Tandem Control Game Setup

1. Download all appropriate programs:
   a. Spyder IDE: [Spyder IDE](#)
    b. bHaptics Player: [Faqs, downloads, requests and etc](#)
    c. GitHub Desktop: [GitHub Desktop](#)
    d. YOST Labs 3-Space Suite: [Yost Labs 3-Space Sensor Software Suite](#)
    e. Vibrotactile Feedback Project Repository:
       https://github.com/toazbenj/vibrotactileFeedbackProject
        i. After downloading GitHub Desktop, on the Vibrotactile Feedback Project webpage go to Code => Download with GitHub Desktop.
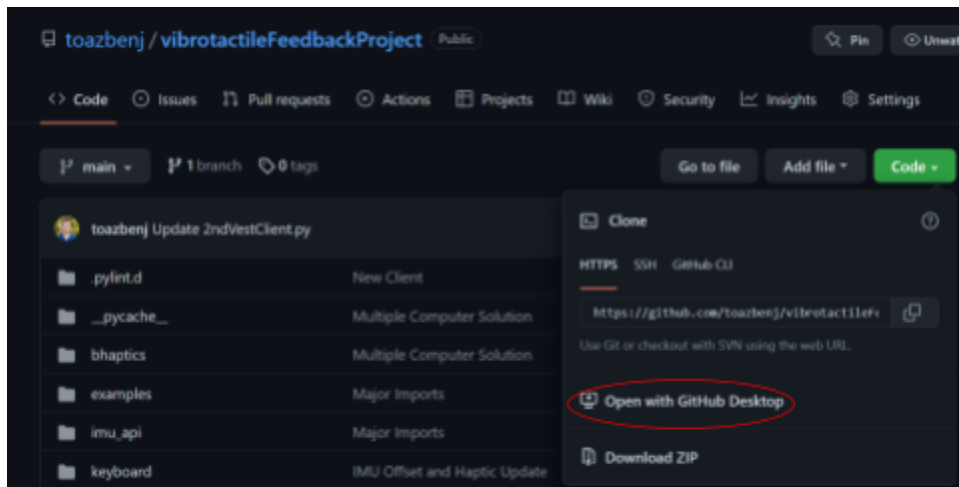

        ii. Opening this way will allow you to easily download updates directly into the programs if needed.

