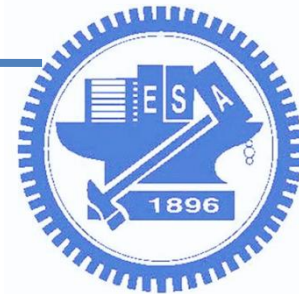# Welcome to "IoT Platform" Course
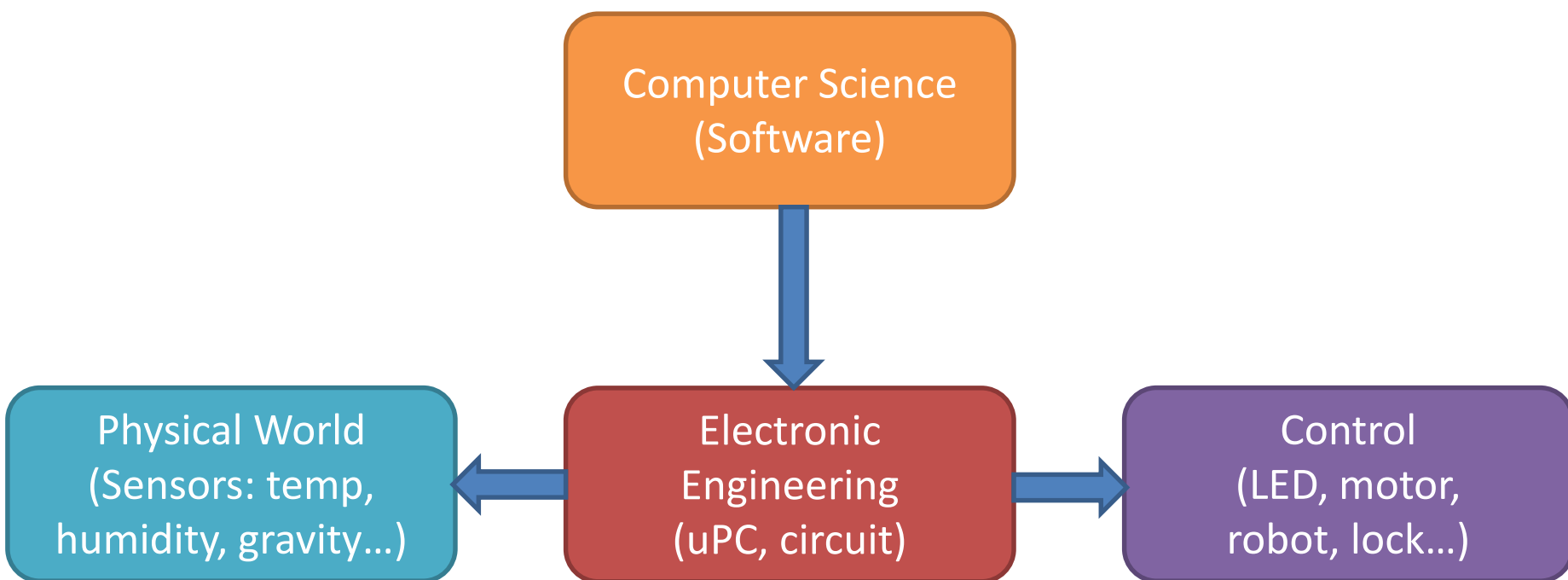
物聯網平台Raspberry PI
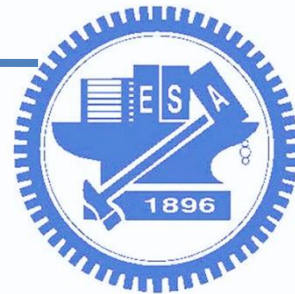
曾煜棋、吳昆儒

交通大學

https://github.com/coldwufish/RaspPI

Aim of This Course

```
                    ┌─────────────────────┐
                    │  Computer Science   │
                    │     (Software)      │
                    └─────────────────────┘
                              │
                              ▼
┌─────────────────┐  ┌─────────────────┐  ┌─────────────────┐
│  Physical World │◄─│   Electronic    │─►│    Control      │
│ (Sensors: temp, │  │   Engineering   │  │  (LED, motor,   │
│ humidity,       │  │  (uPC, circuit) │  │  robot, lock…)  │
│ gravity…)       │  │                 │  │                 │
└─────────────────┘  └─────────────────┘  └─────────────────┘
```
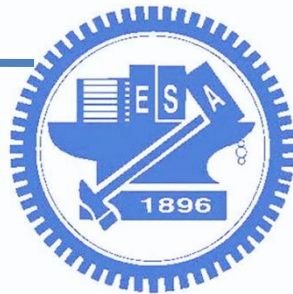
授課心得

- 100%以實習為主：學生翹課率 ~0%
- 減少lecturing：學生幾乎不打瞌睡
- 現場動手做：有問題立刻提問
- 設計discussion questions：參與度高，同時刺激思考
- 每次3小時，留下1小時做quiz questions，整合/歸納當天學習成果
- 放一些網路上短片，刺激思考並強化學習動機
- 設備帶回家：期末負責交回點收

推廣模組清單

- 物聯網平台Raspberry PI
  - 單元1：Raspberry PI Introduction
  - 單元2：Raspberry PI GPIO, Sensors and Python
  - 單元3：Input and output of Raspberry PI
  - 單元4：Communications (Wi-Fi, Bluetooth)
  - 單元5：Cloud Integration
 - 實驗：In-class discussions, quiz, hands-on labs
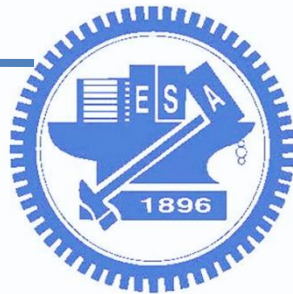
授課內容

1. Basic of Raspberry PI
2. Raspberry PI GPIO
3. Sensors and Python on PI
4. PI camera applications
5. Facial recognition by OpenCV
6. Object detection by Tensorflow
7. Communications (BLE advertisements)
8. Voice assistance and Cloud integration
9. Final project

實驗環境

個人電腦

USB TTL傳輸線

麥克風
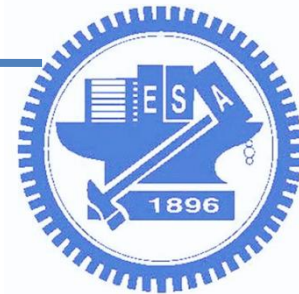
- Raspberry PI開發板連接各式各樣的感測器
  - 感測器、慣性元件、攝影機、通訊模組、語音辨識
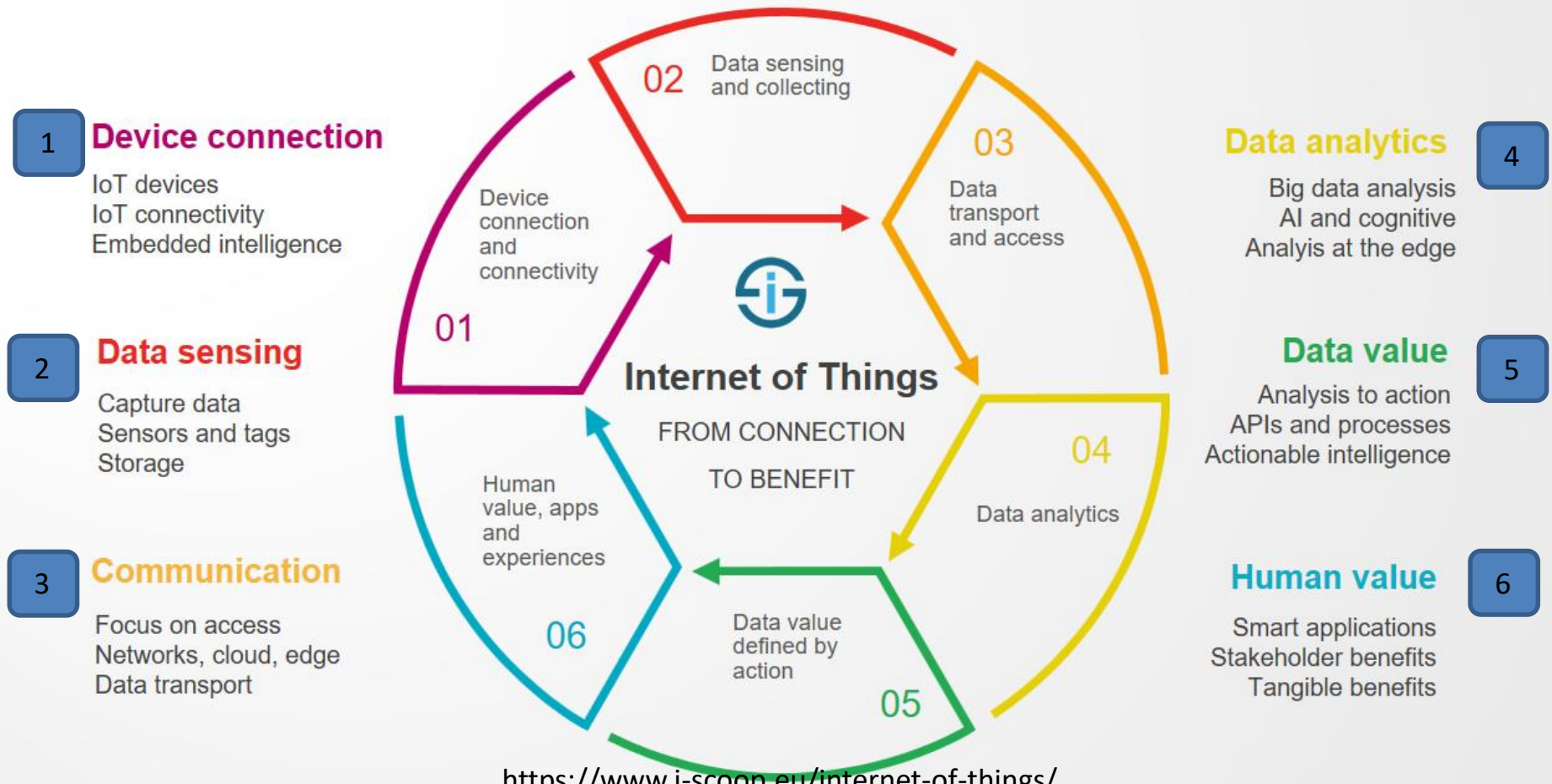 - 可依照課程需要做調整

