Swing Path Tracking

Team：Undefined

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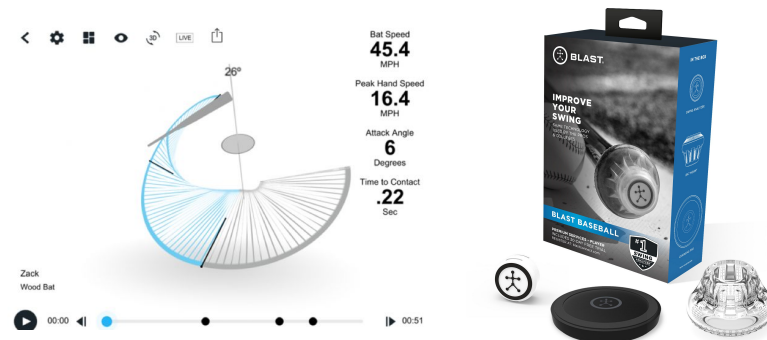
Motivation & Idea

➔ Motivation
 ◆ Baseball team of NYCU
 ◆ Improve training efficiency
 ◆ Batting is quite important of baseball
 ◆ Track the path of bat while swinging
 ◆ Help player to adjust the batting pose

➔ Idea
 ◆ Use IMU (GY-801) track the path
 ◆ Plot and visualize the path
 ◆ Remote or Direct
 ◆ Show the result via LINE Notify

Used knowledge
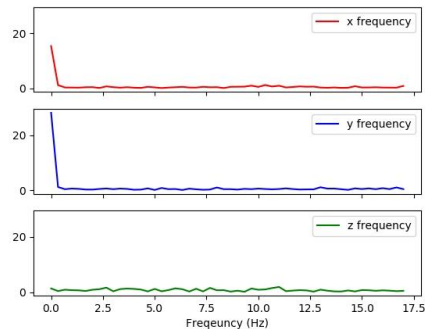
➔ Mathematical
- ◆ Physical : Acceleration to Displacement
- ◆ Calculus : Intergration
- ◆ Linear algebra : Coordinate transformation
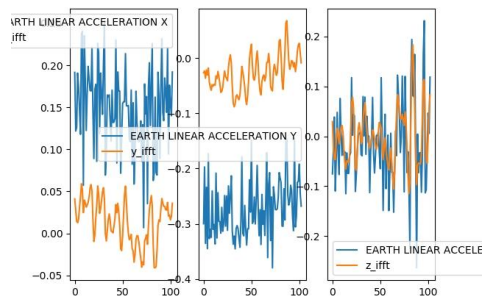- ◆ Signal and System : Bandpass filter, FFT

➔ Technology
- ◆ Computer Network : MQTT
- ◆ Electronic Lab : Hardware design
- ◆ IOT : AHRS (Sensor Fusion)
- ◆ IOT : LINE Notify

Hardware & Software
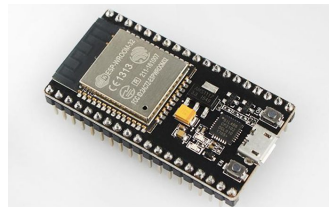
➔ Hardware
  ◆ Raspberry PI (Broker)
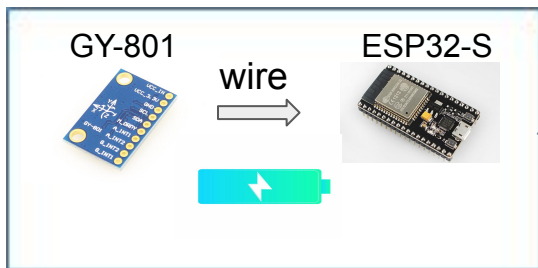 ◆ ESP32-S (Client)
  ◆ GY-801
  ◆ Battery (18650)

➔ Software
  ◆ Python   (Raspberry PI)
  ◆ Micropython   (ESP32-S)
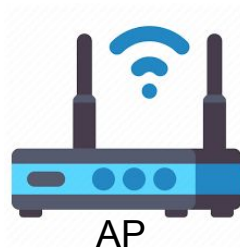 ◆ MQTT   (Message Queuing Telemetry Transport)
  ◆ LINE Notify API

python™

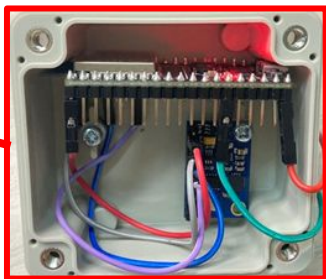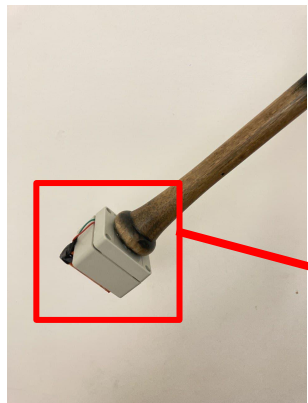MicroPython

MQTT

LINE Notify

Architecture Diagram

Measure

GY-801   wire   ESP32-S

MQTT

Broker

Result figure

AP

Flow Chart

```
┌─────────────────┐        ┌─────────────────────┐
│   對手機下達      │───────▶│ 透過SSH對Raspberry pi │
│ "Hey Siri, swing."│        │  下指令執行量測程式    │
└─────────────────┘        └─────────────────────┘
                                                    ┌──────────────────────┐
                                                    │ Raspberry pi 透過 MQTT  │
┌─────────────────┐        ┌─────────────────────┐ │  subscribe 量測數值     │
│ 利用ESP32-S 讀取  │───────▶│  ESP32-S 透過 MQTT   │ └──────────────────────┘
│   GY-801數值     │        │   publish 量測數值    │
└─────────────────┘        └─────────────────────┘
                                                    ┌──────────────────────────┐
        ┌──────────────────────┐                    │  將數據進行演算法運算, 並將    │
        │  將結果透過Line回傳至手  │◀───────────────────│ Frequency Spectrum、IFFT、與 │
        │  機, 讓使用者方便觀察    │                    │ Attenuated IMU trajectory 的結│
        └──────────────────────┘                    │        果以圖表顯示          │
                                                    └──────────────────────────┘
```

