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

`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

```
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