Internet of Things (IoT)

Topic 5: Simple Network Game – ping-pong

Introduction

Devices can communicate with each other to collaboratively work together through the network. Socket is the facility for programmers to develop network applications. We are going to implement a very simple ping-pong game on raspberry pi and senseHAT using python.

Socket Programming

Two devices can talk to each other through socket programming using the client-server communication paradigm. In the client-server model, the server always listens to the channel to see whether there is anyone who wants to talk to him. When the client would like to talk to the server, he sends a message to the server and the server can reply accordingly.

When the client sends a message, the recipient of the message has to be clearly defined. The recipient should be a certain application on a certain machine. IP address is used to tell the machine identity while the port number uniquely defines which application on that machine the message should be sent to. Refer to socket.pptx, lecture video, and sample programs for more information.

Running the Ping-Pong Game

Team up with another classmate or get another Pi so that you have two Pi's. **Connect two Pi's with SenseHAT to the workshop wifi access point [other wifi access may not work]. If you work at home, connect both Pi's to your home network.**

Download files pong_server.py and pong_client.py. Read the socket preparation section in both files. The server (pong_server.py) has to specify which port number it is using for this application. The current port number used is 3542 as specified in *server_address*. After creating the socket, the server then listens to the socket. When a request/message comes it, it will accept the request and set up a connection to talk to the client.
To send a request to the server, the client has to specify the IP address and the port number. In pong_client.py, the information is kept in *server_address*. To know the IP address of your server, on the Pi that you are going to run the server program, type "ifconfig" in the command prompt. Locate the IP address. It is in the format of XXX.XXX.XXX.XXX. Put the address in the appropriate place in pong_client.py. The port number (3542) has been specified for you. Save your file.

To start the game, make sure you have the server file on one Pi and the client file on another Pi. Start the server program on the server first [The game would not start if you start the

client program first] and you should see the message "Server is listening at port 3542…" Then, start the client program on another Pi. You should be able to start playing the game.

Understanding the Ping-Pong Game

In this game, the ball will keep moving and a player can use the joystick to move the bat to bounce the ball. Both server and client are players. Both players need the positions of the two bats and the position of the ball to display on the LED panel. Therefore, the players have to keep exchanging information in order to play the game forever.

Study the `while` loop in both the client and the server. The first line tells what to send to the other player. The server sends his bat position and the position of the ball. The client sends his bat information. You might notice that instead of sending numbers, we send strings. Therefore, we need to transform the strings back to integers after receiving them.

Both the client and server should update the opponent's bat position after receiving that from the socket. Client should also update the ball position. Based on what you have learned in python and SenseHat, answer the following questions to yourself:

1. How is the bat position of the player updated?

2. Who determines the new ball position? How? How often is the ball position updated?

***Task 1**: Enhance the Ping-Pong Game*

Extend the game as follows:

1. when a player cannot catch the ball, the ball position will be reset.

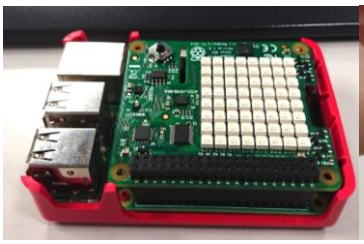
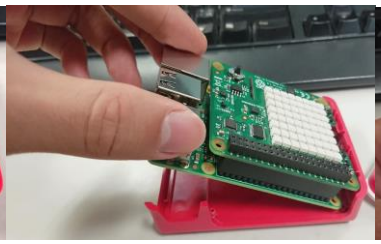
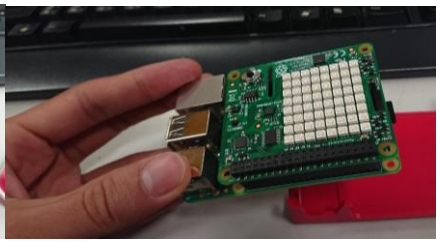
2.increase the ball speed when there 5 consecutive successful catches. Reduce the speed when either player cannot catch the ball. The ball changes color as the speed changes.

*Submit to Moodle: demonstration video & **pong_server.py** & **pong_client.py***

You can now safely remove the SenseHat. Please follow the steps below:

1. Turn off and **cut the power** of the Raspberry Pi
2. Take the Raspberry Pi out of the case

a. b. c.

3. You are suggested to remove the SenseHat using this method to avoid damaging the pins of the Raspberry Pi:

a. b.