- 使用USB TTL傳輸線控制開發板, 撰寫程式並實驗, 無需螢幕鍵盤滑鼠

WiFi

PI camera

耳機/喇叭

雲端伺服器

感測器

Teaching material

- Raspberry PI
- 電子元件
- 感測器、慣性元件、攝影機、麥克風
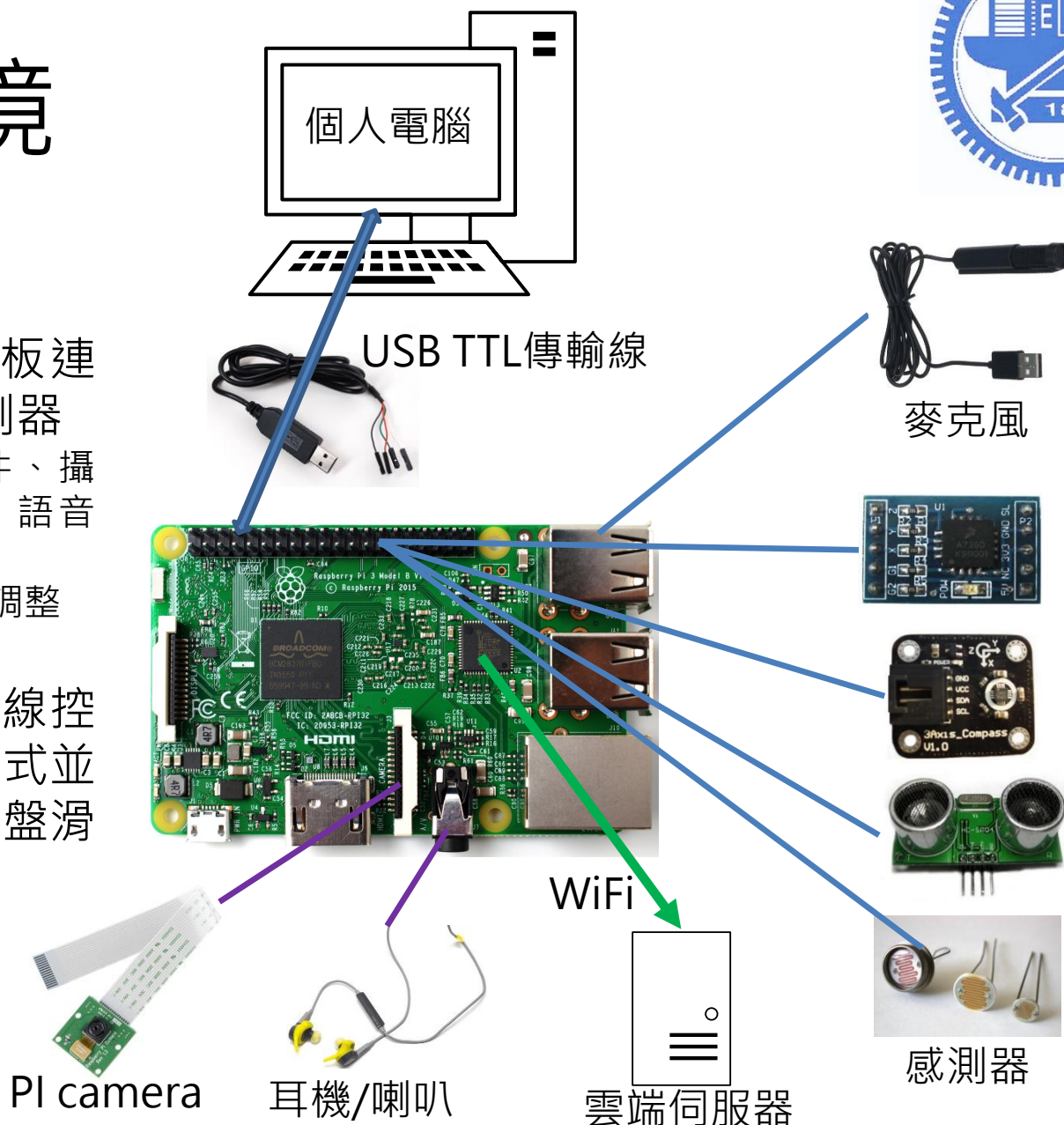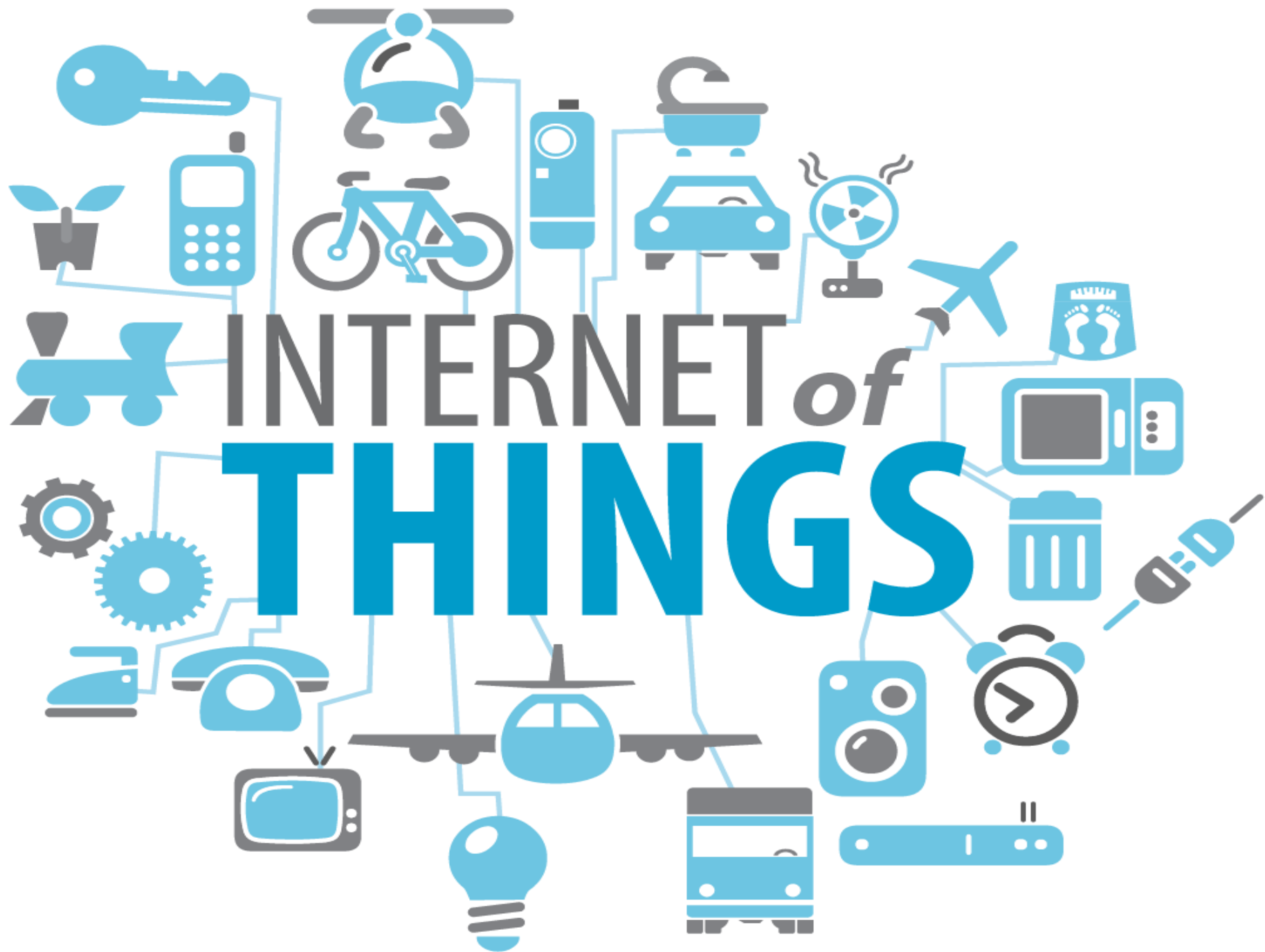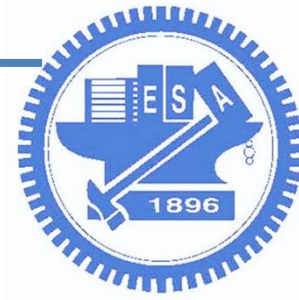
INTERNET of THINGS

