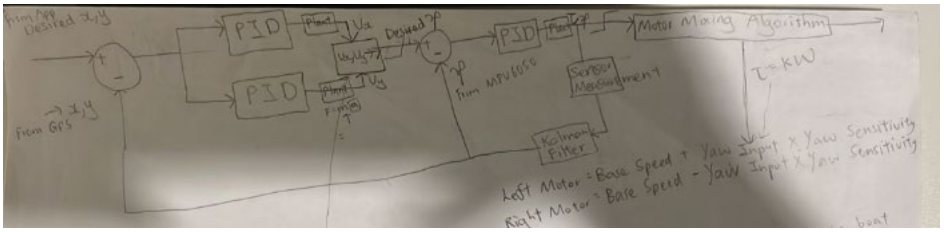
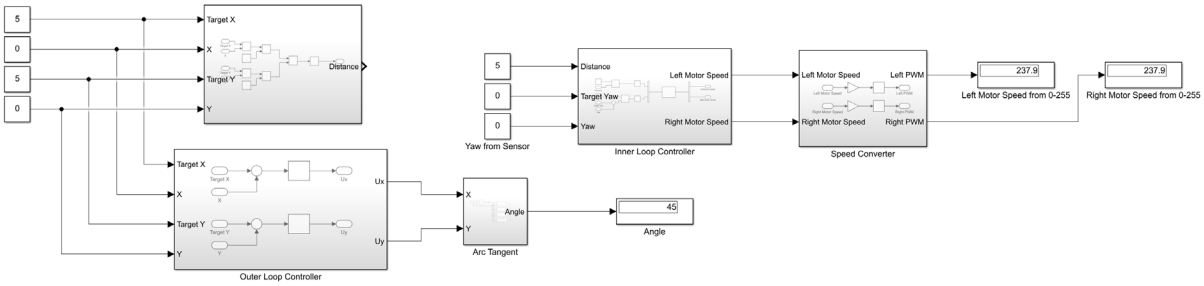
Overall block diagram.

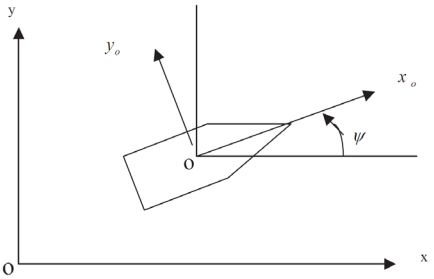
Input: x, y, and heading (from GPS and IMU module) and desired x, y, and heading (from Arfanify).

Output: Left and right motor speed (range from 0-1).

