Virtual Reality Streaming

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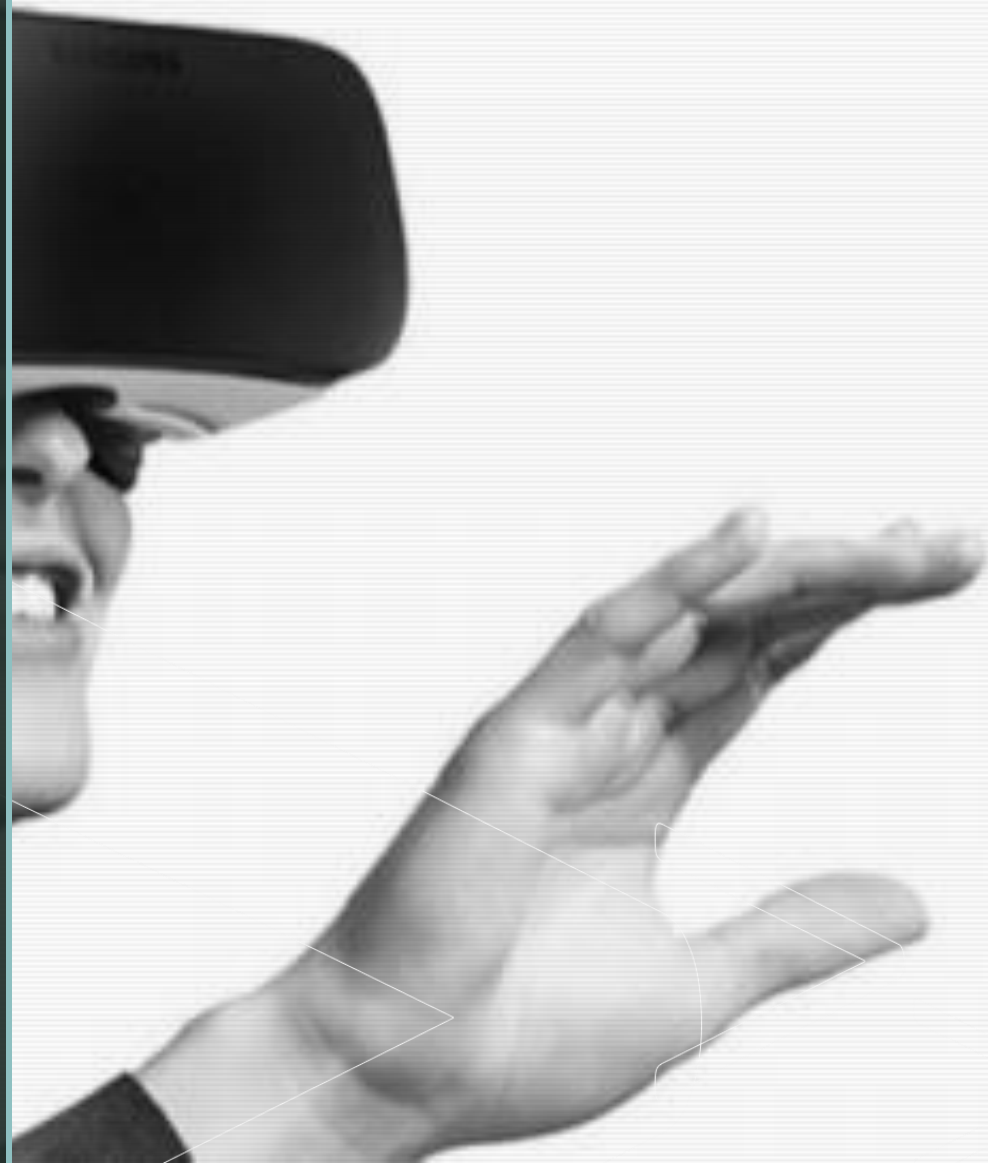


