CSULA RoboSub 2018-2019

I. Technical Plans for The Dreadnought

1. One Sub vs. Two Subs

i. Idea One (preferred):

We use one sub equipped with CV system (Pi or Motherboard), hydrophones, pinger for sonar, DVL, and all the weapons systems

Pros:

- Less total work and manufacturing
- Less total money
- Less potential for things to not work out — ie sub is not completely dependent on something we are unsure will work in the end
- Easier simulation
- More centralized; easier

Cons:

- Possibly heavier
- Possibly slower

ii. Idea Two (less efficient):

We either have two subs that do the same thing to reduce total time at comp (difficult because we only have one DVL), or we have one scouting sub that uses sonar for object detection, the DVL for position, and hydrophones and pingers for intervehicle communication. It uses sonar to navigate to the location of the first object, sends signals to the second sub via pingers and that sub navigates to the location of the first sub and uses CV to complete the tasks.

Pros:

- Reduced course time
- Potential to reduce total weight

Cons:

- We would have to answer several questions: would the 2-sub idea be feasible without a second DVL? Would intervehicle communication work with pingers and hydrophones? Could we use a raspberry pi for color detection on sub 2 (because if we use a motherboard the

second sub would be too big and combined weight would be too large)? Can we even get sonar to work, and if not, what would we do (since both subs are dependent on one only using sonar)?
    - More money
    - Much more work and time required
    - More difficult simulation
2. CV
    i. Option 1: ROS
    ii. Option 2: Raspberry Pi
    iii. Interfacing with OpenCV in Pi vs ROS
3. Simulation
    i. Matlab/Simulink
    ii. Mathematica
    iii. Ansys
4. Hydrophones and Sonar
    i. Use Matlab example code for hydrophones for testing. Then work on triangulation and incorporating this with ros.
    ii. For sonar: the idea is that the pinger sends out a sound at a certain frequency, and since the returning frequency will vary based on the distance and starting frequency (use the doppler effect to calculate this), we can calculate the range we are detecting for each ms past the time at which the ping is sent out. May need to triangulate to find the exact location of the object since the sound will bounce in various directions. We will need to tweak this a lot.
5. Hardware
    i. Motherboard or Raspberry Pi?
    ii. Hydrophone/sonar board
    iii. Servo board
    iv. BMS — buck/boost converters?
    v. How to interface them all
    vi. Things to remember
        1. Put fuses on everything
        2. Make mounts for everything (how are we organizing the boards/how are we mounting them?)
6. Frame and Hull Manufacturing
    i. Materials

ii. Product Ideas
iii. Things to keep in mind
1. U-hook placement for hoisting
2. Handle placement/shape

7. Weapons Systems
i. Torpedo design — pneumatic or servo activated?
ii. Arm and dropper — materials and general design?
8. Decorative Additions
i. Thinking lights
ii. Decorations based on the theme

II. Recruitment Plan and Team Organization

1. What do we need people for?
- Hydrophone/Sonar Coding (2)
- Hydrophone Board Design (1sd)
- Servo Board Design (1sd)
- Computer Hardware (1sd)
- Electrical System Interface Design (Me)
- Battery Management (1sd)
- T-shirt Design (1)
- Website Management (1)
- Social Media Management (??)
- Video Maker (1)
- Sponsorship Outreach (Me)
- Paperwork, ASI Requirements (Me)
- Advertisement/Recruiting (Me)
- Mechanical Arm, Dropper, Torpedoes (3sd + 1)
- Designing/Manufacturing the Frame (1sd + 2)
- Designing/Manufacturing the Hull (2sd + 1)
- Waterproofing/Buoyancy (1sd + 1)
- Computer Vision (5sd + Me)
- Propulsion and Navigation (1)
- Thinking Lights (1)
- Obstacle Building (2)
- Simulation (Me + 1)

2. What communication platform are we using? (Must let us post deadlines)
i. GroupMe
ii. Discord

III. New Member Plan/Advice
    1. Learn as much as you can about what you'll be working on. Give them a list of things to look into based on their major or interest. Give a list of things that certain people can help with.
    2. Don't expect to be given all the easy work as a new member. You're expected to do just as much as everybody else. If you don't know what's required to complete your task, you'll be expected to learn it. Ask for help. 😊
    3. We're getting CSULA a reputation this year. 1st place or go home. I'm going to be really strict on deadlines. You must be dedicated to working hard so you can have your part done BY the deadline
IV. Group Meeting Days/Times
    1. What day would work best for the advisers and senior design teams for a weekly or bi weekly check in meeting?
V. Sponsor Request List/Funding
    1. Sparkfun
    2. Adafruit
    3. Arduino
    4. Raspberry Pi?
    5. Nvidia
    6. McMasterCarr
    7. Ansys
VI. Schedule/This Year's Layout
    1. What actions should be taken if someone doesn't abide by the deadlines? Because I value deadlines very highly.
    2. See Table 1 below.
VII. Competition
    1. Order 2-3 sets of shirts so we aren't wearing the same thing all week
    2. Awards Possible:
        i. Most Helpful
            1. Buy pizza for the security guards!
            2. Help other teams at comp — give them images, talk to them, help other teams get practice runs if we don't need them, bring a tent to set up for others working in the sun near the kitty pool
            3. Use the forums! Answer questions that other teams might have as best we can

ii. Knowledge Transfer
    1. Start making tutorials and posting instructions on our website regarding things that new members or future members might need
iii. Best Video
    1. Should be professional
    2. Should be well thought-out
    3. Should have a theme, maybe relevant to the theme of the competition or our home or the comp site? Discuss ideas
iv. Best Presentation
    1. Be prepared for this before the competition
    2. Make a very nicely formatted presentation, no typos
    3. Have other teammates ask tough questions in case the judges ask the same ones or so you can make a note to mention that in the presentation
    4. Wear dress clothes?
v. Best use of Simulation
    1. Find videos or images online from the actual transdec
    2. Mathematica, ansys, matlab, etc...
vi. Resource Sharing

