



# 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

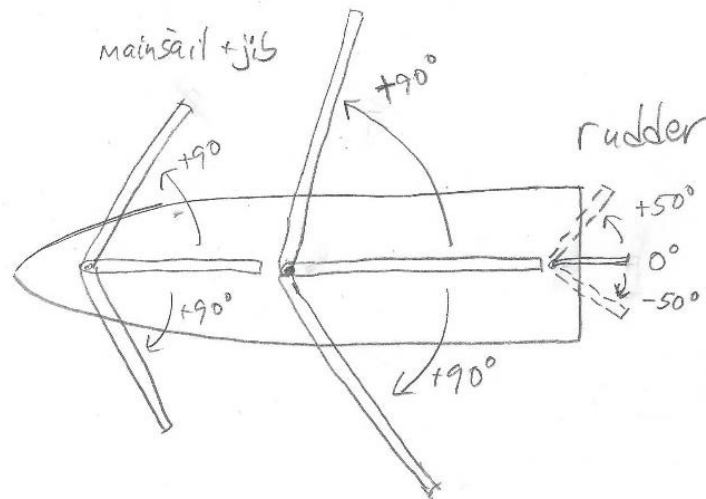
# Actuators and ranges

## Rudder Servo Motor

- range =  $-50^\circ$  to  $+50^\circ$ ,  $0^\circ$  center (cannot go full  $\pm 90^\circ$  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  $90^\circ$
- actual servo is a winch that rotates  $\sim 3 \frac{1}{2}$  revolutions
- We are using servo range from  $\sim 90^\circ$  to  $180^\circ$  to go from full in to full out
- Mainsail and Jib move together

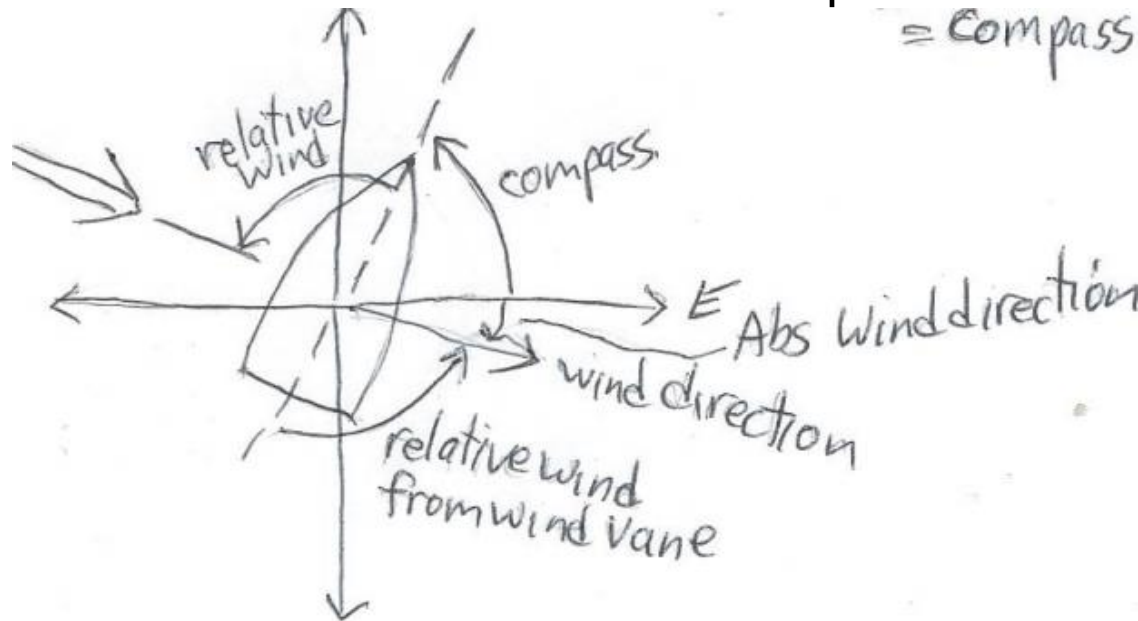


# Values to Calculate

**Absolute** Wind Direction (real direction wind is coming from)

- Set East =  $0^\circ$  range =  $-180^\circ$  to  $+180^\circ$
- 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  $-180^\circ$  to  $+180^\circ$  or 0 to  $360^\circ$
- 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  $-180^\circ$  to  $+180^\circ$  or 0 to  $360^\circ$
- Data needed:
  - GPS location of boat and destination (or just difference)
  - Compass heading

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

