



SAILBOT

1/c Julie Kane & 1/c Ben Williamsz

Advisor: Prof. Hartnett



The objective of this project is to design and prototype a fully autonomous sailboat capable of competing in the annual SailBot Competition.

The competition areas are:

- Autonomous navigation around a race course
- Station-keeping within a predefined area, and
- Fleet racing under manual control

Our final deliverable after this year is a sailboat that can autonomously navigate around a predetermined set of waypoints.



Get Data From Weather Sensor

Software interface with AirMar sensor. Inserts position and weather data into database.



Calculate Desired Course to Next Waypoint

Uses position, waypoint coordinates, and wind direction to calculate desired course. Inserts desired course into database.



Issue Commands to Rudder and Sail Winch Servos

Compares heading to desired course and uses a digital proportional and integrating controller (PI) to issue servo commands.



Database MySQL

Rudder Servo

Futaba S3306



Sail Winch Servo

RMG 380EH Sail Winch



Receiver

Futaba 2.4 GHz 7-Channel Receiver



Remote Control

Futaba 6EXP Remote Control



Weather Sensor

AirMar WeatherStation PB200



Batteries

7.2 V NiMH
-Sail Servo
6 V NiCd
-Receiver
-Rudder Servo
12 V Li-Po
-Computer
-Weather Sensor



Computer

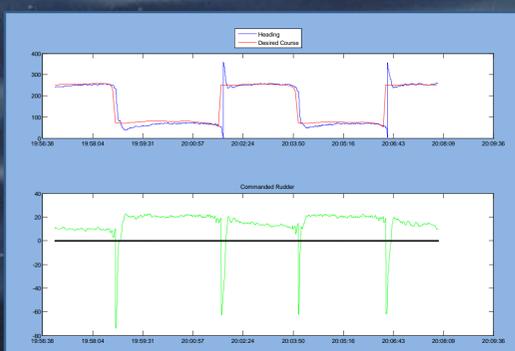
Stealth Intel Atom Processor
Windows XP



Sailbot's software is written exclusively in MatLab, with a central MySQL database for storing environmental and telemetry data. The three scripts pictured above run simultaneously at an effective sampling rate of 10Hz. Dividing the code into three separate modules allows for easy testing and adjustment.

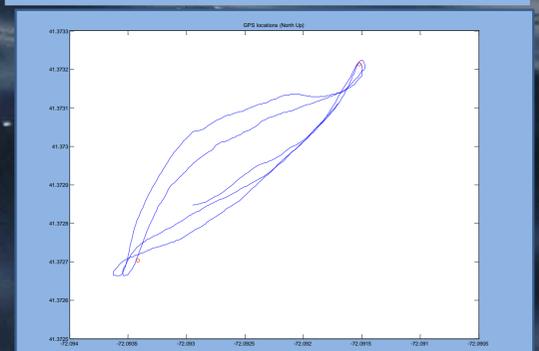
The servos on board Sailbot can be controlled either by remote control or by the onboard computer. Control of the servos is switched via two remote relays. The AirMar weather sensor provides real-time WAAS corrected GPS, wind speed and direction, and other environmental data to the onboard computer. Telemetry data can be viewed via an 802.11g wireless network hosted by the onboard computer.

Heading, Desired Course, and Rudder Commands

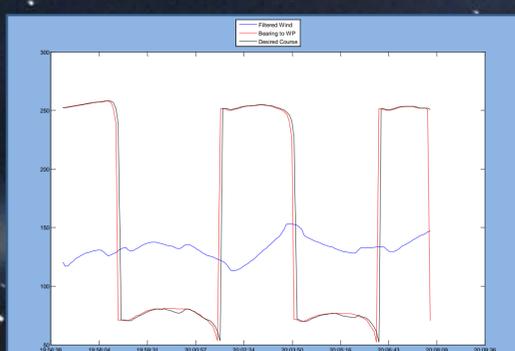


Sailbot is capable of fully autonomous navigation to a specified GPS waypoint on any point of sail. Sailbot chooses the appropriate course to steer and adjusts both the rudder and sails. If necessary, the navigation algorithm will order a tack or jibe to reach the waypoint.

GPS Trackline in Autonomous Mode



Wind Direction, Course to Waypoint, and Desired Course



True Wind Direction Filtering

