

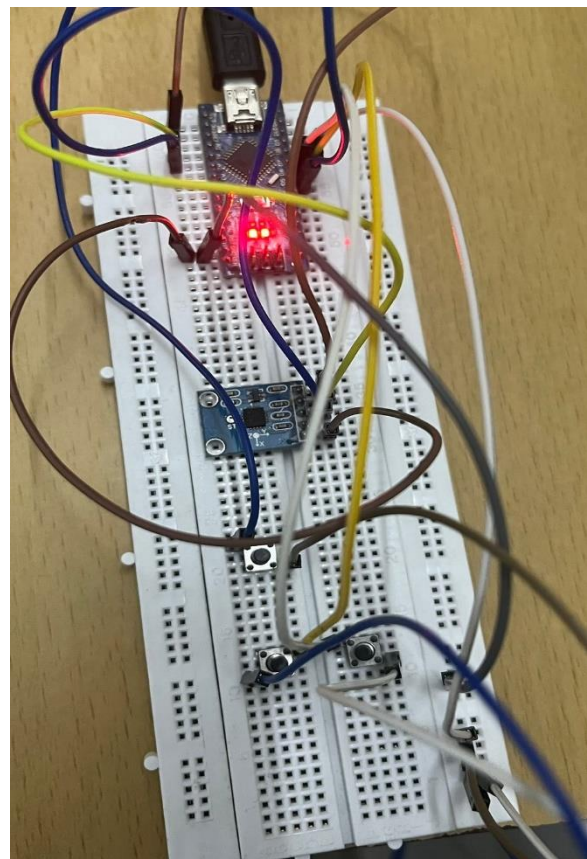
## Week 1 Report – PG20 – Tinkering Lab

### Abstract

In this week (week 1), we began our project with the focus of creating a wired air mouse (in our case, essentially a breadboard with connections) using whatever components were available at the time, i.e., we used an accelerometer and microcontroller to take a step towards implementing gesture control of the cursor by making the appropriate circuit and running the corresponding code for it. However, the chosen method of usage of the components proved to be inadequate and we could not successfully control the laptop screen's cursor and faced obstacles on the way. This helped us understand the shortcomings of our decisions and has made us consider alternate methods to make progress

### Tasks undertaken

- Components used: ATmega328p microcontroller, ADXL 335 Accelerometer, Push buttons, Jumper wires, breadboard, MicroUSB cable
- Hardware: VCC and GND pins for both, the accelerometer and ATmega328p, were connected accordingly. One connection of each of the 3 push buttons was made to D8 (Digital pin) and the corresponding ends were made to pins D5, D6, and D7. One of the connections for each of the push buttons was grounded. X-out pin and Y-out pin of the accelerometer, which reads the acceleration of the accelerometer, in x, and y directions.
- Software: The Arduino code programs the microcontroller to take the readings of the accelerometer. In addition, we also need to use a Python driver script to take control of the cursor on the screen.
- Output: The serial monitor simply displayed: "MOVE, 0, 10, 0"



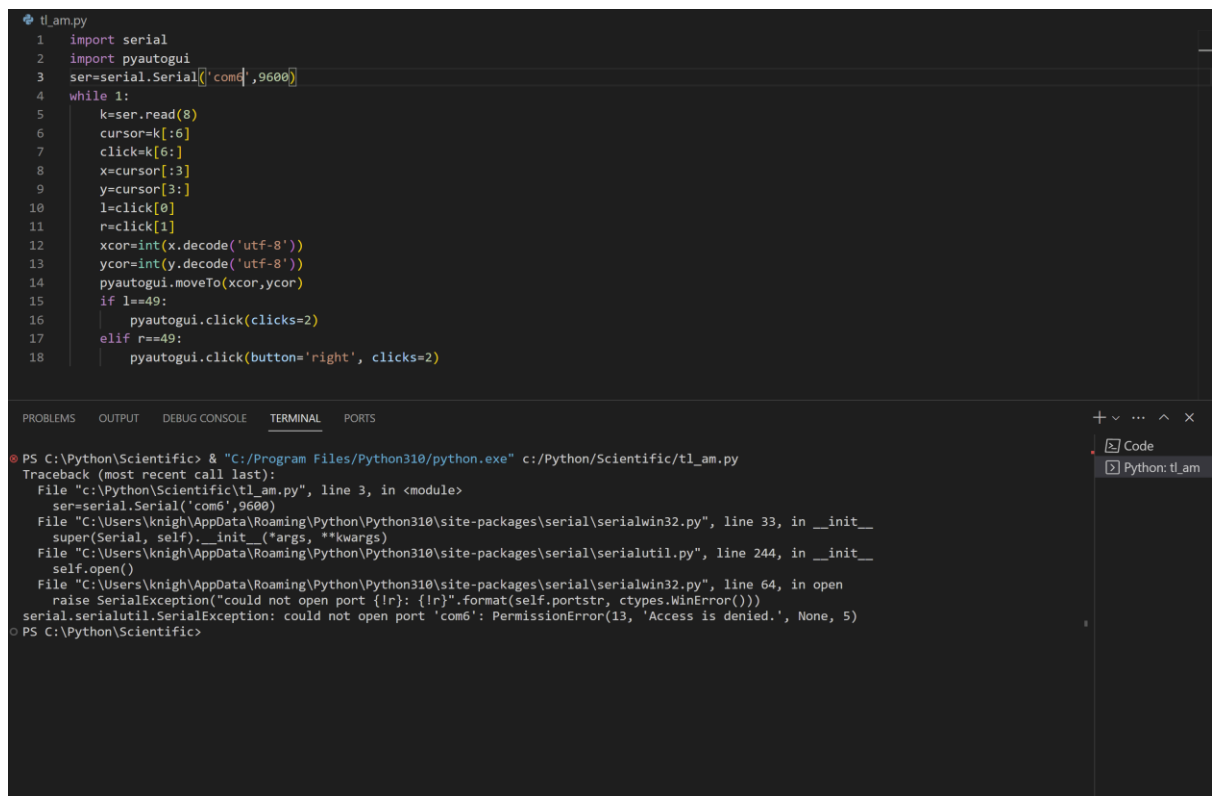
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2 const int x=A0;
3 const int y=A1;
4 int xh, yh;
5 int xcord, ycord;
6 const int trigger = 5;
7 int lstate = 0;
8 int rstate = 0;
9 const int lcliclck = 6;
10 const int rcliclck = 7;
11
12 void setup()
13 {
14     pinMode(x, INPUT);
15     pinMode(y, INPUT);
16     pinMode(trigger, INPUT_PULLUP);
17     pinMode(lcliclck, INPUT);
18     pinMode(rcliclck, INPUT);
19     digitalWrite(lcliclck, HIGH);
20     digitalWrite(rcliclck, HIGH);
21     Serial.begin(9600);
22 }
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24 void loop()
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```
//_amino
void setup() {
    pinMode(digitalReadTrigger, LOW);
}