2. Configure dongle settings to interface with the IMUs.
    a. Open the 3 Space Suite application and select the bluetooth dongle from the "COM Port" dropdown menu.
   b. In the menu, go to Dongle => Dongle Info
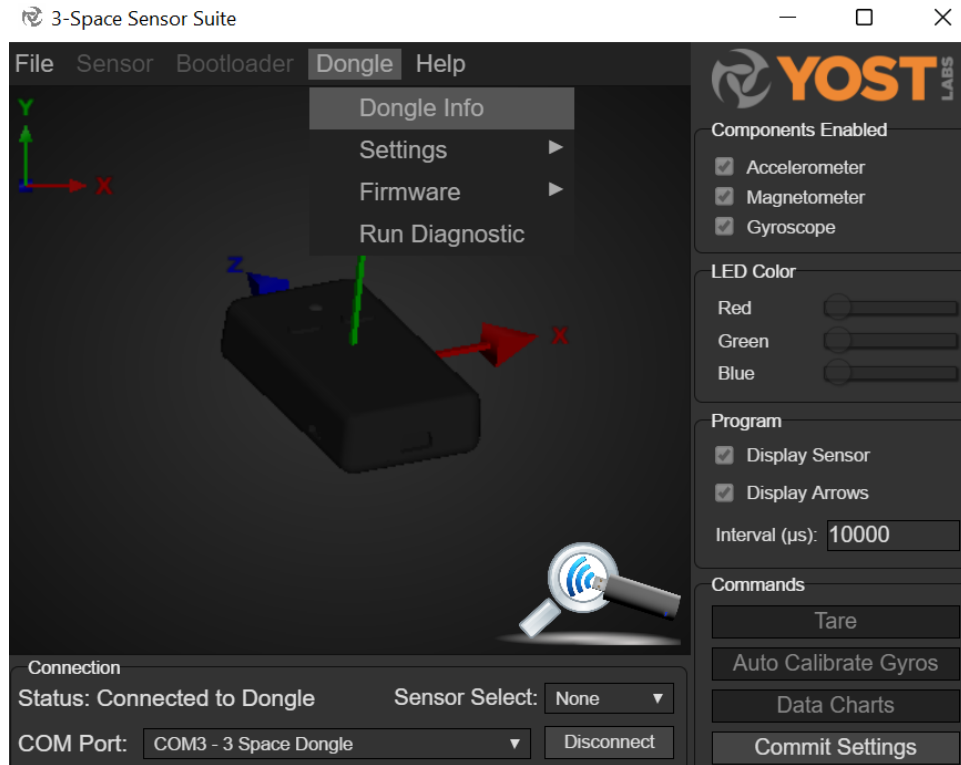
c. In each field, enter your IMUs' serial numbers in the order you will refer to in the controlFile read by the tandem control game program.
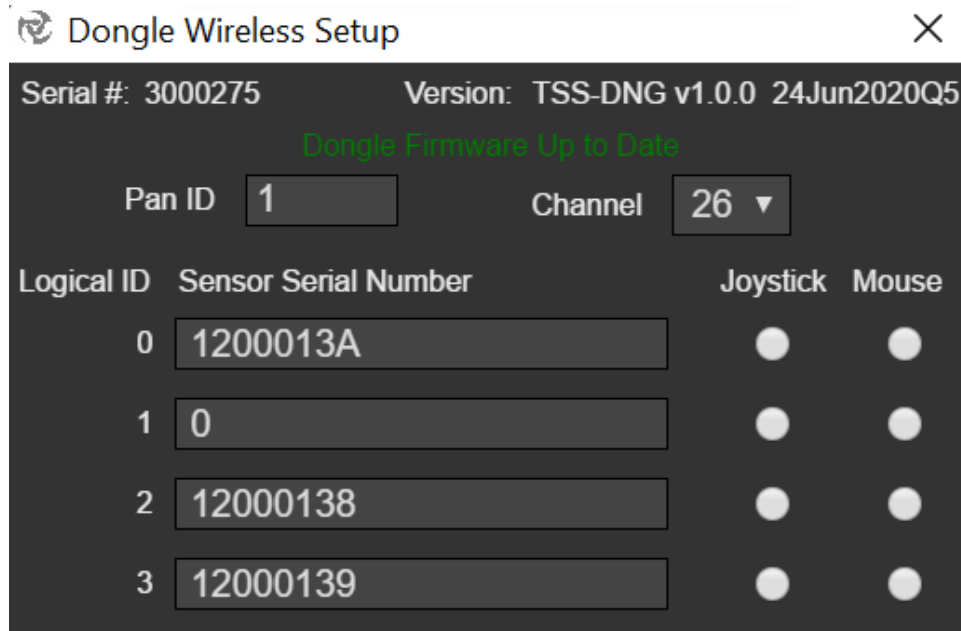

d. Press ok, then in the bottom right hand corner push "Commit Settings" to save the changes.

e. Close the 3 Space Suite. If you forget to close it, the program will give an error since only one application can be reading the dongle at a time.

3. Launch Spider or equivalent IDE on student computer (the one with the dongle) and teacher computer. From within the IDE, open the following files/programs
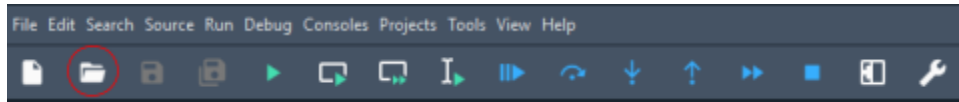
a. On the teacher computer, open "2ndVestClient.py" from the downloaded Vibrotactile Feedback Project repository.
b. On the student computer, open "finalTandemControlGame.py" from the same place.