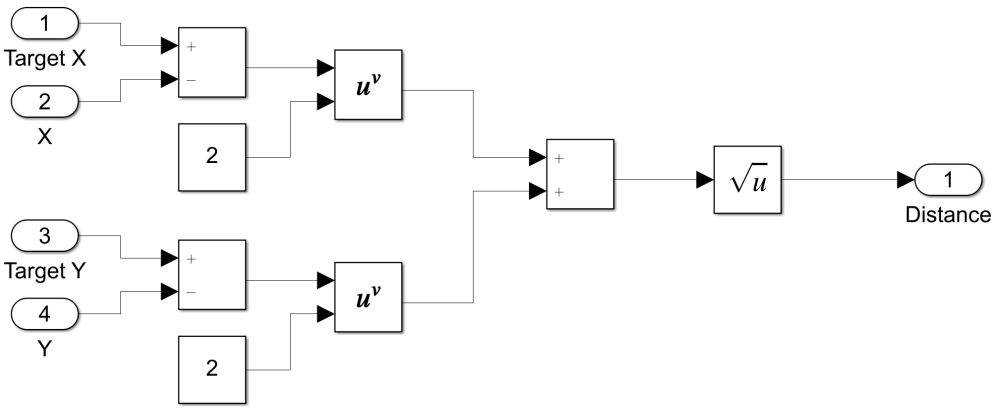




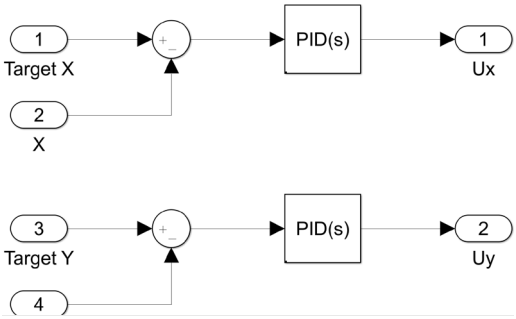
Coordinate system used for boat.



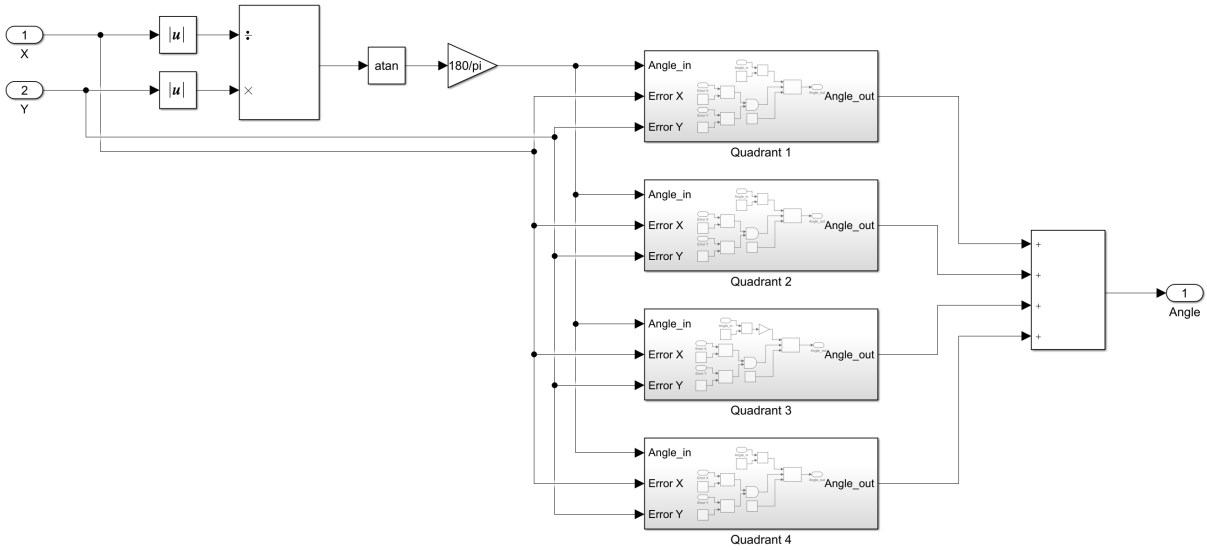
Get distance between 2 points.



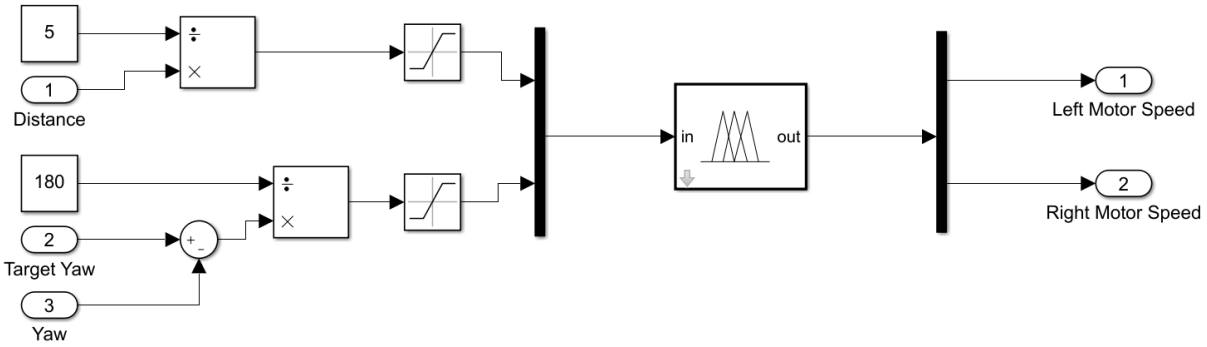
X and y controller.