3. Things to Bring to Comp
    - Extension cords
    - Power strips
    - Food, water
    - A cart
    - A tent
    - Banner/info sign, business cards
    - A router
    - Carabiners for backpacks
    - Zip ties!!
    - Extra weights for buoyancy
    - Extra thrusters, batteries, vents etc
    - 3d printer and filament
    - Sunscreen
    - Resumes
    - Flash drive
    - Printouts of cad designs, board designs, wiring diagrams...

- Walkies or ear pieces
- Speakers for music
- Printout of the rules

	EE	ME	CS	General
Week 0 (Aug 12-18)	Hydrophone/Sonar Research	Find Ideas from Journals	Learning (ROS/Python)	
Week 1 (Aug 19-25)	Create Senior Design Task Plan/List	Find Ideas from Journals	Learning (ROS/Python)	Sponsors, officer info form, banking form(s)
Week 2 (Aug 26-Sep 1)	Review old board designs, research sensors, etc, (buy hydrophones)	Begin Frame Design	Choose Computer (jetson vs motherboard)	Sponsors/ Advertising
Week 3 (Sep 2-8)	Visit lab to learn about sub, Begin Board Designs (not hydrophones)		Choose Cameras, start CV program	Advertising Club
Week 4 (Sep 9-15)				
Week 5 (Sep 16-22)		Start designing (or just thinking about) weapons systems		Videos, photos of us working
Week 6 (Sep 23-29)	Begin hydrophone board design			
Week 7 (Sep 30-Oct 6)				
Week 8 (Oct 7-13)				
Week 9 (Oct 14-20)				
Week 10 (Oct 21-27)	Finish all Board Schematics	Start designing hull		
Week 11 (Oct 28-Nov 3)				
Week 12 (Nov 4-10)	Finish Board Designs (optimized for size and tested on breadboard)			
Week 13 (Nov 11-17)	Send Boards for Manufacturing			
Week 13.5 (Nov 18-24)	Relax	Relax	Relax	Relax
Week 14 (Nov 25-Dec 1)	Get Manufactured Boards	Weapons systems prototyping; finish designing hull & start manufacturing		Get money from asi?
Week 15 (Dec 2-8)	Buy wire, connectors, etc	Buy screws, vents, etc needed for assembly		
Finals (Dec 9-15)	Study	Study	Study	Study
Break (Dec 16-Jan 19)	Connect everything to new boards			ODC meeting #2 ☹ (Jan 16)
Week 1 (Jan 20-26)	Solder, use connectors			
Week 2 (Jan 27-Feb 2)	Troubleshooting	Finish Manufacturing frame, hull		
Week 3 (Feb 3-9)	Testing	Assemble Sub		
Week 4 (Feb 10-16)	Testing	Design 3D print mounts for boards		
Week 5 (Feb 17-23)		3D print mounts	Finish CV Program	

Week 6 (Feb 24-Mar 2)				
Week 7 (Mar 3-9)	Wire up weapons systems, LEDs	Finish Manufacturing Weapons Systems	Interface LEDs, Servos, hydrophones	
Week 8 (Mar 10-16)		Build Obstacles	Interface LEDs, Servos, hydrophones	
Week 9 (Mar 17-23)			Training	
Week 10 (Mar 24-30)			Training	
Week 10.5 (Mar 31-Apr 6)	Relax	Relax	Relax	Relax
Week 11 (Apr 7-13)			Training	
Week 12 (Apr 14-20)			Training	Turn in comp event papers, go to alcohol trainings (svpt and tips, 2 people)
Week 13 (Apr 21-27)			Training	Finish Video
Week 14 (Apr 28-May 4)			Training	T-Shirt Design, get money from asi?
Week 15 (May 5-11)			Training	
Finals (May 12-18)	Study	Study	Study	Study
Cmencemnt (May 19-25)	Relax	Relax	Relax	Relax
The rest of summer break (Probably 2 more months)			Training	Technical Paper, Comp presentation, order shirts

Task Distribution

EE Senior Design:

- Hydrophone Board
- Servo Board
- Battery Management
- Power Distribution
- Computer Hardware
- Propulsion (Arduino)
- Sensor Integration

ME Senior Design:

- Frame Design/Manufacturing
- Hull Design/Manufacturing
- Weapons Systems
- Buoyancy

New Members

- Hydrophones+ Sonar/ Mech Arm/ other

CS Team

- Computer Vision
- Hydrophones, thrusters, servos, LEDs, sensors integration

General

- T-Shirt, obstacles
- Advertisement
- Sponsor Requests
- Website/Media
- Video
- ASI Meetings