Internet of Things

From connecting devices to human value

https://www.i-scoop.eu/internet-of-things/

Applications

結合超音波、溫度、警示訊息，計算距離

應用: 倒車雷達
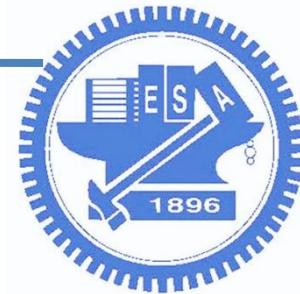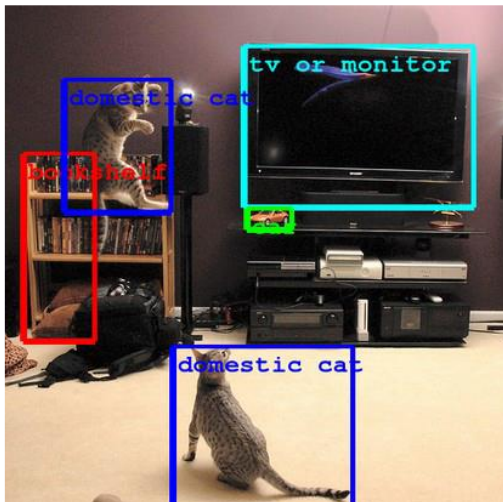
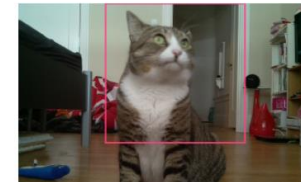# Applications

內建慣性元件(加速度, 陀螺儀, 電子羅盤等)

應用: 智慧手環
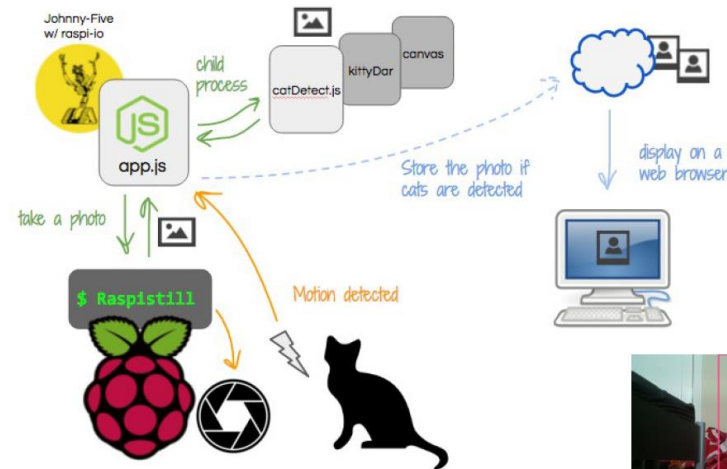
Applications

龍珠雷達

利用**方位感測器**與**三軸加速度**，
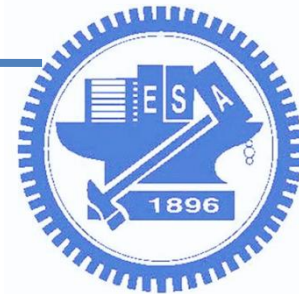配合移動來接近光源。
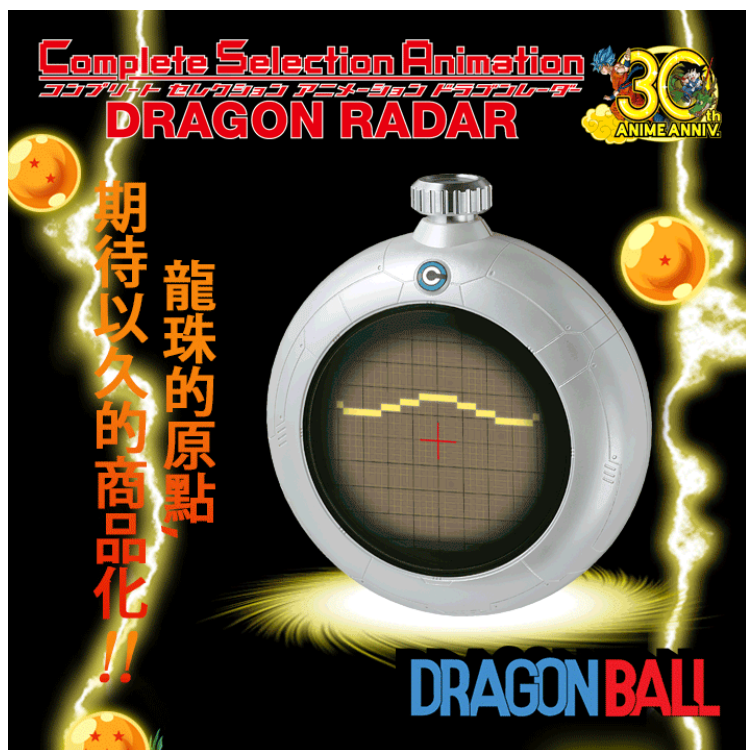
應用: 慣性元件

Applications
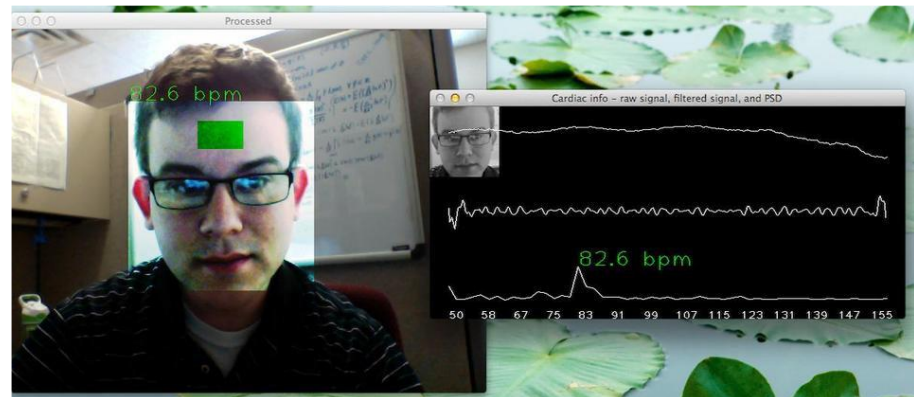
應用: 網路攝影機 與 影像辨識
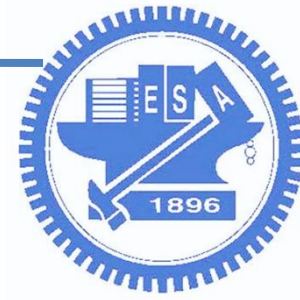
Applications