4. In the 2ndVestClient program, find the comment "Initialize host and port."
a. The "host" variable under this header should be named the same as the student computer's IP address.
b. To find the IP address, in the student computer, go to Settings => Network and Internet => Properties.
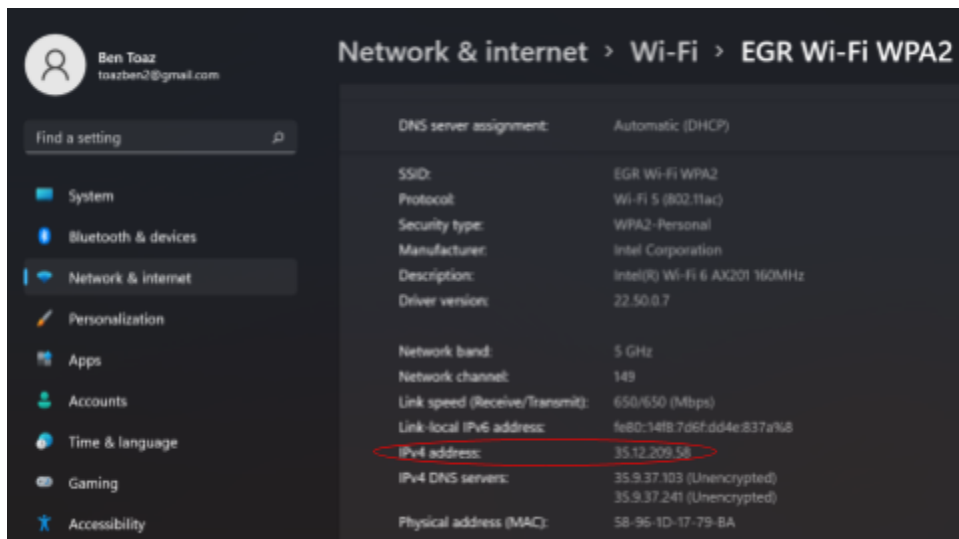
c. Find the string of numbers that looks like "35.12.209.98" for example under the label "IPv4 address."
d. Make sure that the variable named "host" around line 36 in 2ndVestClient matches the IPv4 address.

```
36        try:
37            # Initialize host and port
38            host = "35.12.209.58"
39            port = 8080
```

e. Also make sure that the variable named "port" matches in both 2ndVestClient and finalTandemControlGame.

```
158        if training_mode == 3 and isSecondComputer:
159            # Link to 2nd computer
160            socket = socket.socket()
161            port = 8080
```

5. Open "controlFile2.csv" from the repository in Excel on the student computer and check device parameters:
   a. Verify that the training type matches the experimental group you are testing.
      i.   1- No teacher, no haptics
      ii. 2- Teacher, no haptics
      iii. 3- Teacher, haptics

	A	B	C	D	E
1	Device Parameters				
2	Training Type/Mode	Teacher Sensor (number 1-4)	Student Sensor (number(1-4)	Data File Name	2nd Computer (1=Y,0=N)
3		3	3	4 data6.csv	1

b. Check that the teacher and student sensor numbers correspond with the IMUs you want. Note that the sensor's number is determined by the order that the serial numbers were entered into the dongle info on step 2.

	A	B	C	D	E
1	Device Parameters				
2	Training Type/Mode	Teacher Sensor (number 1-4)	Student Sensor (number(1-4)	Data File Name	2nd Computer (1=Y,0=N)
3		3	3	4 data6.csv	1

c. Enter the data file name in the last field so you know which file is which.
   i. **Warning: If you forget to name the file something else, the next trial will overwrite the last trial's data.**
   ii. If the files were backed up to GitHub it is possible to retrieve them so long as the corrupted versions are not uploaded to the repository.

|	A	B	C	D	E
1	Device Parameters				
2	Training Type/Mode	Teacher Sensor (number 1-4)	Student Sensor (number(1-4)	Data File Name	2nd Computer (1=Y,0=N)
3		3	3	4 data6.csv	1

d. If using 2 computers to run haptics on both vests, put a 1 in the 2nd Computer cell. If only one computer is being used for just student haptics, put a 0.

|	A	B	C	D	E
1	Device Parameters				
2	Training Type/Mode	Teacher Sensor (number 1-4)	Student Sensor (number(1-4)	Data File Name	2nd Computer (1=Y,0=N)
3		3	3	4 data6.csv	1

e. Configure the training student control values. If the graduated increase is set to 1, student control will increase for each round within each block. If set to 0, it will increase for each training block. Note that the number of values to the right of the graduated increase boolean must match the number of round units in training if set to 1 or the number of training blocks if set to 0.

|						
13	Training Control Values					
14	Graduated Increase (1=Y,0=N)	Student Control Values: List horizontally for number of training rounds/blocks				
15	1	0.1	0.3	0.5	0.7	0.9

f. Save and close the controlFile.

