



E11: Autonomous Vehicles

Fall 2015

Clark

PS 6: Gold Code Detection

Lab Objective

The objective of this lab is to write a program `ps6_1_Lastname_Firstname.ino` that

- 1) Uses your phototransistor to detect the Gold Code being transmitted by beacon on the competition playing fired or being transmitted by the LED on another robot. Note that each bit of the gold code will be transmitted for 250 micro seconds.
- 2) After detecting the Gold Code, three values should be printed to the Serial Monitor:
 - a) The ID number of the gold code detected
 - b) The corresponding correlation
 - c) The team color

Note, this lab is virtually impossible to get right on the first try. So, as usual, test each small step (printing intermediate results) as you go along. Debug that step until you get it right, and only then move on to the next step. You'll need to do most, if not all, of your programming and testing in the lab.

Suggested Steps

You may complete your program in any way you desire, but here are a set of suggested steps to get you started:

1. First, you'll want to read and store 31 raw samples of the beacon's LED using your phototransistor. We suggest sampling every 250 micro seconds using a timer, (not a delay).
2. Next, we'll want to turn these 31 raw samples into a binary format. We're trying to figure out which of these values correspond to the LED being ON and OFF. To do this, take an average of all 31 values. Then compare each raw value to the average. If it's above the average, the LED was OFF. If it's below the average, the LED was ON. *Use this principle to turn your 31 raw inputs into a sequence of 31 bits (i.e. each input becomes either a 0 or a 1).
3. Now, you have a sequence that you can correlate against the known Gold Code for each of the 8 beacons. The beacon whose Gold Code most highly correlates with your sequence will determine the ID number of the broadcasting beacon.

NOTE: Since the gold codes are being continuously broadcasted from the beacon, you may have sampled a shifted version of the beacon gold code! Thus, you'll want to compare each of the 8 gold codes with all possible shifts of your sequence.

4. See the note about the beacons below to determine the color being displayed by the beacon. ****Have your Mudduino board print which gold code it's detecting to the Serial Window!**

* If you're using another bot to double as a gold code for you with the GoldCodeBroadcaster code, you may need to be as close as 2.5 [cm] to actually read the LED flashes.

**A few notes about the beacons: Depending on which color the beacon is displaying, the LED output will either be the Gold Code or the inverse of that Gold code (aka: the 1s and 0s are switched). What this means is that you'll either get a correlation of 31 or -31

Deliverables

You are responsible for turning in 1 Arduino file to the dropbox folder in the E11 page on Sakai:

- `ps6_1_Lastname_Firstname.ino`

Be sure to include this line at the top of your file, (xx = hours it took you to complete):
`// Time to complete program = xx hours`

The files are due on Monday, November 9th at 11:00am.

Grading

Your score is based on the following:

- Up to 1.0 points for the program:
 - 0.5 points if your program compiles
 - 0.25 additional points if your program mostly runs as expected
 - 0.5 additional points if your program works according to the requirements described above
- Up to 1.0 points for your commenting:
 - 0.5 additional points for code that is mostly clear and well commented
 - 1.0 additional points for code that is clear and well commented
- This results in 2.0 points maximum