

Robotics 311 : How to build robots and make them move

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ROB 311 – Lecture 18

- Work on your ball-bot
- Announcements
 - HW 4 posted, due 11/10 at class start
 - Midterm exam – 11/8

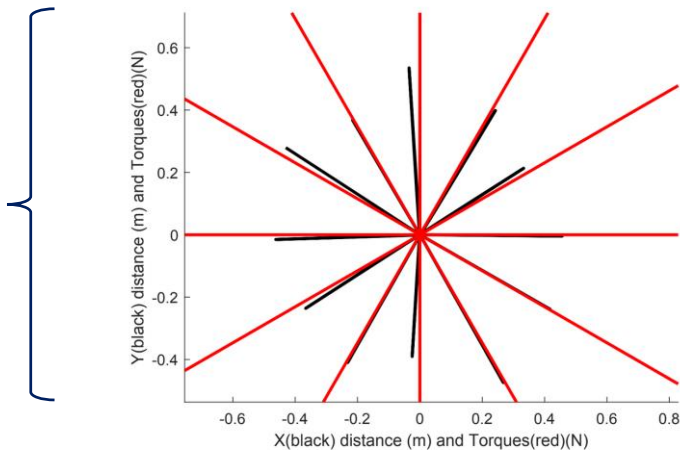
Lab 9

- Last week's lab provided our first ability to send power to the motors

```
commands['motor_1_duty'] = T1
commands['motor_2_duty'] = T2
commands['motor_3_duty'] = T3
ser_dev.send_topic_data(101, commands)
```

- Your goal was to rotate the ball using torques applied in ~8 – 10 directions
- Plot the difference in motion direction between the applied torque and motion

Your plot should look like this



Checklist for Skills

- Be able to rotate the ball in any desired direction
- Be able to read any state variable provided in `message_defs.py`
- Be able to convert motor rotation into ball rotation
- Be able to convert planar torques into motor torques
- Be able to add and save data in Python
- Be able to read and analyze data into MATLAB
- Make sure you know variable units and axis conventions
- You can also wire up your LEDs



```
1 import numpy as np
2
3 mo_cmds_dtype = np.dtype([
4     ("kill", np.double),
5     ("motor_1_duty", np.double),
6     ("motor_2_duty", np.double),
7     ("motor_3_duty", np.double)
8 ])
9
10 mo_states_dtype = np.dtype([
11     ("timestep", np.double),
12     ("theta_roll", np.double),
13     ("theta_pitch", np.double),
14     ("theta_yaw", np.double),
15     ("dpsi_1", np.double),
16     ("dpsi_2", np.double),
17     ("dpsi_3", np.double),
18     ("psi_1", np.double),
19     ("psi_2", np.double),
20     ("psi_3", np.double)
21 ])
22
23 mo_pid_params_dtype = np.dtype([
24     ("theta_kp", np.double),
25     ("theta_ki", np.double),
26     ("theta_kd", np.double)
27 ])
```