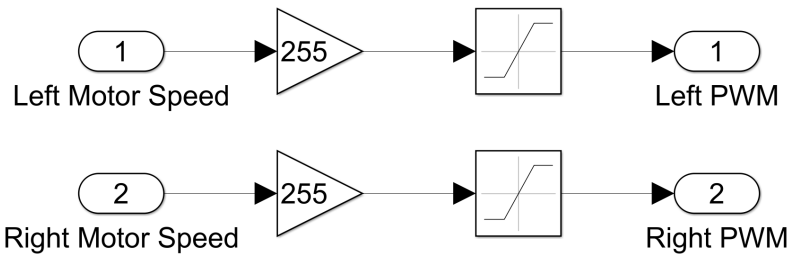
Get the desired heading.



Inner loop controller.



Convert normalised speed from controller.



Rules for Fuzzy Logic Controller (inner loop controller).

VS – Very small distance

S – Small distance

M – Medium distance

B – Big distance

VB – Very big distance

LN – Large negative

MN – Large negative

SN – Large negative

ZE – Zero error

SP – Small positive

MP – Medium positive

LP – Large positive

VS – Very slow

S – Slow

M – Medium

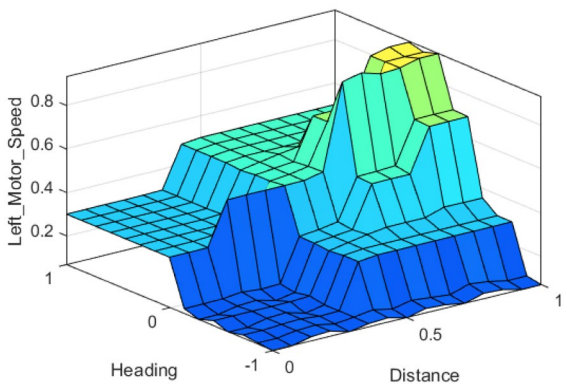
F – Fast

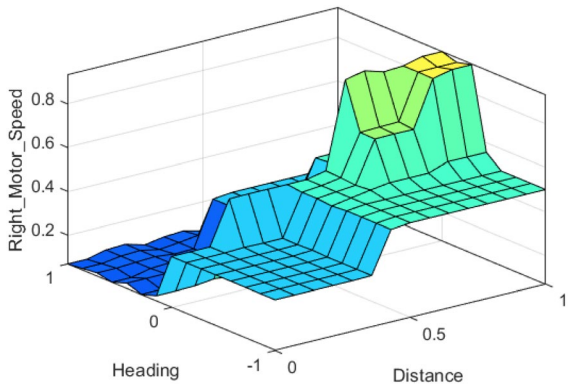
VF – Very fast

Rule	Distance	Heading	Left	Right
1	VS	LN	VS	S
2	S	LN	VS	S
3	M	LN	VS	M
4	B	LN	VS	M
5	VB	LN	VS	M
6	VS	MN	VS	S
7	S	MN	VS	S
8	M	MN	S	M
9	B	MN	S	M
10	VB	MN	S	M
11	VS	SN	VS	S
12	S	SN	VS	S

13	M	SN	S	M
14	B	SN	M	F
15	VB	SN	F	VF
16	VS	ZE	S	S
17	S	ZE	M	M
18	M	ZE	F	F
19	B	ZE	VF	VF
20	VB	ZE	VF	VF
21	VS	SP	S	VS
22	S	SP	S	VS
23	M	SP	M	S
24	B	SP	F	M
25	VB	SP	VF	F
26	VS	MP	S	VS
27	S	MP	S	VS
28	M	MP	M	S
29	B	MP	M	S
30	VB	MP	M	S
31	VS	LP	S	VS
32	S	LP	S	VS
33	M	LP	M	VS
34	B	LP	M	VS
35	VB	LP	M	VS