void loop() {
    lstate = digitalRead(lclick);
    rstate = digitalRead(rclick);
    xh=analogRead(x);
    yh=analogRead(y);
    xcord=map(xh,286,429,100,999);
    ycord=map(yh,282,427,100,800);
    Serial.print("xcord is: ");
    Serial.println(xcord);
    Serial.print("ycord is: ");
    Serial.println(ycord);

    if (lstate == LOW)
        Serial.print(0);
    else
        Serial.print(1);

    if (rstate == LOW)
        Serial.print(0);
    else
        Serial.print(1);
    delay(4000);
}
```



```
tl_am.py
1 import serial
2 import pyautogui
3 ser=serial.Serial('com6',9600)
4 while 1:
5     k=ser.read(8)
6     cursor=k[:6]
7     click=k[6:]
8     x=cursor[:3]
9     y=cursor[3:]
10    l=click[0]
11    r=click[1]
12    xcor=int(x.decode('utf-8'))
13    ycor=int(y.decode('utf-8'))
14    pyautogui.moveTo(xcor,ycor)
15    if l==49:
16        pyautogui.click(clicks=2)
17    elif r==49:
18        pyautogui.click(button='right', clicks=2)
```

```
PS C:\Python\Scientific> & "C:/Program Files/Python310/python.exe" c:/Python/Scientific/tl_am.py
Traceback (most recent call last):
  File "C:\Python\Scientific\tl_am.py", line 3, in <module>
    ser=serial.Serial('com6',9600)
  File "C:\Users\knigh\AppData\Roaming\Python\Python310\site-packages\serial\serialwin32.py", line 33, in __init__
    super(Serial, self).__init__(*args, **kwargs)
  File "C:\Users\knigh\AppData\Roaming\Python\Python310\site-packages\serial\serialutil.py", line 244, in __init__
    self.open()
  File "C:\Users\knigh\AppData\Roaming\Python\Python310\site-packages\serial\serialwin32.py", line 64, in open
    raise SerialException("could not open port {}: {}".format(self.portstr, ctypes.WinError()))
serial.serialutil.SerialException: could not open port 'com6': PermissionError(13, 'Access is denied.', None, 5)
PS C:\Python\Scientific>
```

### Discussion and Problems Faced:

- Hardware: We overlooked an important component, a resistor (~10 kilo ohm) for using a push button. The resistor (used as a pull-up resistor) is essential for obtaining input, which is why the serial monitor didn't show any changes when any of the push buttons were used.
  - There may also be an issue with proper communication between the ATmega328p microcontroller and the accelerometer; to begin with, there was some issue with establishing the connection between the microcontroller and Arduino program
  - As push buttons were not working (due to the absence of pull up resistor), we still observed "0, 10, 0"; Program considers that there is no left or right click.
- Software: The Python driver script is not working (as can be seen above), owing to failure to establish a connection with a communication port, as a result of this the cursor can't be controlled
- By far the biggest issue is probably that the Arduino code is not properly uploaded to the ATmega328p microcontroller. This is suggested by the fact that there is absolutely no change in the serial monitor regardless of what we do. We used the ATmega328p microcontroller as it has the same requirements as Arduino Uno and Nano and seemed to be versatile to us.

### Decisions to be taken

- While the pins of ATmega328p are similar to Arduino Nano, there seems to be a problem in uploading code to it. Therefore: we will use Arduino Uno, for any such tasks henceforth
- Use pull up resistors
- Use an LED too. It could help us troubleshoot hardware/software issues
- This idea is not related to the issues faced so far – but is an idea to handle the issue of not having an MPU-6050 accelerometer (6- axis); We could implement such an accelerometer perhaps by using an ADXL335 (3-axis) accelerometer) along with a 3-axis digital compass
- Use a Bluetooth module to deal with the issue of establishing control over the computer screen cursor – This might give us alternate ways to use the Python driver script