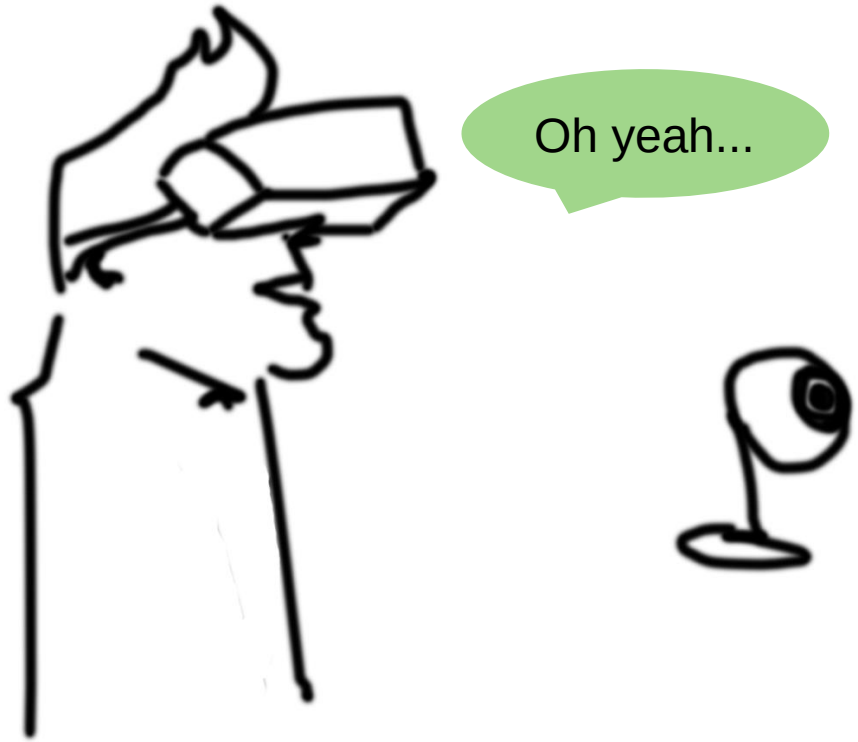
Motivation

Live broadcasting are getting more and more popular nowadays, but it's ooften stricted to 2D screen.

Therefore, we want to create a new product, which allows users interact with each other while live broadcasting