語音識別、語言理解、對話...等

Microsoft Invoke

Amazon Echo

Apple HomePod

Google Home

Amazon Dot

應用: 語音助理

Applications

藍牙BLE Beacon封包，夾帶廣告訊息
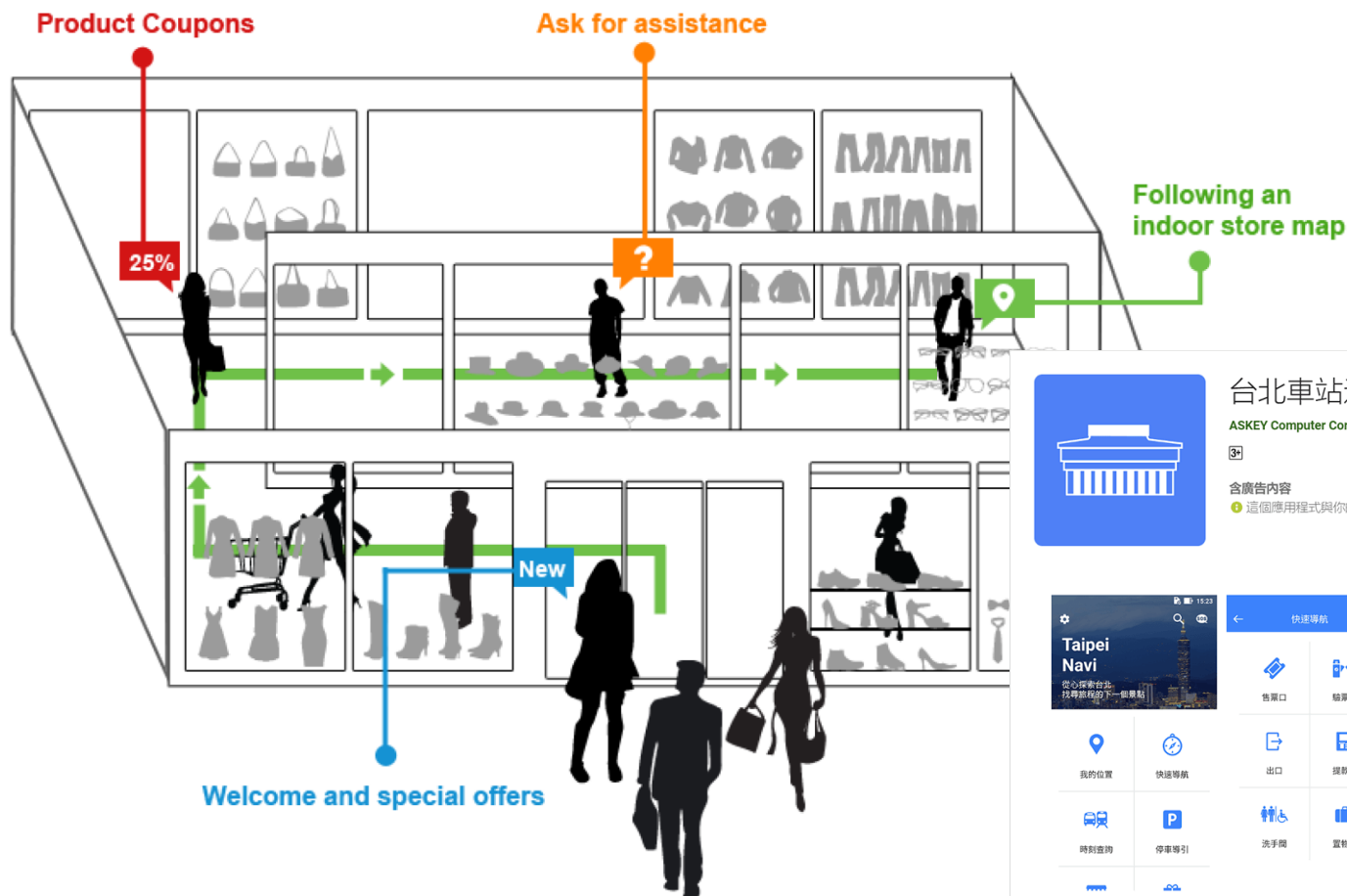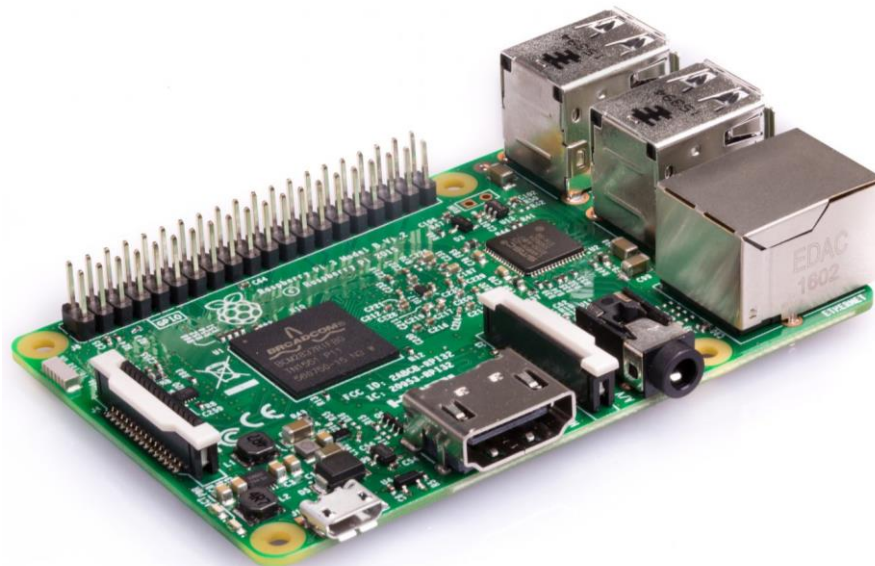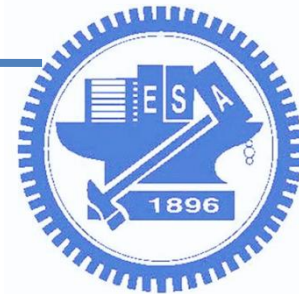

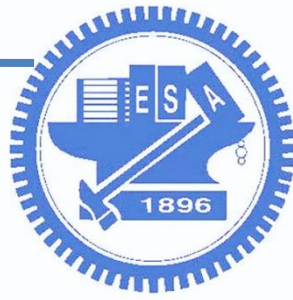應用: 推播訊息、定位(Beacon)
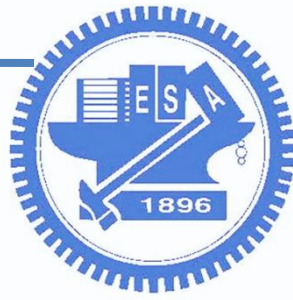
Use Raspberry PI
to create a IoT applications

Raspberry PI 硬體週邊

40 GPIO pins

Display interface

Power supply

HDMI

Camera interface (CSI)