6. Launch bHaptics player on the teacher computer and connect the tactsuit with the teacher sensor via bluetooth. Repeat for the student's computer and vest. Order does not matter, but must not be done simultaneously.
   a. Turn on the vests one at a time by pressing the huge button on the back with a T on it for 2+ seconds. The vest will glow blue when it is on.
   b. The vest will sow gray while pairing and orange when paired. When it is displayed in gray, double click to pair.
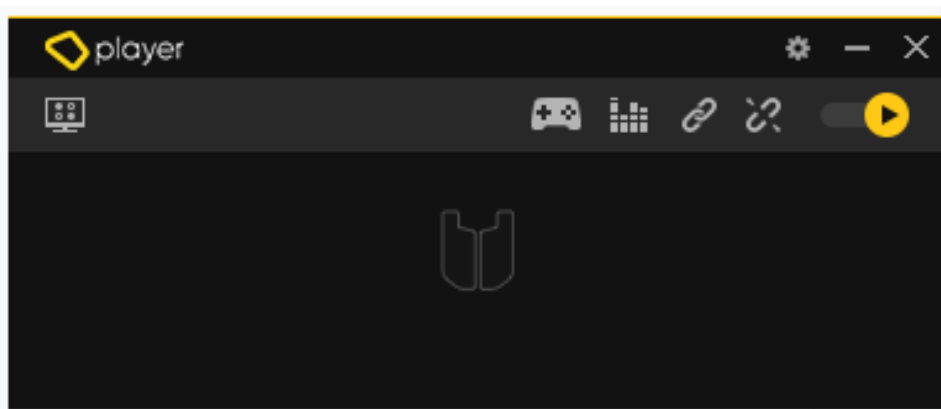
    c.   To test which one is paired to which computer, right click the vest icon and at push "Ping." The haptics will briefly buzz.
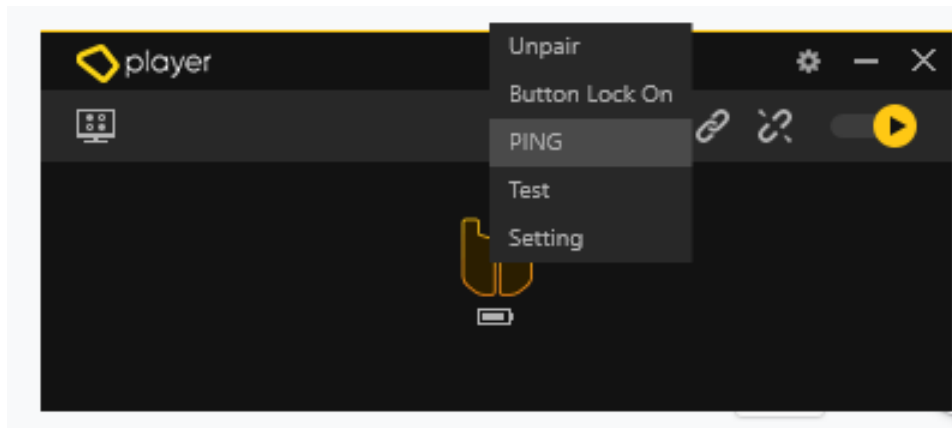
    d.   If the computer doesn't have bluetooth, a bHaptics bluetooth dongle is included.

7.   Turn on IMUs and run the finalTandemControlGame program using the F5 key with function escape F level shortcuts enabled or the green play button in the top menu (if in Spyder).
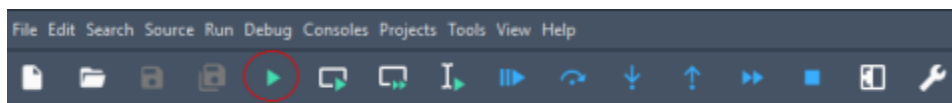

