

QEA Robots Night 2: Bridge of Death

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Exercise 1

$$r(t + \Delta t) = r(t) + r(\Delta t)$$

$$\theta(t + \Delta t) = \theta(t) + \theta(\Delta t)$$

Exercise 2

$$V_L = 0.2\text{m/s}$$

$$V_R = 0.1\text{m/s}$$

$$d = 0.245\text{m}$$

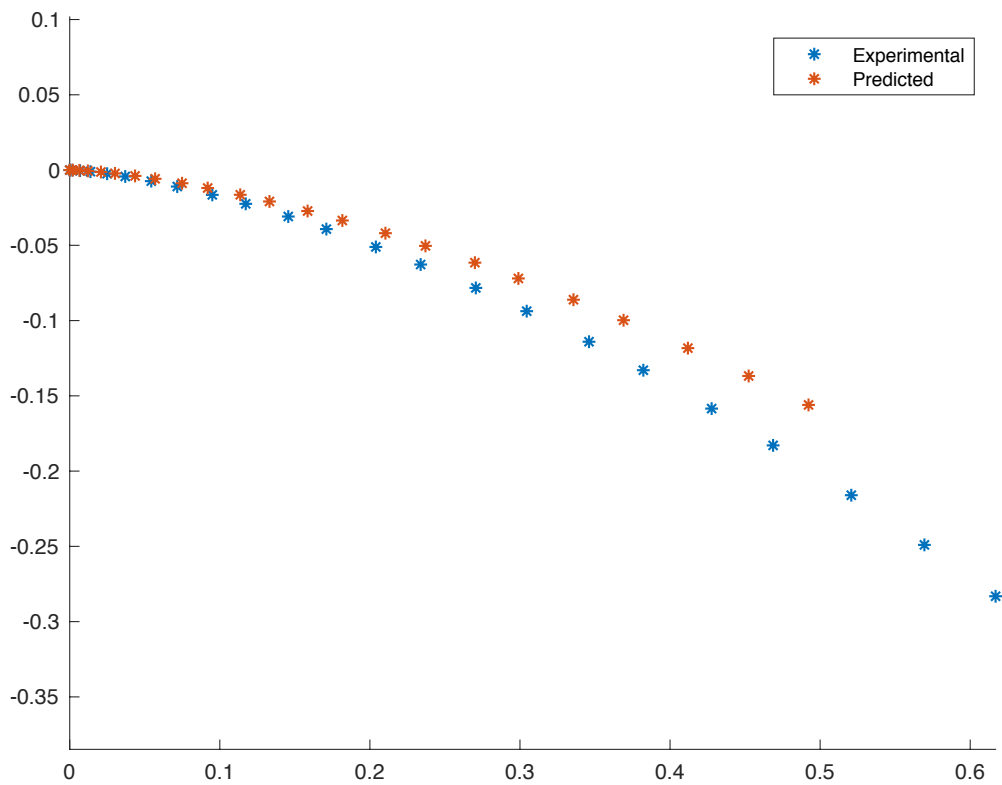


Figure 1: Predicted and collected data for test curve (constant wheel velocities).

Exercise 3

$$r(t) = \frac{1}{2} \cos(t)\hat{i} + \frac{3}{4} \sin(t)\hat{j}$$

time (s)	ω (rad/s)	v (m/s)
0	0.2249	0.2373
0.3200	0.2643	0.2244
0.6400	0.3347	0.2019
0.9600	0.4198	0.1772
1.2800	0.4569	0.1610
1.6000	0.4054	0.1628
1.9200	0.3197	0.1814
2.2400	0.2549	0.2065
2.5600	0.2208	0.2276
2.8800	0.2249	0.2383
3.2000	0.2643	0.2373

Exercise 4



Exercise 5

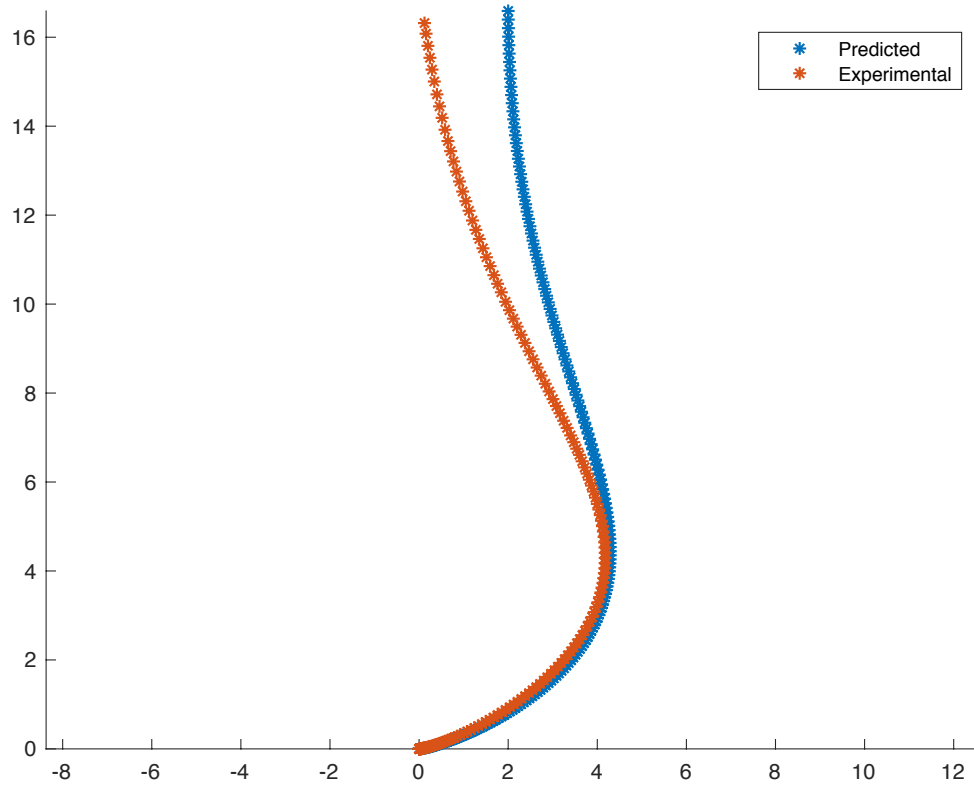


Figure 2: Predicted and collected data for S-shaped "Bridge of Death"

Process

I didn't pay much attention to the partner pairing as I had a bunch of other stuff happening at the time, so I ended up without one. It started ok; I was learning a lot of stuff and I felt that having full knowledge of the entire system in my head was helping me learn things very thoroughly. However when I thought I was nearing the end, I experienced several very exhausting road bumps that I barely made it over. I also remembered how useful talking over the process with someone else is.

On the technical side, I got myself pretty confused about angular velocity. I for some reason didn't remember the $\Omega = \hat{T} \times \frac{\delta \hat{T}}{\delta t}$ equation from day 2 and started calculating Ω through position in the global reference frame. Once I found the equation, getting my Neato to drive the bridge of death was a breeze. The other big setback was my plots of predicted and experimental positions not matching. A big problem ended up being that the velocities reported by the data collection program were a factor of 10 smaller than the input velocities (to *raw_vel*). I'm not sure whether this was documented somewhere.

Source Code

<https://github.com/Bogidon/qea-robotsn2>