Demo

Video: https://youtu.be/8w8HOQ4D0T
Code: https://github.com/jerry871002/Embedded-System-Final-Project
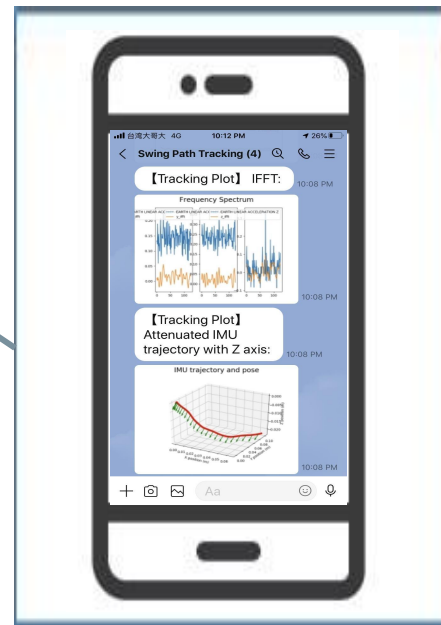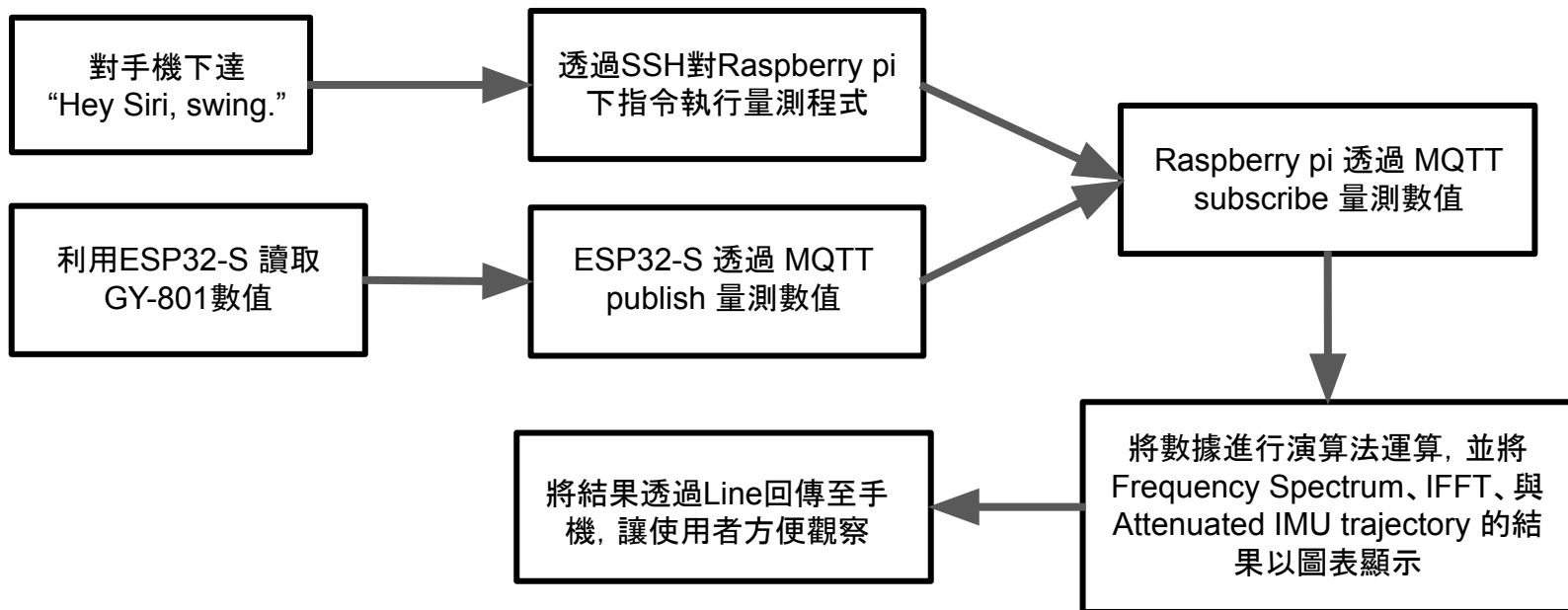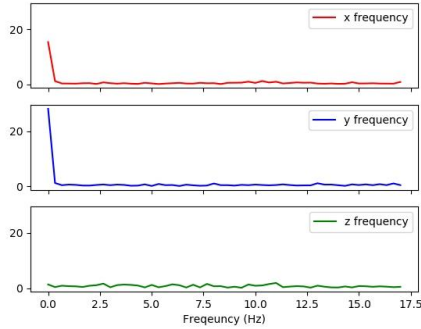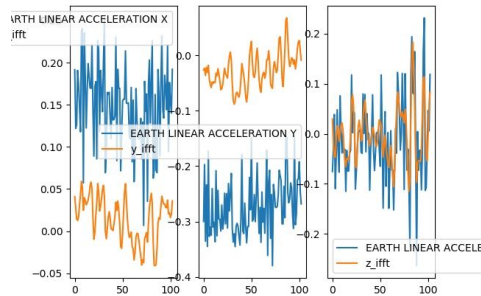
Result Figures

Frequency Spectrum

Frequency Spectrum

IMU trajectory and pose