    a.   If in mode 3 with a second computer the student computer console will read "Waiting for connections." Then run the 2ndVestClient program to connect the teacher computer to the student computer. If no connection is established, review step 4.
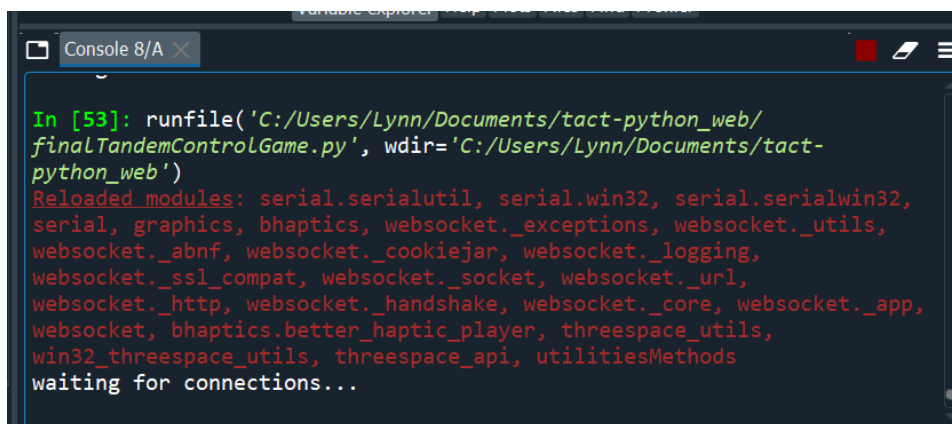
b. After this the program will show a 5 second count down in the console until sensor taring. Have the subject stand up straight and tall without any movements.

```
waiting for connections...
('35.9.134.188', 51013) is connected to server
Haptics not connected
Teacher battery at 100%
Student battery at 100%
Taring in 5

4


3


2


1
```

c. If the IMUs are not on when the program starts there will be an error. Refresh the console using the little x next to the console tab in the bottom right corner panel of the screen (if in Spyder). Alternatively, close the whole program and start from step 1 to resolve the error.
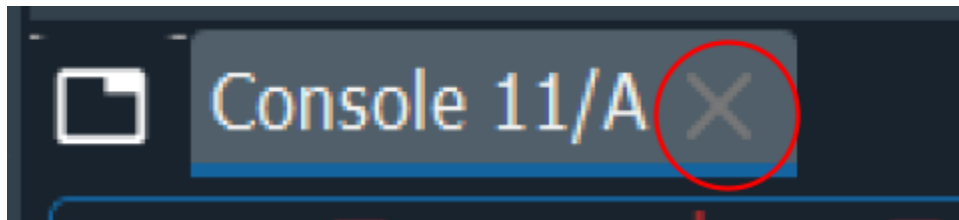
8. Bring up the graphic window and put it in the center of the screen. When the subject is ready, click the graphics window to start the target sequence.
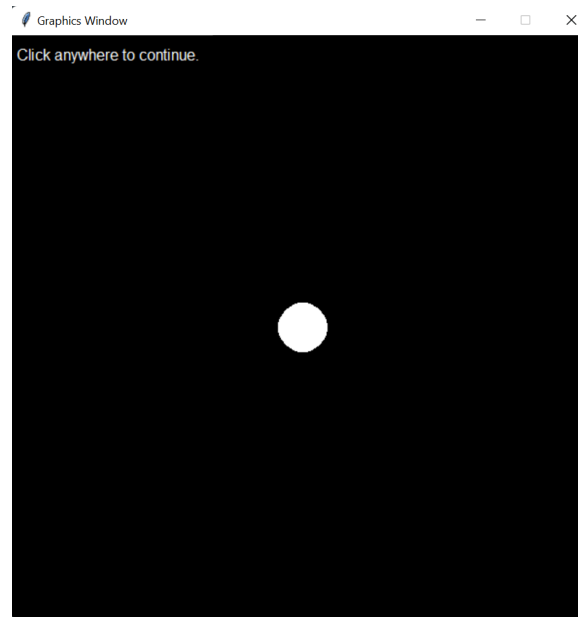
a. Rounds will progress as follows: Pretest, Training 1, Midtest, Training 2, Post Test
b. If applicable, the teacher will be active with haptics during the training rounds, but not during testing.
c. If the dongle fails to read an IMU due to low battery or weak signal, the game will be paused and the calibration sequence will start again. Plug in the affected IMU or move closer to the computer and the signal will resume.

9. When the program is complete the total time and score will be displayed. Devices should be closed automatically in preparation for the next trial.

a. The data file named earlier should be available in the same file as the programs.

Note: The programs include several error handling statements at the end that will print instructions to the console when issues occur. Most problems can be solved by refreshing the console by pushing the small x in the upper left of the kernel and running the programs again.