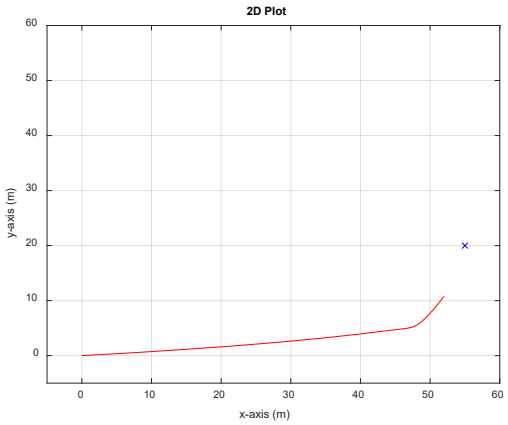
Surface for left and right motor speed from 0-1. Then is scale to 0-255.

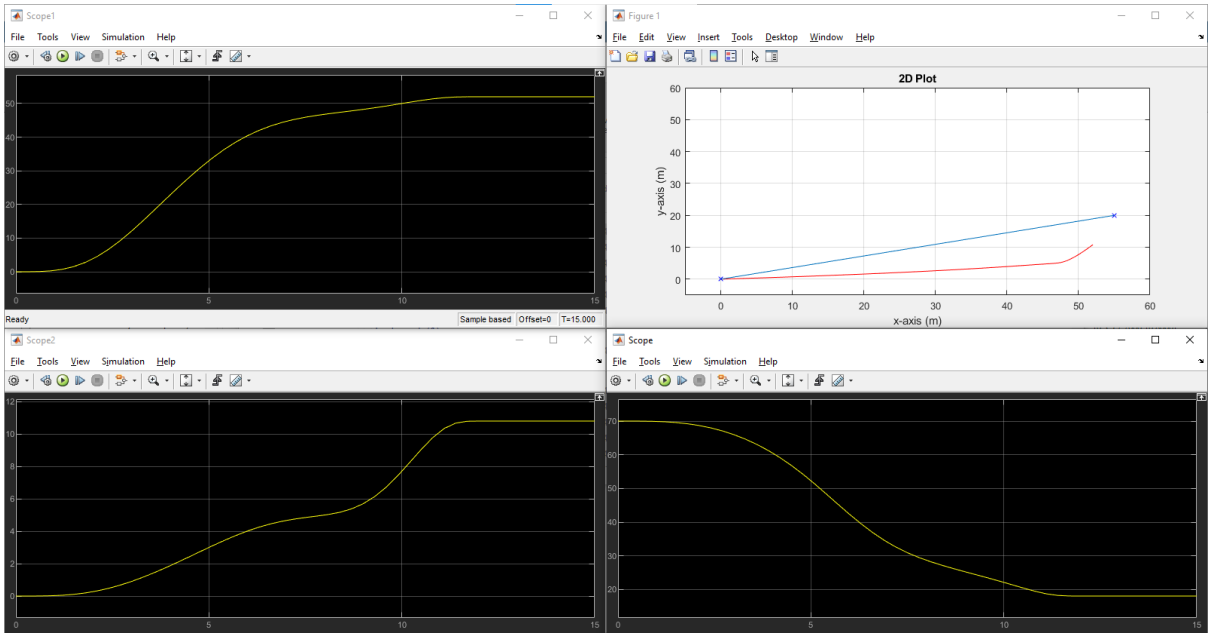




Red – Sensor reading.

Blue – Setpoint.

