- Mechanical
- Computer
- Aerospace
- Computer Science
- Other majors welcome!

We currently have a bay in the Ware Lab, which we share with the Autonomous Surface Vehicle Team

We are always looking for new members!



The 2010-2011 Team!



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