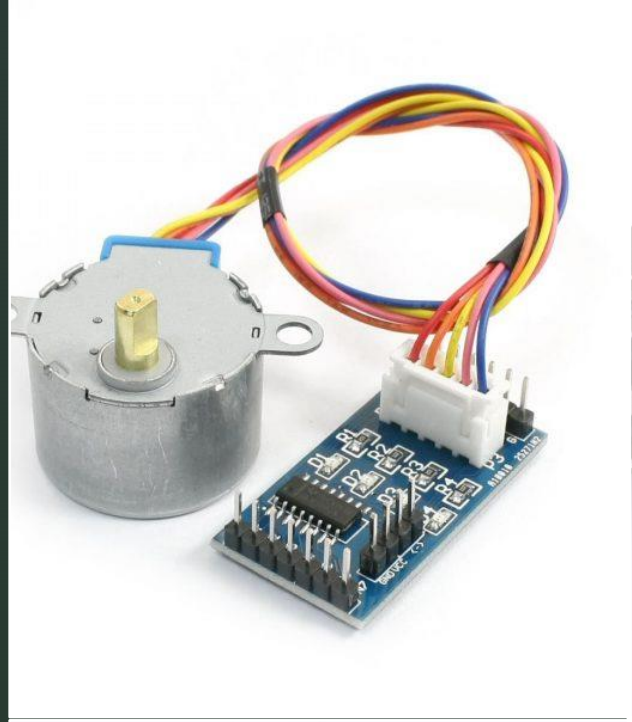
Objective

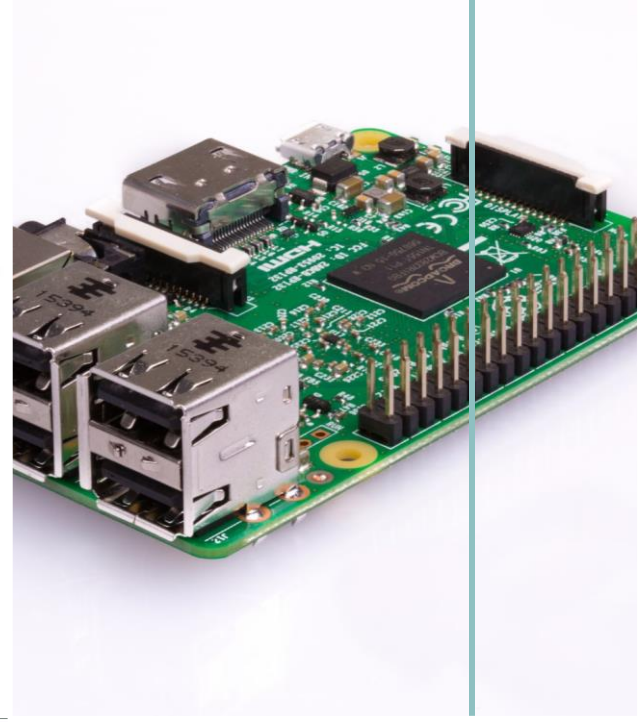
The little camera can live broadcast to viewers, and rotate according to head motion, changing the field of view

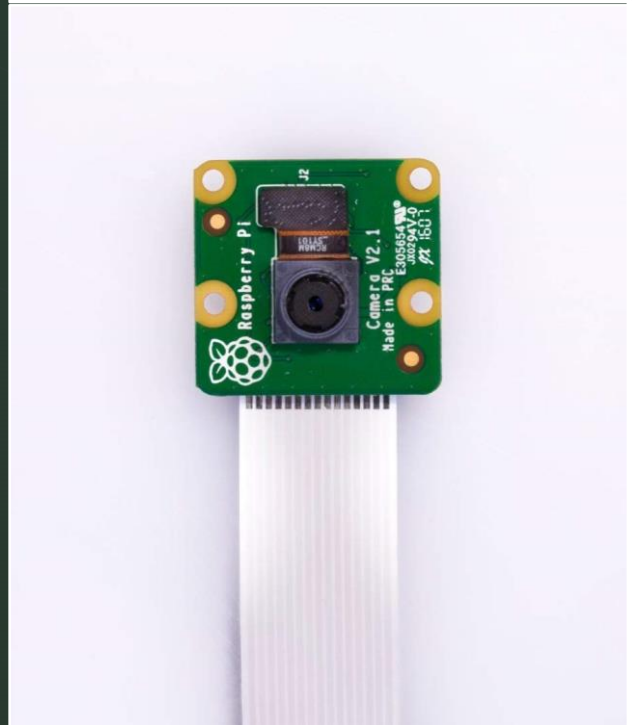


Materials

- Raspberry Pi *2
- Stepper motor
- Pi camera
- Head Mounted display
- Smartphone