USB 2.0 *4

10M/100M Ethernet port

Combined 3.5mm audio jack and composite video
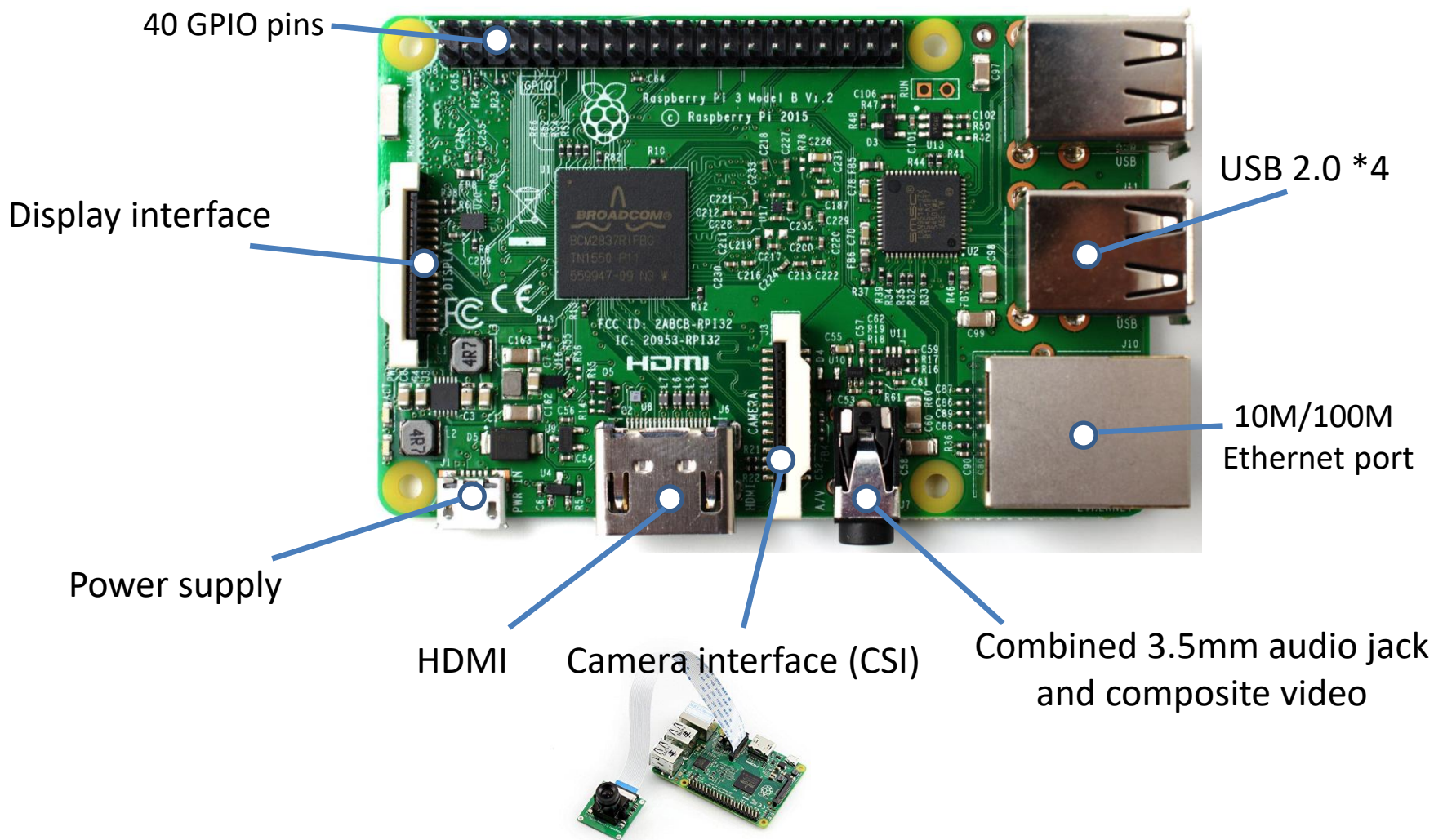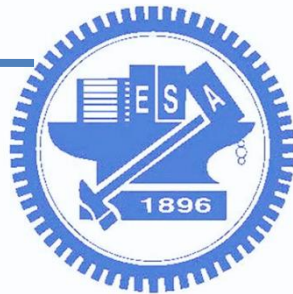
Raspberry PI 3 Model B

- Raspberry PI 3 model B:
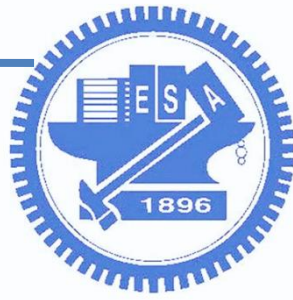 - 主要有以下功能:
    - 1.) SD 卡: 當成內建的硬碟使用，一般來說最少需要有4GB 的容量，建議用比較穩定的牌子，這樣可以確保讀取資料正常
    - 2.) HDMI 輸出顯示
    - 3.) USB 的輸入端口: 如滑鼠與鍵盤
    - 4.) RJ45網路線端口
    - 5.) Micro USB 電源端口: 僅供電, 無資料傳輸用途
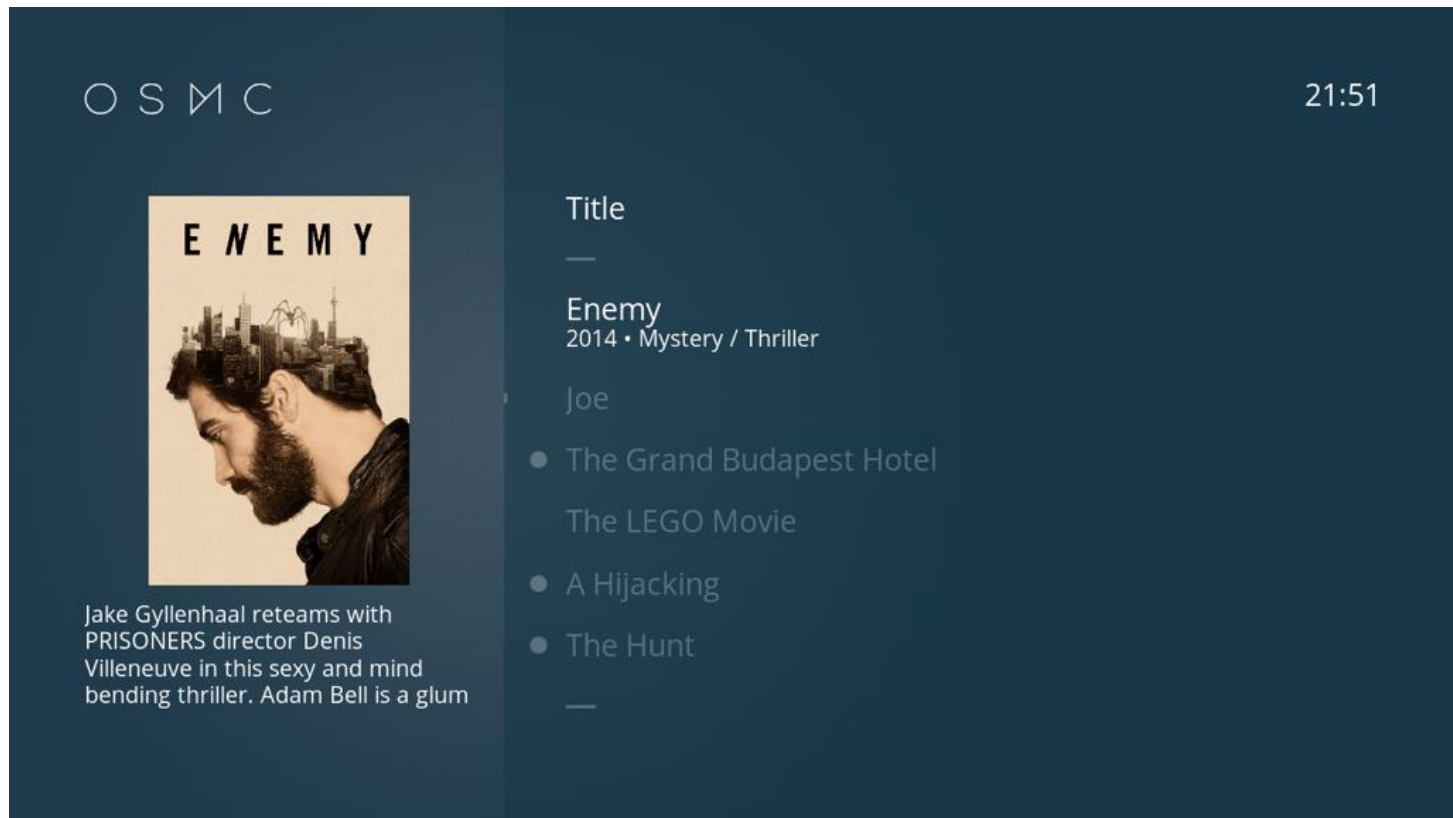   - 6.) 內建802.11n Wi-Fi 與 藍牙4.1

Raspberry Pi 可以用在?

