E11: Autonomous Vehicles
Fall 2014

PS 5: Reaction Timer and Light Tag

In this assignment you will write two programs: one to test reaction times and the other to play light tag. You will use two of your Mudduino's sensors: the distance sensor and the phototransistor. You will also need a flashlight or other light source. **Important:** keep track of how long it takes for each program by placing the following comment on the first line of each program file (where xx is the number of hours that it took you).

```
// Time to complete program = xx hours
```

Part 1: Reaction Timer

Your first assignment is to build a reaction timer game using the Mudduino's buzzer and distance sensor. You will play a note on the buzzer for a random length of time, switch the note, then time how long it takes to move your hand in reaction to the changed note.

Create a program called `ps5_1_Lastname_Firstname.ino` that does the following:

1. To begin the game, the user puts his or her hand in front of the distance sensor.
2. Once your program detects the user's hand, it begins to play a note for a random length of time between 300 and 3000 ms, then switches notes.
3. When the program switches notes, the user moves his or her hand away from the distance sensor (best is to move the hand up or down, out of range of the sensor).
4. The program times how long it takes between the note switch and the user moving his/her hand.
5. The program prints the reaction time to the Serial Monitor and waits for the user's hand to be placed in front of the distance sensor to start the game again.

Note: it is very easy to cheat and register a reaction time of 0. If the user simply places his or her hand in front of the distance sensor to start the first note and then removes it before that note is done playing the reaction time will be recorded as 0 milliseconds. You can ignore this case (none of your friends would cheat!)

Part 2: Light Tag

Now you will play Light Tag using the phototransistor on your Mudduino. The phototransistor detects light and converts the light level into a voltage. In addition to your Mudduino, you will need a flashlight (or other light source) to complete this lab.

Create a program called `ps5_2_Lastname_Firstname.ino` that does the following:

1. The program should play a song to indicate that it is ready to play. (You can use the song from problem set 2 if you want.)
2. The song continues to play until the phototransistor is "tagged" – i.e., detects the light source.
3. The program plays a second song (can be a simple beeping – or could be something more dramatic) to indicate that the Mudduino has been tagged.
4. After a short amount of time, the program plays the first song again, indicating that it is again ready to play.

Deliverables

You are responsible for turning in 2 Arduino files "Resources/Problem Set 5" folder in the E11 page on Sakai:

- `ps5_1_Lastname_Firstname.ino`
- `ps5_2_Lastname_Firstname.ino`

The files are due before class.

Grading

Your score is based on the following:
- Up to 1.0 points for each program:
  - o 0.5 points if your program compiles
  - o 0.25 additional points if your program mostly runs as expected
  - o 0.5 additional points if your program works according to the requirements described above
- Up to 1.0 points for your commenting:
  - o 0.5 additional points for code that is mostly clear and well commented
  - o 1.0 additional points for code that is clear and well commented
- This results in 6.0 points maximum