Implementation Details

Overview

Client site

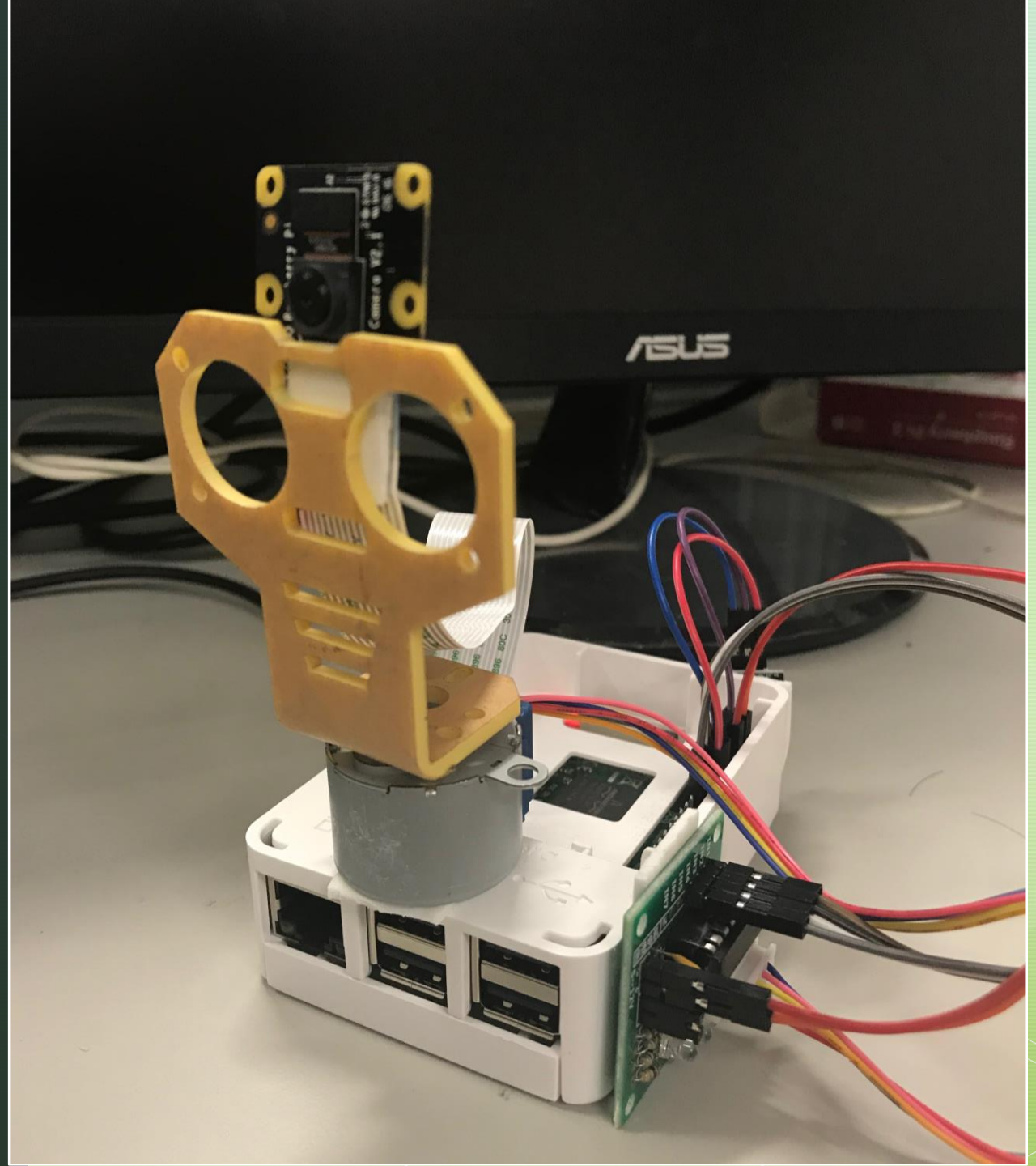
1.Watch the video with browser
2. Record the head motion and transmit ot the server

All are transmitted on the internet

Server site

1.Record the video, stream on the server
2. Rotate accoding to the head motion

Server site



Streaming : mjpeg-streamer

Github link: https://github.com/jacksonliam/mjpg-streamer

- It's can be used to stream JPEG files over IP-based network from a webcam to various browsers
- It’ s written for embedded devices with vary limited resources in terms of RAM and CPU.