- 桌機 (Raspbian, Ubuntu)
  - FTP, Web, NAS, AP, 自動化控制…等
- 多媒體影音作業系統
  - OSMC (Open-Source Media Center)
  - OpenELEC (Open Embedded Linux Entertainment Center)
- 遊戲機 (RetroPie、 PiPlay)
- 網站滲透測試 (Kali Linux)
- IoT應用
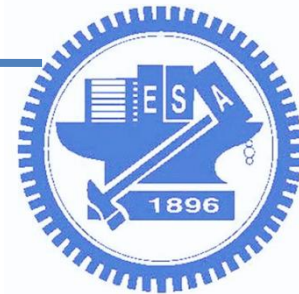 - 連接特定感測器,讀取數值進行分析
- 嵌入式應用
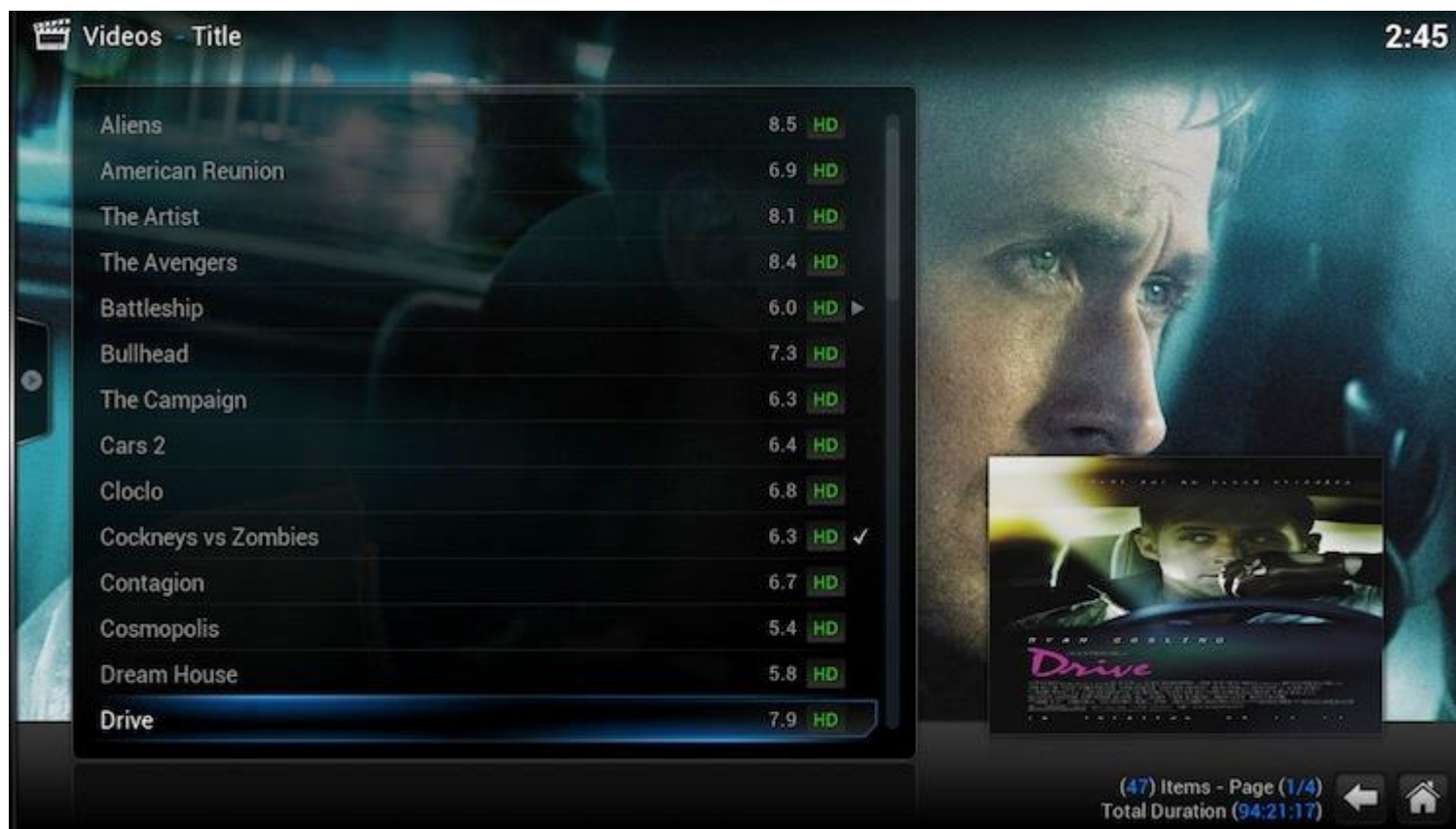 - 前面提到的倒車雷達、智慧手環、網路攝影機、語音助理…等。

Raspberry Pi 可以用在?

□ OSMC

https://osmc.tv/download/
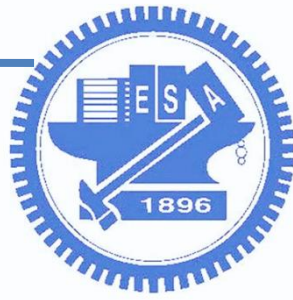
Raspberry Pi 可以用在?

□ OpenELEC

http://openelec.tv/get-openelec

Raspberry Pi 可以用在?

□ RetroPie

http://makezine.com/projects/build-retro-gaming-console-raspberry-pi/

Raspberry Pi 可以用在?

☐ PiPlay

http://piplay.org/
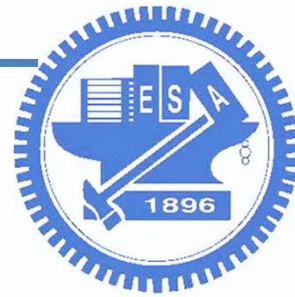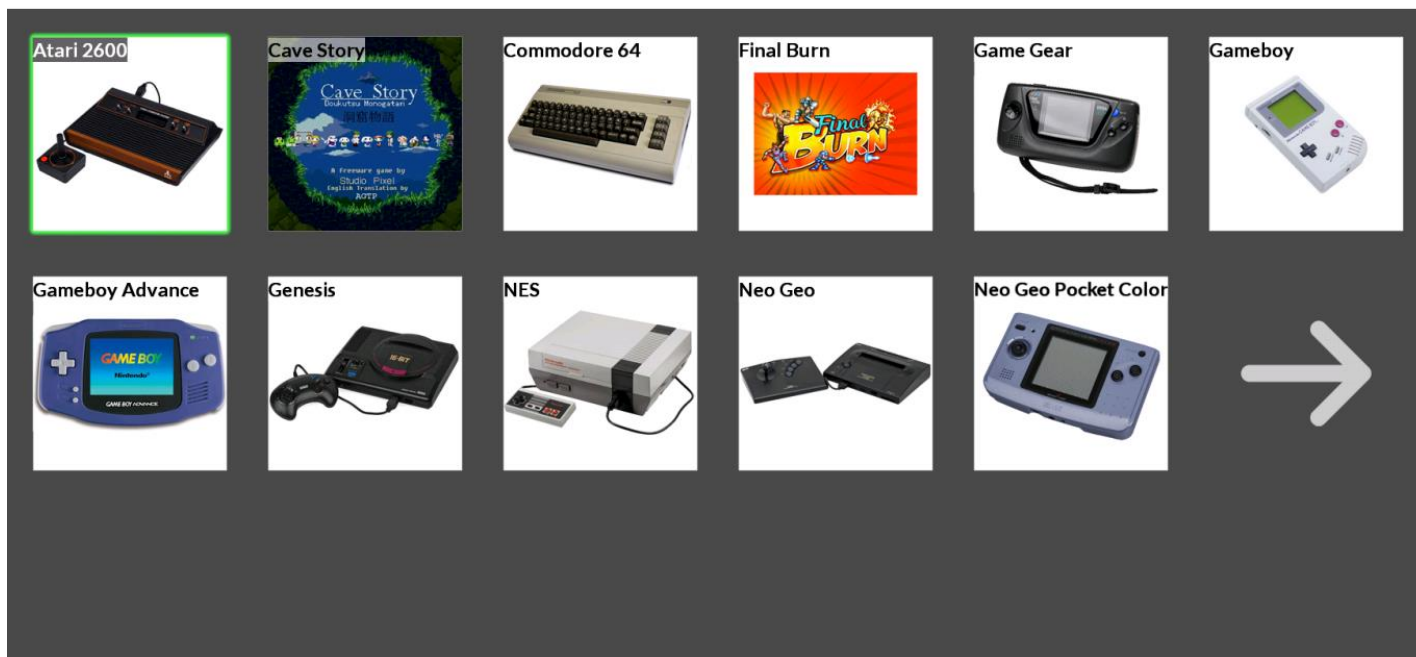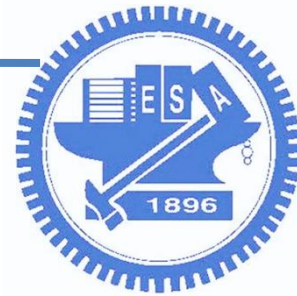
Raspberry Pi 可以用在?

