Robosail Workshop 1

Objectives Students will:

- Know each other and the plan for the course.
- Characterize the boats by sailing them radio-control.
- Do “robot sailing” exercises.
- Learn the names of the mechanical and electronic parts of the RoboSail boat
- Get personal computers ready to program Arduinos.
- Get started on coding Arduinos by experimenting with servo motors

Materials:

- 1 workbook per boat
- Sailing review sheet for each student
- 4 RC boats, set up for radio control, with good batteries
- Laptops – at least 1 per team, up to 1 per student
- 1 set of (Arduino/USB Cable/Servo/3 bare wires) per laptop computer
- Arduino tutorials – 1 copy for each student

Part I Introduction (40 min)

1. Welcome-sign-in on attendance sheet
    a. Fill in Google form found on RoboSail Community Boating student page
2. Take handout packet / student workbook
3. Boats will available to try out RC - investigate
4. Teacher/Mentor introduction
    a. Training, Engineering Work, Teaching/mentoring exp, Sailing exp,
5. Ground rules
    a. Honor yourself, your classmates, and the learning process:
    b. Phones away!
    c. Be safe, Stay on task, look out for others, ask questions, bring problems/concerns to someone who can do something about them, Have Fun!
6. Materials
    a. Laptop with USB port
    b. Pencils
    c. Good attitude
7. Student Intros
    a. Your Name
    b. Where you are from
    c. Engineering experience, Sailing experience
8. Boat Intro
    a. Show servos, Arduino computer, RC Receiver, wind sensor, GPS, and compass
9. Discuss Overall Goals and Outline of course, resources
    a. Show website
10. Show Regatta plans for 2 last days

Robosail Workshop 1

Part II Sailing Radio-Control boats (60 min)

1. Review Basic Principles of Sailing (have a student do review)
    a. How sailboats works, correct sail trim
    b. Points of sail (POS)
    c. Maneuvers: head up, bear off, tack, gybe, get out of irons, beat, run
2. Characterize boats. Go to dock and try these maneuvers. Take notes on sail position and rudder positions for effective maneuvers.
    a. head up, bear off,
    b. tack, gybe,
    c. get out of irons,
    d. Beat upwind,
    e. run downwind
3. Robot sailing exercise "sense, think, act"
    a. 1 student watches boat and reports back (sensors)
    b. 1 person comes up with commands (computer)
    c. 1 operates controller (servo motors)

Part III Arduino/coding introduction (60 min, add 30+min if students need to download software)

1. Download Arduino IDE and Hardware test code
    a. Links on CBI Student page
    b. Can finish at home
2. Arduino setup
    a. Connect Arduino to PC with USB cable
    b. Go to hardware test code, to serial folder, to "HelloWorld" code
        i. Open and demonstrate/explain code and serial monitor
3. Arduino Tutorial 1 with a servo motor
    a. Connect servo motor to Arduino board as shown in diagram (colors matter!)
    b. Follow tutorial to learn basics
        i. We are intentionally not reviewing the Arduino or servo much. Students experience them first and figure out as much as they can on their own.
    c. Discuss – highlight points from tutorial
        i. Can start with things you didn't like about environment, or did like
        ii. How different words light up in color
        iii. Verify/compile and upload buttons
        iv. Semicolons
        v. Curly brackets and parentheses
        vi. How to name and save sketches (programs)
        vii. camelCase naming convention
4. Wrap-Up
    a. Tutorials and references on www.robosail.org
    b. Show website with fun Arduino projects
    c. Try out Arduino at home – can sign out a board with me