Internet, RaspberryPi

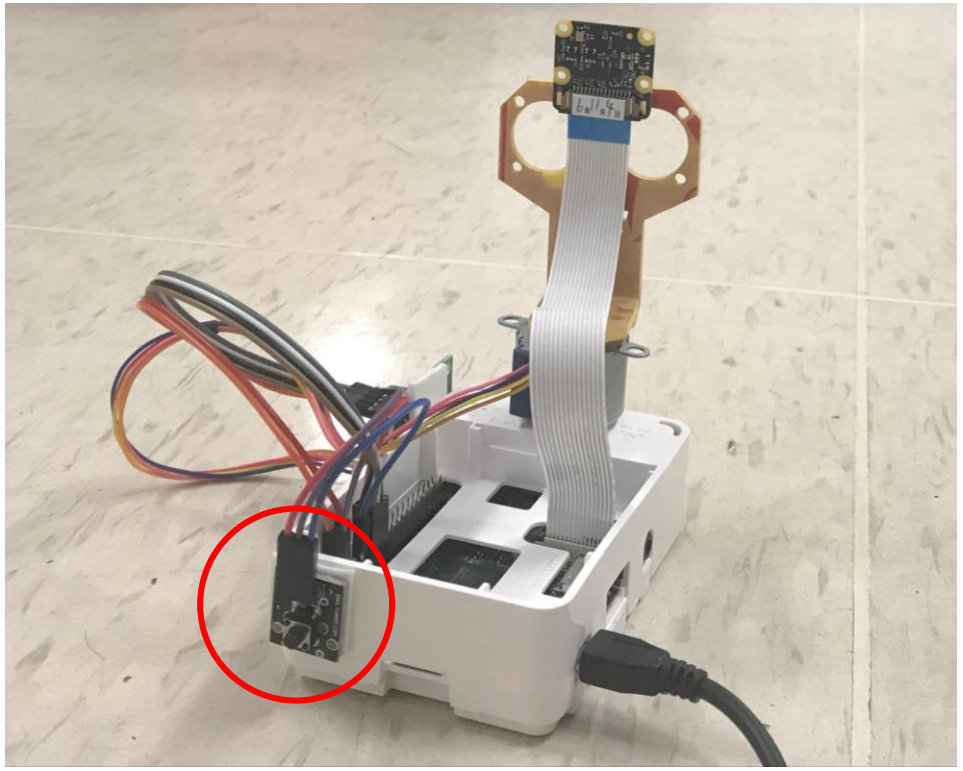
Rotation

- Provide a service on local host with another port different from streaming
- Communicate with the clients via sockets instead of Bluetooth, which can't transmit in large distance
- Receive the infromation of "destination" demanded from the client, and rotate accordingly.

Reset the cemera position

We set a botton to close the service, and to rotate the camera to the original position.

It’ s covenient for use



Button to reset

Performance with multi-thread

3 threads (original)	2 threads (revised)
Streming quality is bad Rotation is unstable Handle the button with 1 independemt thread, which is totally a waste	Streaming quality and rotation are both smoother and more stable Can handle the button event just as original version.

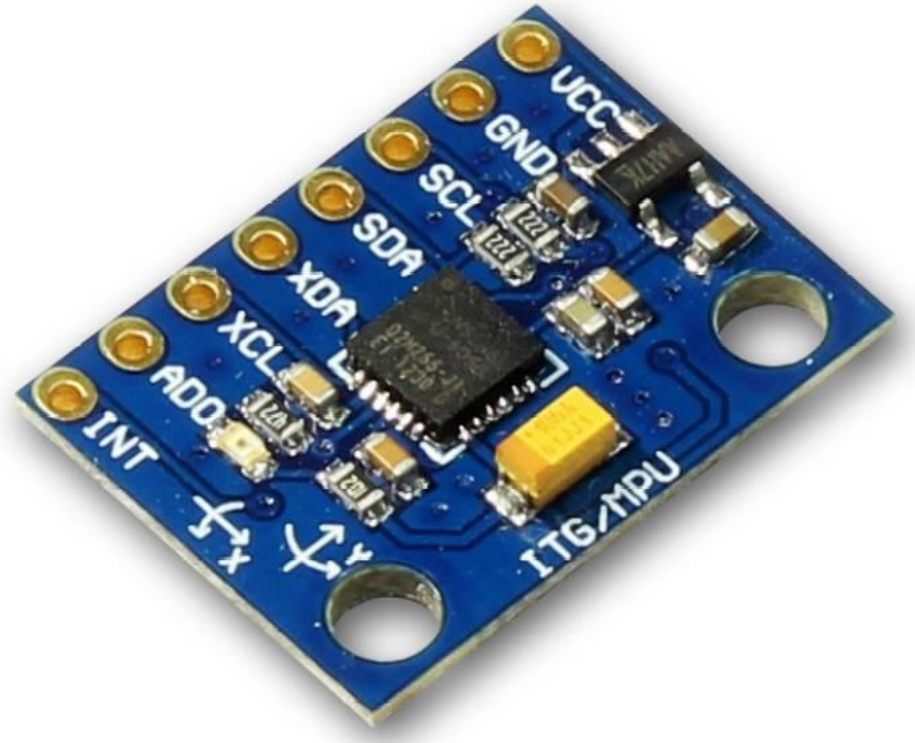
It might because the streaming cosumes too much resorces