- Kali Linux

https://www.kali.org/
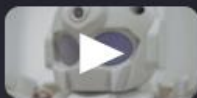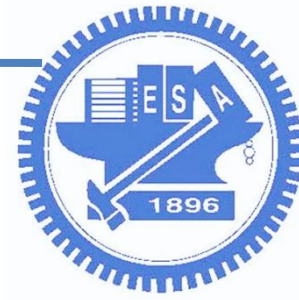
RAPIRO

RAPIRO

Arduino Compatible Controller
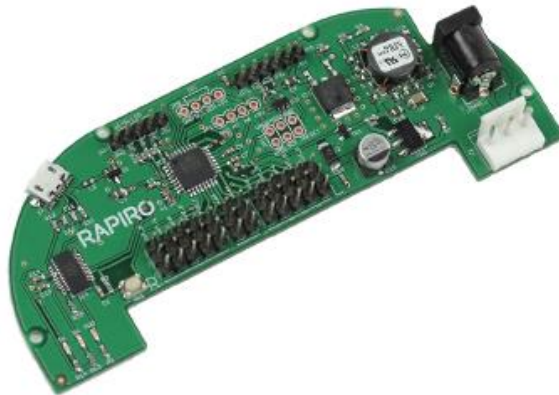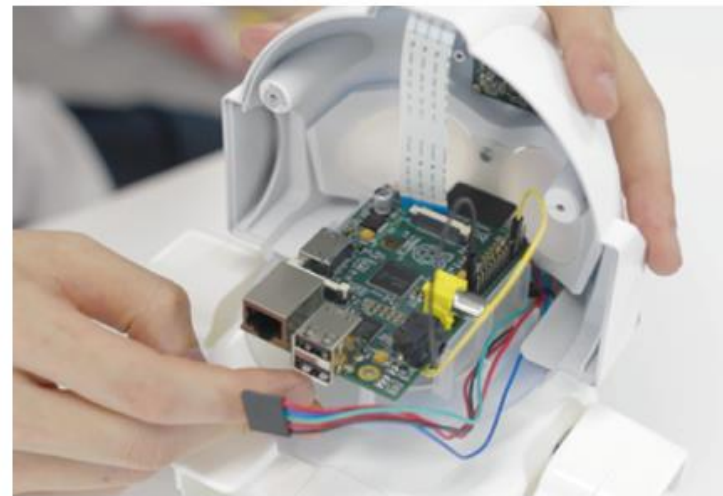

The Rapiro main board works like an Arduino board, and it can be reprogrammed using Arduino IDE. Rapiro is not only for those who have programming skills but also for beginners.

Arduino is a combination of an 8-bit AVR based microcontroller board and C++ like development environment (Arduino IDE).

You can install Raspberry Pi

If you want more functions, you could do it by installing a Raspberry Pi (sold seprately) inside Rapiro. Raspberry Pi can be programmed with a wide variety of programming languages for Linux. Depending on your programming, your Rapiro could give you message notifications with Wi-Fi enabled or could protect your home as a security robot using a camera module!
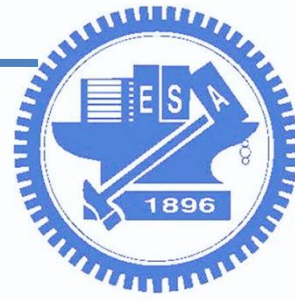
RAPIRO

https://www.youtube.com/watch?v=AQynsVZx5Pk
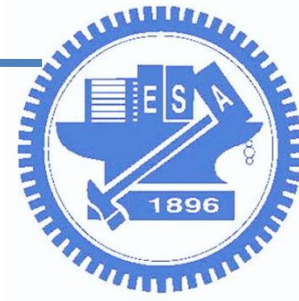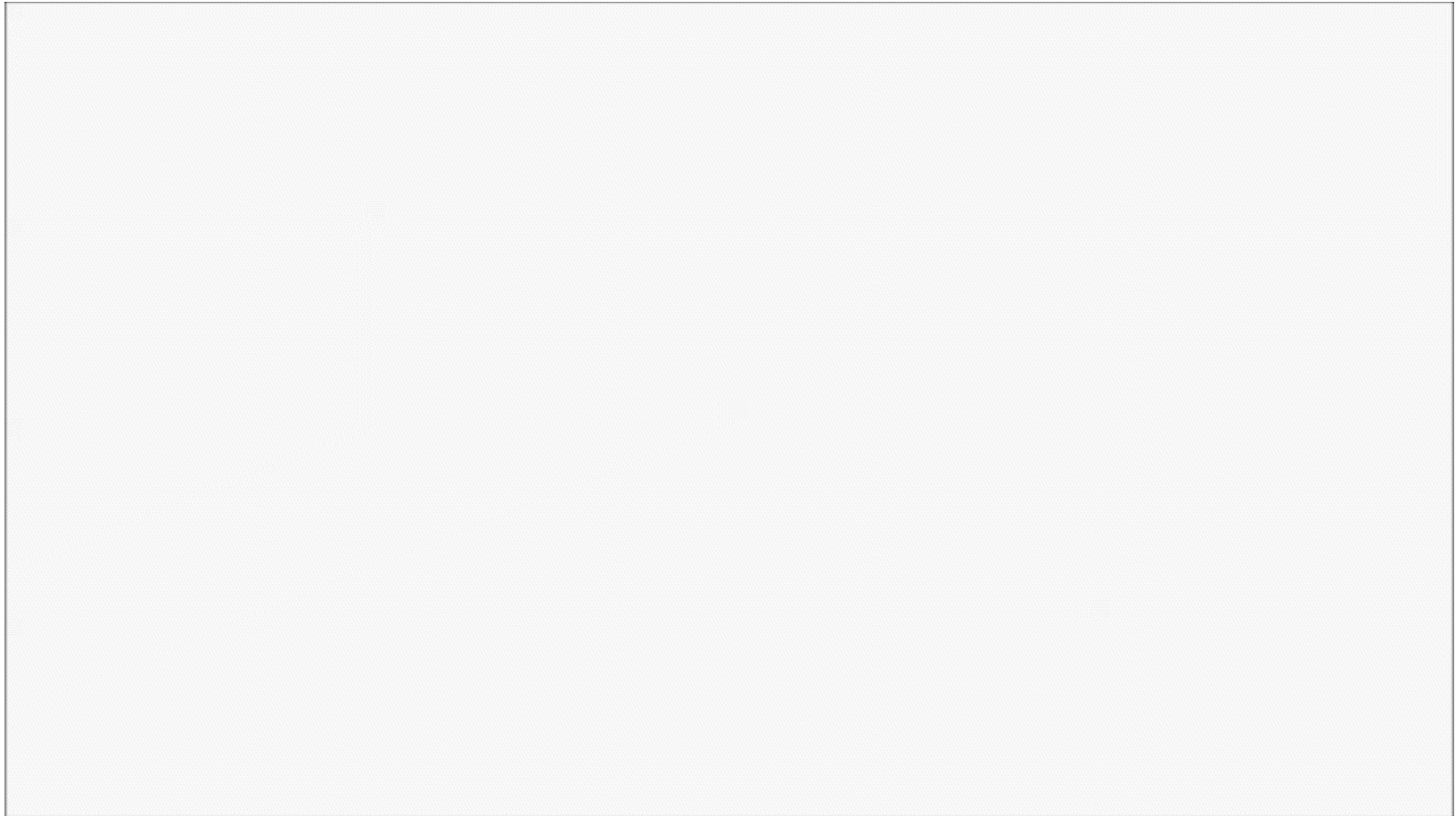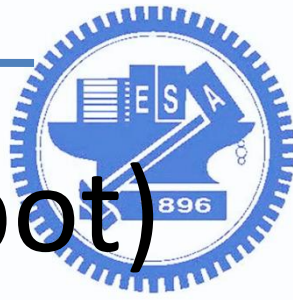
Duckietown (self-driving robot)

