Project 7: Compasses and Position Control
Questions?
Project 6

• Demos by Monday
Project 7

1. Add a magnetometer

2. Software:
   • Access function: read_rotation()
   • Error computation: compute_rotation_error()
   • Control: position_control()
   • Main:
     • Read current orientation; this is the goal
     • Ramp lift fan up until the craft begins to rotate
     • Hover for 30 seconds while moving the craft toward a goal orientation
     • Ramp lift fan down
     • The template that we provided for project 6 is still appropriate

3. Testing
Reading Rotation

```c
int16_t read_rotation(void)

• Reads orientation from the compass that you have
• Returns orientation
  • Units: 10ths of a degree
  • Range: -1799 to 1800
  • Zero corresponds to magnetic North

• Test this function and the sensor before implementing other pieces of the project
```
Compass Calibration

• MPU-9150s (also have the gyro): use the provided calibration procedure. This will give you a line of code that will configure the compass (this avoids recalibration every time you start your program)

• Other compasses (which you have not used yet): the configuration is stored on the compass itself & may already be calibrated

• If your compass does not give you reasonably accurate values, then you need to recalibrate
Computing Error

```c
int16_t compute_rotation_error(int16_t theta_goal, int16_t theta)
```

- Returns the difference between the goal and the current orientation
- Units: 10ths of a degree
- Range: -1799 … 1800
- Positive errors: current orientation is clockwise from goal
Position Control

In order to move the craft to the goal, we will drive the left/right fans to produce torque toward the goal

• Use your computed orientation error to make the control decisions

See specification for implementation details
Notes

• Like project 6, this project is also very involved
  • You can’t start the day before the deadline and complete on time

• Implement and test components incrementally
Next Time

Microprocessors and memory