Client site

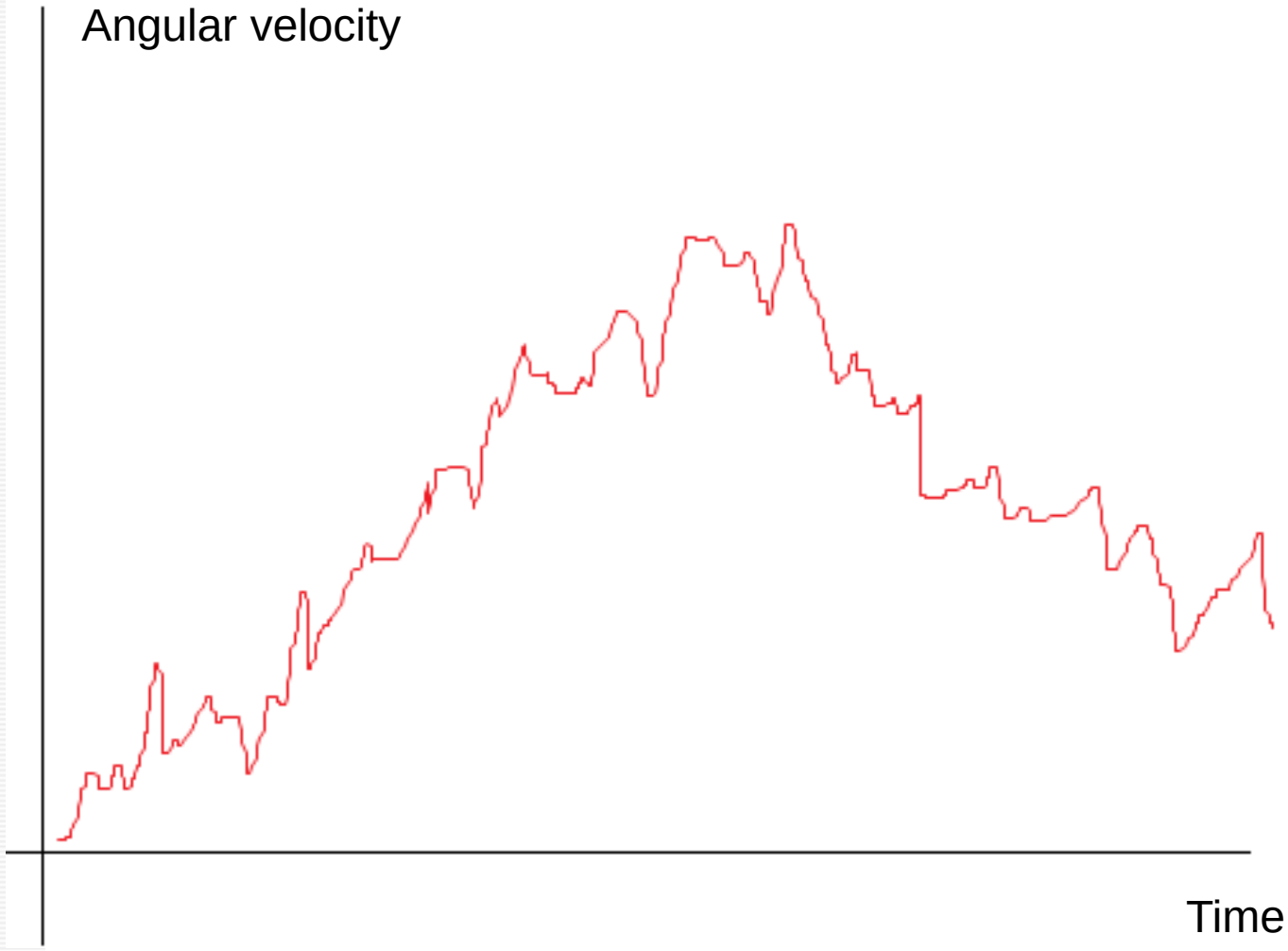
Detect head motion

- Sensor : MPU6050
- It has a gyroscope inside, which can sense the angular velocity