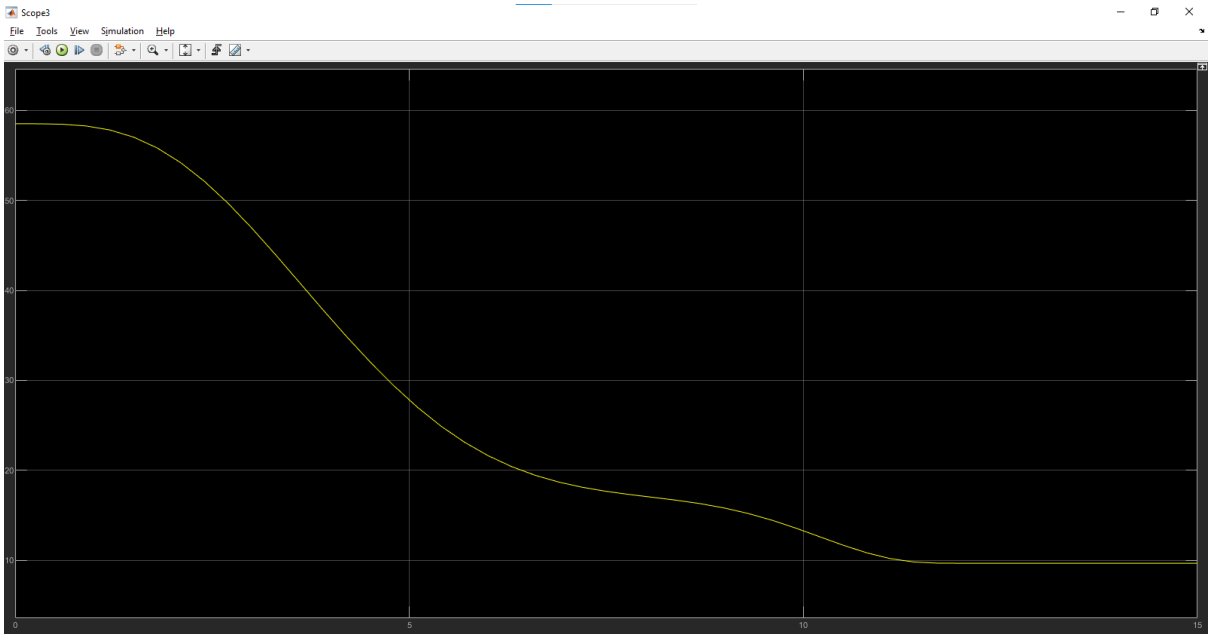




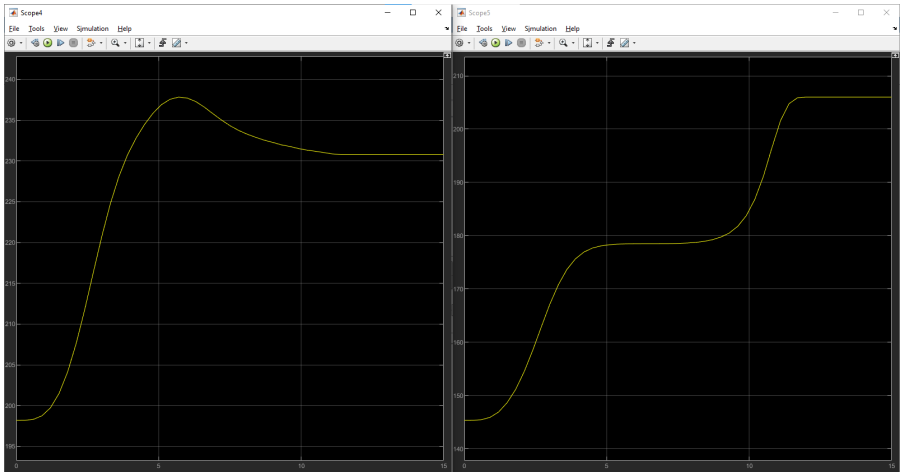
Top left – x.

Bot left – y.

Bottom right – yaw (assuming boat at 0 degree).



Distance to setpoint.



Left and right motor speed.