Sensors and data outputs

Wind Vane (direction wind is coming from)

- US Digital MA3 Magnetic Encoder
- Data comes in 0-360°, set 0° = in irons, starboard wind is -180° and port wind is +180°
- Relative reading

Compass (direction boat is pointing)

- Data comes in 0 to 360°, expect North is 0° but we will orient sensor so East = 0°
- Adafruit LSM303 Accelerometer and Compass Breakout
- Absolute reading

GPS (location in latitude and longitude)

- starts as angle in degrees, we convert to radians, then to x, y (meters)
- Adafruit Ultimate GPS Breakout
- Absolute reading

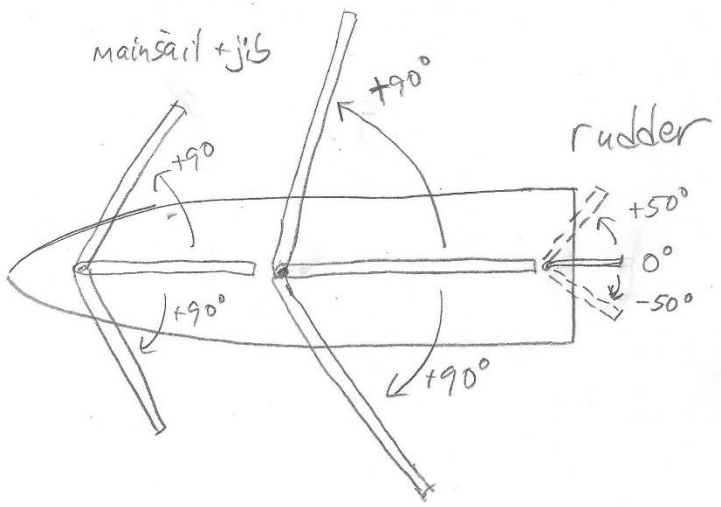
Actuators and ranges

Rudder Servo Motor

- range = -50° to +50°, 0° center (cannot go full +-90° range)
- measure angle looking down on rudder, CCW is +, CW is -

Sailwinch Servo Motor

- Uses a line to create a sail angle range = 0 to 90°
- actual servo is a winch that rotates ~3 ½ revolutions
- We are using servo range from ~90°to 180° to go from full in to full out
- Mainsail and Jib move together

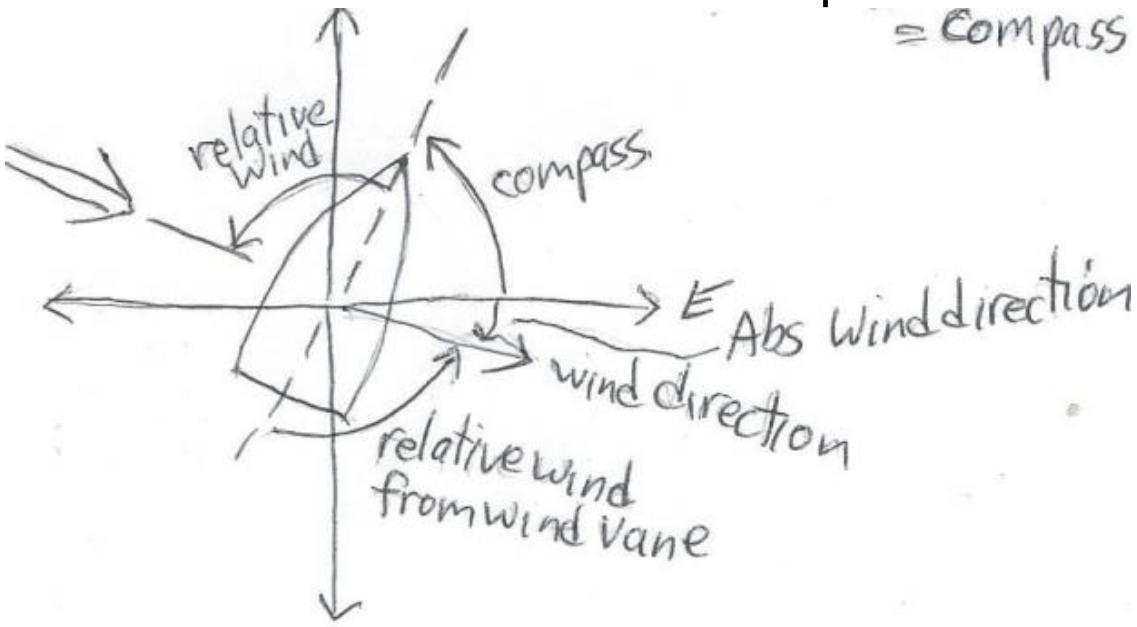


Values to Calculate

Absolute Wind Direction (real direction wind is coming from)

- Set East = 0° range = -180° to +180°
- Data needed: Relative Wind Direction

Absolute Wind Direction = **Absolute** Compass + **Relative** Wind Vane



Values to Calculate

Absolute Angle-to-Waypoint (direction from boat to destination)

- range is -180° to +180° or 0 to 360°
- Starting point is (x1, y1), destination waypoint is (x2, y2)
- Data needed: GPS location of boat and destination, or just difference

Absolute Angle-to-Waypoint = arctan (y2 – y1/ x2 – x1)

Values to Calculate

Relative Angle-to-Waypoint (angle boat must turn through to be heading at destination)

- range is -180° to +180° or 0 to 360°
- Data needed:
  - GPS location of boat and destination (or just difference)
  - Compass heading

Relative Angle-to-Waypoint = **Absolute** Angle-to-Waypoint – **Absolute** Compass