- We wrote a integrator to record the posision which head is faced



Integrator

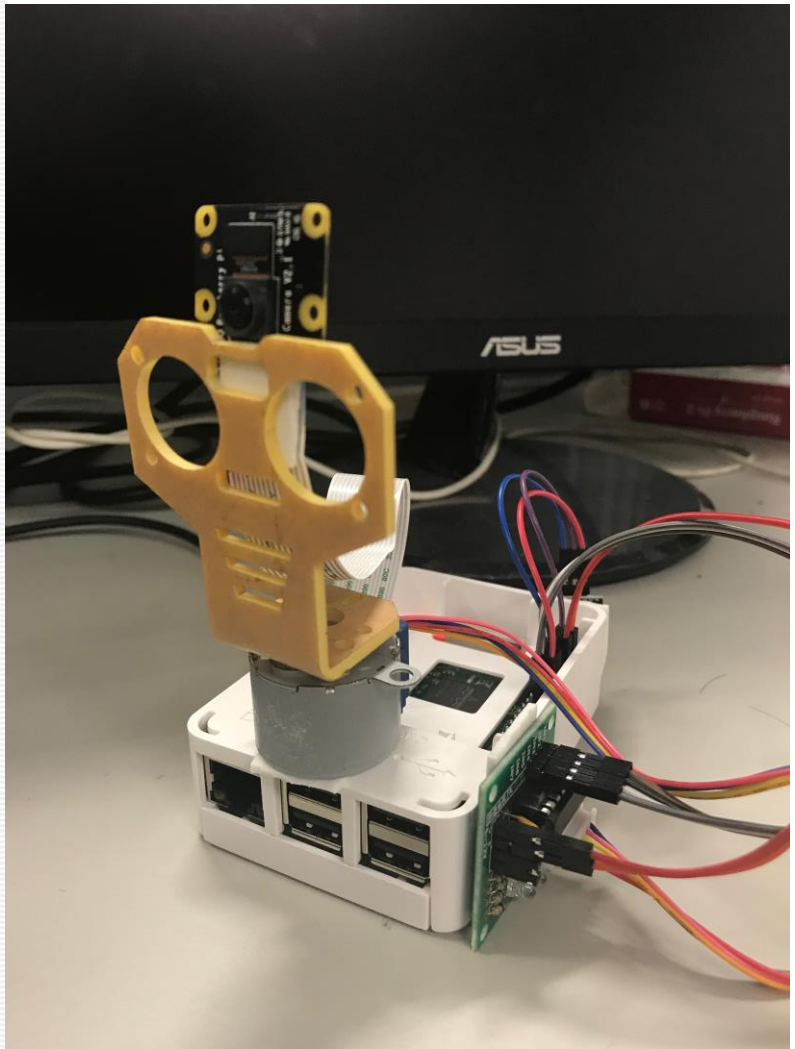


The raw data is very unstable, to stablalize the signal, we design two strategy:

1. **filter**:
   Consider low value as 0, so it wouldn’ t make the camera move when head motion is too small

2. **discretalize** :
   Devide the raw value by a scalar, So the output value would be the same in a range.

Result



Demo time !

Reference

- https://desertbot.io/blog/how-to-stream-the-picamera
- Github
- https://blog.everlearn.tw/%E7%95%B6-python-%E9%81%87%E4%B8%8A-raspberry-pi/raspberry-pi-3-model-b-%E5%88%A9%E7%94%A8-uln2003a-28byj-48-%E9%A9%85%E5%8B%95%E6%9D%BF%E6%8E%A7%E5%88%B6%E6%AD%A5%E9%80%B2%E9%A6%AC%E9%81%94

Thanks for listening !