Setup Raspberry Pi

Steps to setup a new Raspberry Pi, which will be used to conduct Design Intelligent Edge Computing course. Computer is running on Ubuntu 20.04.

On Ubuntu, run following command to install programs.

```
sudo apt install rpi-imager
sudo apt install nmap
```

Install Raspbian OS to SD Card

- Insert SD Card to computer.
- Run `rpi-imager`
  - Choose an image; select the SD card; and click on **Write** button.
- Creating a blank file `ssh` at the root of the SD card.
  - This is to enable SSH in Raspbian.

Connect to RPi

Connect through Ethernet Cable

- Connect Ubuntu and pi via ethernet cable.
- In Ubuntu, go to Settings > Network; Find the connected wired connection; Change its IPv4 method to "Shared to other computers".
- In Ubuntu, run following command to check IP (inet and netmask) of wired connection.

  ```
  ifconfig
  ```

  - For example, `inet 10.42.0.1  netmask 255.255.255.0` is equivalent to `10.42.0.1/24`.
- In Ubuntu, run following command to find IP of all Raspberry Pi.
  - It lists the IP of all Raspberry Pi in the network.

  ```
  sudo nmap -sn 10.42.0.0/24 | awk '/Nmap scan report for/{printf $5;}/MAC Address:/{print "\t" substr($0, index($0,$3)); }' | sort
  ```

- SSH into RPi using above IP
  - Login to RPi using username `pi`, password `raspberry`.

  ```
  ssh pi@10.42.0.xx
  ```

Setup RPi

Enable Features

Start `raspi-config`.

```
sudo raspi-config
```

- Enable following features under `Interface Options`.

  > Camera

- Configure `Localisation option`.

Update Software

Update Raspbian OS.

```
sudo apt update
sudo apt upgrade -y
sudo apt dist-upgrade
sudo apt clean
```

Install applications

```
sudo apt install vim
```

Install Python packages

```
pip3 install --upgrade pip
pip3 install --upgrade setuptools
pip3 install RPI.GPIO
```

Setup Wifi

We need to edit the `"wpa_supplicant.conf"` file to setup wireless profiles. You can add more than one wireless profiles.

1. Login to RPi.
2. Edit `wpa_supplicant.conf` file

   ```
   sudo vim /etc/wpa_supplicant/wpa_supplicant.conf
   ```

3. Add following profiles in the file.
   - We can use hotspot to setup the `rpi` profile for temporary connection.

- You can add other WIFI profiles.

```
network={
    ssid="rpi"
    psk="qwer1234"
    key_mgmt=WPA-PSK
    priority=1
}

network={
    ssid="TP-LINK_CAB0"
    psk="20132116"
    key_mgmt=WPA-PSK
    priority=2
}
```

Setup GrovePi+

Install Libraries

Follow instructions in following website.

- https://www.dexterindustries.com/GrovePi/get-started-with-the-grovepi/
- https://www.dexterindustries.com/GrovePi/get-started-with-the-grovepi/setting-software/

Display IP on LCD

Create a Python file `~/_sys/lcd_ip_address.py` with following code.

```
#!/usr/bin/env python3

# Edit crontab and add in following line
# $ crontab -e
# @reboot sleep 10 && python3 ~/_sys/lcd_ip_address.py

from grove_rgb_lcd import *
import subprocess
import time

try:
     time.sleep(2)
     setRGB(0,255,0)
     process = subprocess.Popen(['hostname', '-I'], stdout=subprocess.PIPE, stderr=subprocess.PIPE)
     out,err = process.communicate()
     setText("IP:"+ str(out.decode("utf-8")))
     time.sleep(2)
except KeyboardInterrupt:
     setText("KeyboardInterrupt")
     setRGB(255,0,0)
except IOError:
     setText("IOError")
     setRGB(255,0,0)
```

Setup crontab job to run the script after reboot.

```
$ crontab -e
```

Add following line in crontab.

```
@reboot sleep 5 && python3 ~/_sys/lcd_ip_address.py
```

Others

Clone Raspberry Pi SD Card

To replicate existing RPi OS to another RPi, the easiest way is to clone the SD card.

1. Copy a well-setup SD card as an image file.
    - Insert SD card to computer
    - Use `Disks` program to find out the mounting path of SD card, e.g. `/dev/sda`
    - Run following code to create an image file.

      ```
      sudo dd if=/dev/sda of=~/raspbian_backup.img
      ```

    - It will take a while for the image file (same size as SD card) to be created.
2. The raspberrypi.org provides a useful Raspberry Pi Imager which makes reformat and clone of SD card very easy.
    - Install and run Imager
    - Use Imager to format SD card and write the created image to it