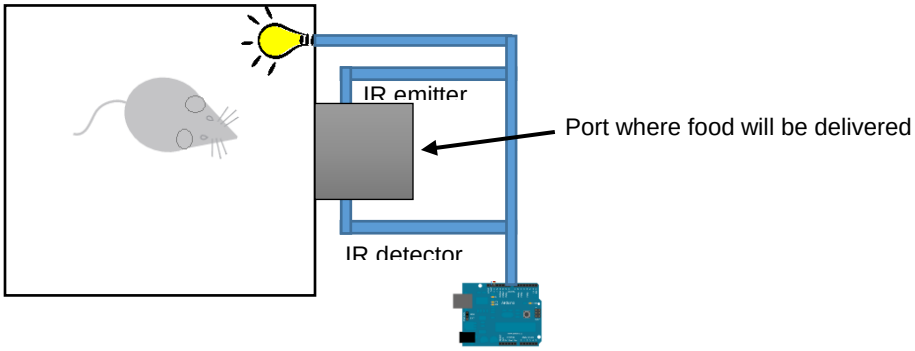
Arduino for Neuroscientists

Session 1 problem set

Yur A. Psy-Entist wants to conduct Pavlovian conditioning such that a mouse associates a light with delivery of sugar water (i.e. 20% sucrose). To deliver the liquid reward we will need to use a solenoid which we will discuss in session 2 so we will come back to this part next week.



As a measure of learning, Yur wants to record the number of times the mouse enters the food port. To detect head entries, you can use an IR beam break.

a) Write an Arduino script that uses an IR beam break and every time the threshold is crossed the code prints to the serial monitor. Print a phrase such as “a head entry occurred” or “beam is past threshold” and print the time by using the millis() function. Print these two things on the same line, which means you’ll need to learn the difference between Serial.print() and Serial.prinln(). Save this file as IRtest.ino
b) Now let’s work on code that will let us use the light as a conditioned stimulus (CS) in a conditioning paradigm. Write a script that turns on an LED for 10 seconds every 5 minutes. In other words, the CS duration is 10 sec and the inter-trial interval (ITI) is 5 min. The problem with using the delay() function is that the Arduino cannot perform any other computation during the delay such as detecting and printing the beam breaks. Therefore, write this script without using delay(). For reference, look at BlinkWithoutDelay in the built-in examples (https://www.arduino.cc/en/Tutorial/BlinkWithoutDelay). Save this file as conditionedStimulus.ino
c) *Optional*: Change conditionedStimulus.ino such that the LED turns on roughly every 5min. For example, the ITI could vary from 4 min to 6 min with a mean of 5min. The random() function will be handy. The distribution of your ITIs could also be a truncated exponential but there is no built-in function for this in Arduino (there is in Matlab), which means you will need to use the uniform distribution and convert it to the exponential one.

Submission instructions:

Create a zip folder that contains the IRtest folder and the conditionedStimulus folder. Name the zip folder with your first initial, last name, and pset1. For example, “FPena_pset1”. Email the zip to me by the beginning of the next class.

For general info about Arduino IDE commands and syntax, check out https://www.arduino.cc/en/Reference/HomePage