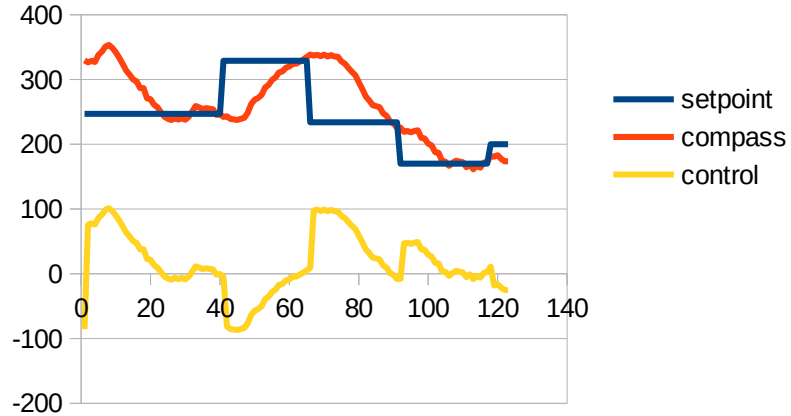


Orientation-001

ET	CW	247	329.59	-85.5
TS	CW	247	326.48	75.51
EO	CCW	247	328.87	77.77
OS	CCW	247	327.06	76.06
OS	CCW	247	337.93	86.38
OS	CCW	247	343.08	91.28
OS	CCW	247	350.77	98.59
OS	CCW	247	353.49	101.17
OS	CCW	247	348.88	96.79
OS	CCW	247	342.01	90.26
OS	CCW	247	333.46	82.14
OS	CCW	247	323.89	73.05
OS	CCW	247	313.79	63.45
OS	CCW	247	307.33	57.32
OS	CCW	247	300.1	50.44
OS	CCW	247	297.13	47.62
OS	CCW	247	286.8	37.81
OS	CCW	247	286.76	37.77
OS	CCW	247	271.03	22.83
OS	CCW	247	269.72	21.59
OS	CCW	247	261.24	13.53
OS	CCW	247	257.19	9.68
OS	CCW	247	249.51	2.39
ET	CCW	247	242.66	-4.12
TS	CCW	247	239.36	-7.26
EO	CW	247	237.44	-9.08
OS	CW	247	240.46	-6.21
OS	CW	247	238.22	-8.34
OS	CW	247	240.57	-6.11
OS	CW	247	237.93	-8.61
OS	CW	247	242.44	-4.33
ET	CW	247	250.53	3.35
TS	CW	247	259.04	11.44
EO	CCW	247	257	9.5
OS	CCW	247	254.42	7.05
OS	CCW	247	255.82	8.38
OS	CCW	247	254.96	7.56
OS	CCW	247	254.01	6.66
ES	CCW	247	245.33	-1.59
SS	CCW	247	246.49	-0.48
ET	CCW	329	242.29	-4.48
TS	CCW	329	243.25	-81.46
EO	CW	329	239.3	-85.21
OS	CW	329	238.4	-86.07
OS	CW	329	237.55	-86.88
OS	CW	329	239.22	-85.29
OS	CW	329	240.89	-83.7
OS	CW	329	248.66	-76.33
OS	CW	329	262.24	-63.43

Orientation

Used compass turn table



20230523 Experiment: New Control Function

Had to move control function (**uf**) from state method to updatePID() so that **uf** would be continuously updated. I'm no longer using the dot product for the process point instead the **angle-dot** product. All 2D-vectors are unit-vectors therefore the properties of arc-cosine dot product:

Dot Product Range: -1 to 1

if $y = \arccos(x)$, range (x) is (-1 to 1), domain (y) is (0 to pi) where x is the dot product...

Issue: positive angle values. Solution multiply the sign of PerpDot product to **angle-dot** product.

See m_updatePID() method for recent changes...

PID CHART

Setpoint is the random angle...

Compass is the measured value...

Control is the control function (uf)...

I used the compass turn table where the compass was mounted and then moved by hand. Notice how the control approached zero and then a new random began a new experiment...

States

ES - Enter Setpoint State

SS - Setpoint State - new random angle

ET - Enter Turn Direction State

TS - Turn Direction State - CW or CCW

EO - Enter Orientation State

OS - Orientation State - Transitional Flags

The dot product may be used for the motor control.

Orientation-001

OS	CW	329	268.91	-57.09
OS	CW	329	271.73	-54.41
OS	CW	329	276.37	-50
OS	CW	329	287.7	-39.23
OS	CW	329	291.81	-35.33
OS	CW	329	299.48	-28.05
OS	CW	329	303.28	-24.44
OS	CW	329	311.05	-17.05
OS	CW	329	312.49	-15.69
OS	CW	329	318.19	-10.27
OS	CW	329	320.19	-8.37
OS	CW	329	324.33	-4.43
OS	CW	329	324.54	-4.24
OS	CW	329	327.73	-1.21
ES	CW	329	330.8	1.71
SS	CW	329	334.77	5.48
ET	CW	234	338.54	9.07
TS	CW	234	336.95	97.8
EO	CCW	234	338.2	98.99
OS	CCW	234	336.12	97.01
OS	CCW	234	338.43	99.21
OS	CCW	234	335.67	96.59
OS	CCW	234	337.76	98.58
OS	CCW	234	335.65	96.57
OS	CCW	234	335.05	96
OS	CCW	234	327.93	89.23
OS	CCW	234	324.46	85.94
OS	CCW	234	317.95	79.76
OS	CCW	234	311.95	74.05
OS	CCW	234	306.57	68.94
OS	CCW	234	295.72	58.63
OS	CCW	234	285.32	48.75
OS	CCW	234	273.83	37.84
OS	CCW	234	267.58	31.9
OS	CCW	234	260.2	24.89
OS	CCW	234	258.95	23.7
OS	CCW	234	257.19	22.03
OS	CCW	234	247.72	13.03
OS	CCW	234	243.97	9.47
OS	CCW	234	235.27	1.2
ES	CCW	234	232.03	-1.87
SS	CCW	234	225.5	-8.08
ET	CCW	170	225.84	-7.75
TS	CCW	170	219.31	46.84
EO	CCW	170	220.53	48
OS	CCW	170	218.53	46.1
OS	CCW	170	220.61	48.08
OS	CCW	170	221.63	49.04
OS	CCW	170	209.86	37.86

Orientation-001

OS	CCW	170	208.86	36.91
OS	CCW	170	200.89	29.34
OS	CCW	170	198.12	26.71
OS	CCW	170	187.83	16.94
OS	CCW	170	186.67	15.84
OS	CCW	170	173.97	3.77
OS	CCW	170	173.09	2.94
ET	CCW	170	166.65	-3.18
TS	CCW	170	171.17	1.11
EO	CCW	170	174.6	4.37
OS	CCW	170	173.35	3.18
OS	CCW	170	172.16	2.05
ET	CCW	170	164.56	-5.17
TS	CCW	170	169.18	-0.78
EO	CW	170	161.31	-8.26
OS	CW	170	166.92	-2.92
OS	CW	170	163.88	-5.82
ES	CW	170	171.43	1.36
SS	CW	170	173.05	2.9
ET	CW	200	181.56	10.99
TS	CW	200	180.83	-18.22
EO	CW	200	183.08	-16.08
OS	CW	200	177.48	-21.4
OS	CW	200	173.65	-25.03
OS	CW	200	173.67	-25.01