- An Open-Source MIT Class & Computer-Vision Self-Driving Robot for Raspberry Pi

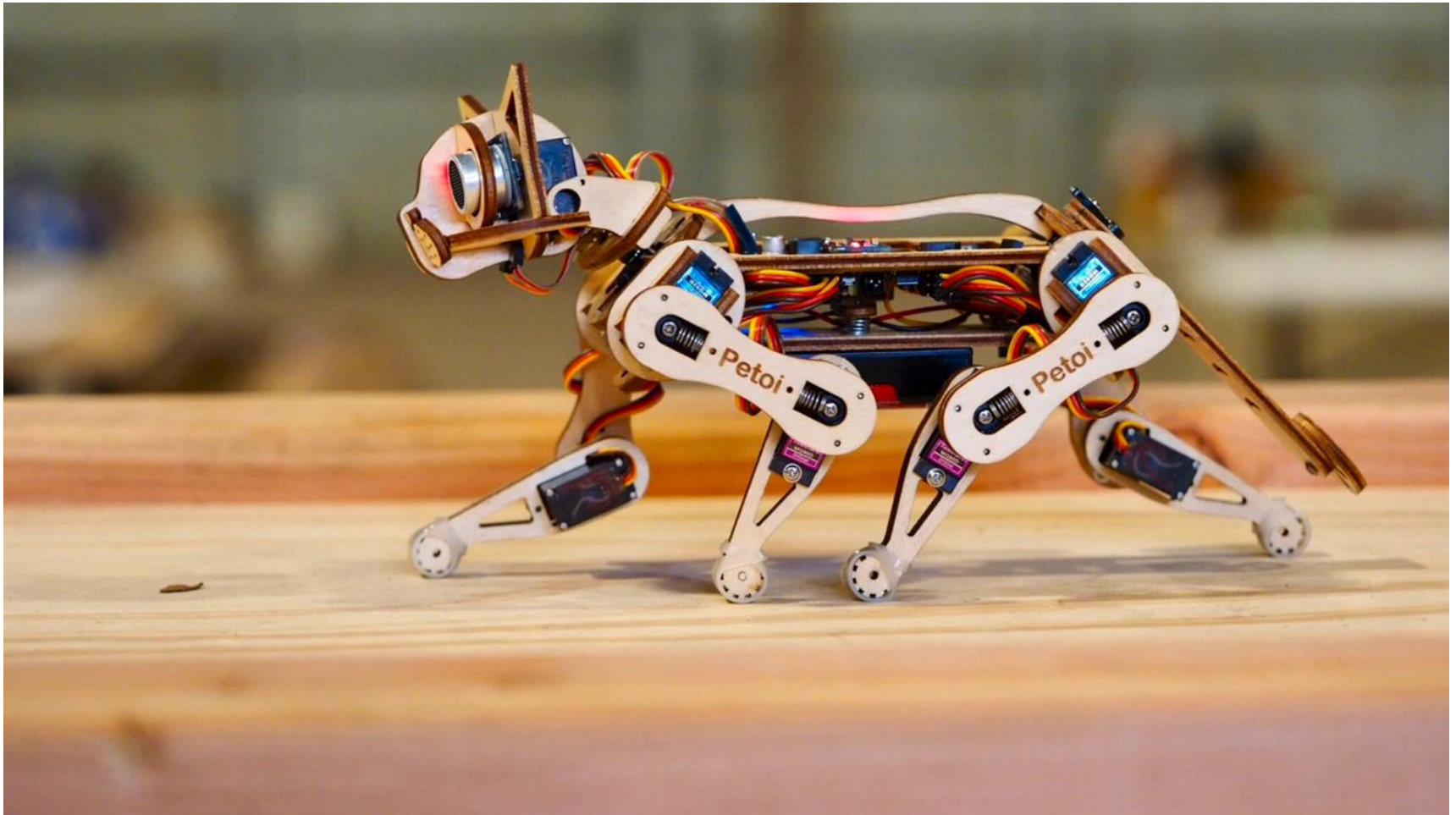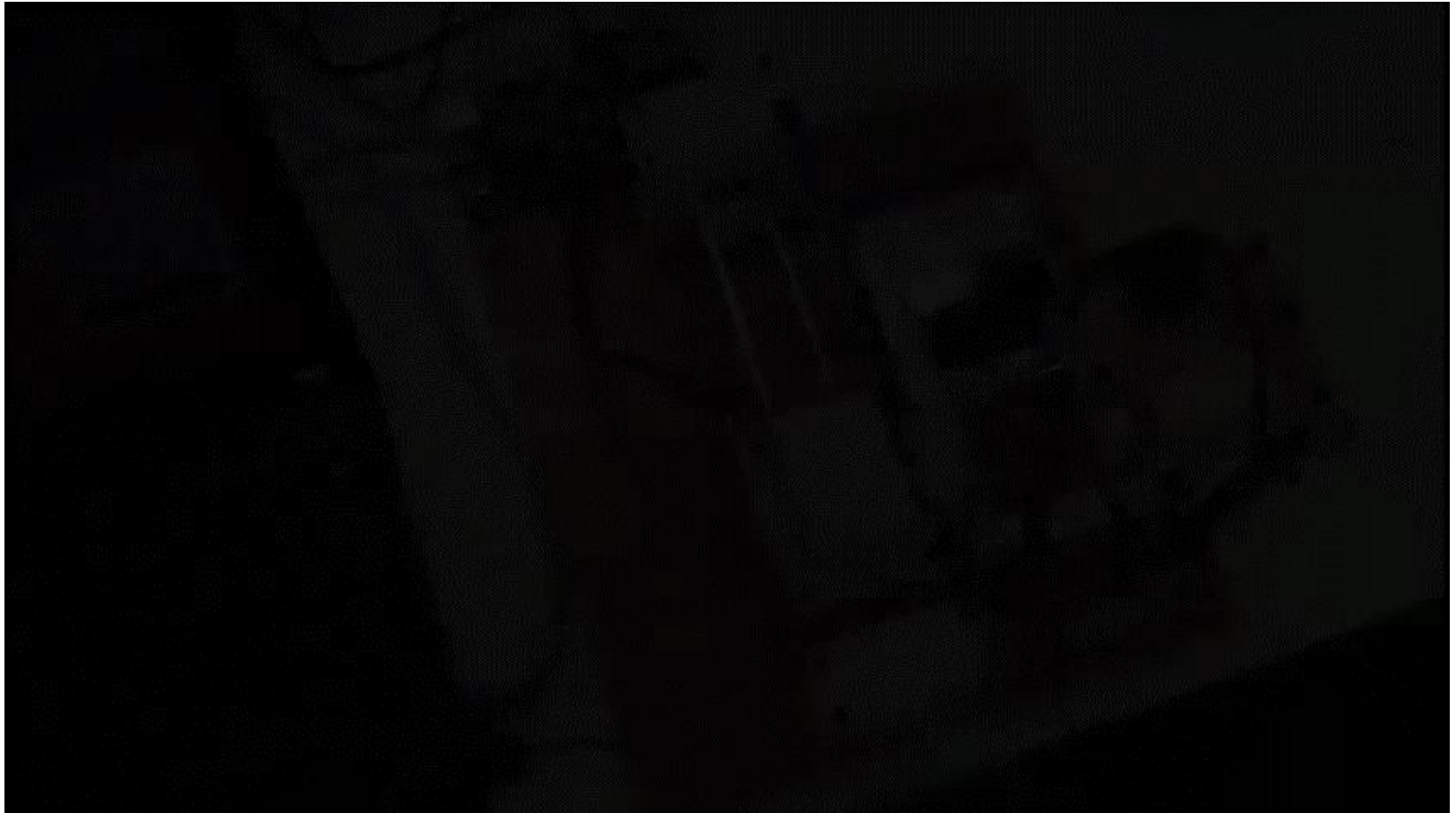https://blog.adafruit.com/2016/05/25/duckietown-is-an-open-source-mit-class-computer-vision-self-driving-robot-for-raspberrypi/

Nybble (PI cat)

- https://www.youtube.com/watch?v=g7_ODr_3DTc

Puzzle and Dragon robot

http://www.nicovideo.jp/watch/sm28160788