

# BIOE6901\_project3\_UQ

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3D Photogrammetry Facial Scanner project

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## Table of Content

- [BIOE6901\\_project3\\_UQ](#)
  - [Table of Content](#)
  - [Required Equipment](#)
    - [Optional](#)
  - [Setup](#)
    - [Python dependencies and Ximea camera setup](#)
    - [Communication between raspberry pis](#)
  - [Running the program](#)

## Required Equipment

- Raspberry Pi 4B (at least 2 and their required power supply)
- Ethernet cable (at least 2)
- Usb to ethernet adaptor (at least 2)

## Optional

- External monitor and display cable (at least one)
- Mouse and keyboard (at least one)
- Ximea camera (Used in this example, max 6)

## Setup

If the Raspberry Pi is connected to an external monitor, connect it the internet via wifi and run

```
sudo apt update
sudo apt-get upgrade
sudo apt install build-essential
```

If your accessing the Raspberry Pi via ssh, you will have to add the following to `/etc/wpa_supplicant/wpa_supplicant.conf`:

```
sudo nano /etc/wpa_supplicant/wpa_supplicant.conf
```

```
network={
  ssid="wifi_name"
  psk="password"
}
```

You may have to reboot the Raspberry Pi Once you are connected to the internet run the previously specified command before continuing.

Python should come pre-installed, you can check using the `which python` or `which python3`, which should return the location of the program (probably `/usr/bin/`). If it is not installed, install it with : `sudo apt-get install python3.8`

## Python dependencies and Ximea camera setup

Install the following dependencies

```
pip3 install opencv-python
pip install -U numpy
```

You may also have to install the following if you get a cv2 related error:

```
sudo apt-get install libcbblas-dev
sudo apt-get install libhdf5-dev
sudo apt-get install libhdf5-serial-dev
sudo apt-get install libatlas-base-dev
sudo apt-get install libjasper-dev
sudo apt-get install libqtgui4
sudo apt-get install libqt4-test
```

**Note some of the above dependencies may fail to install, simply continue with the rest of the set up**

Run the following commands **only if you are using the ximea cameras**:

```
wget https://www.ximea.com/downloads/recent/XIMEA_Linux_SP.tgz
tar xzf XIMEA_Linux_SP.tgz
cd package
./install
```

You may want to install vs code as well:

```
sudo apt-get install code
```

## Communication between raspberry pis

We are trying to send images from two Raspberry Pis (RPi1 and RPi2) to one central Raspberry Pi (RPi0)

RPi1 --> RPi0 <-- RPi2

In order for the Raspberry Pis to communicate through ethernet we will need to set a static IP address for each Raspberry Pi. To do so, add the following lines to `\etc\dhcpcd.conf` in each Raspberry:

```
interface eth0
static ip_address=192.168.0.03/24
static routers=192.168.0.1
static domain_name_servers=192.168.0.1 8.8.8.8

interface eth1
static ip_address=192.168.0.04/24

interface eth2
static ip_address=192.168.0.05/24
```

**Don't forget to change the ip address (xx) in `static ip_address=192.168.0.xx/24` to a different value in each raspberry Pi to avoid IP address conflicts.**

The above line will set up a static ip for eth0 (ethernet port) and, eth1 and eth2 through the two usb ports. This will enable us to communicate between 2 device. However if we want to connect to multiple Raspberry Pis (RPi1 and RPi2) from a single Raspberry Pi (RPi0) simultaneously (through 2 seperate interface) we will also need to set up a bridge:

```
sudo brctl addbr br0
sudo brctl addif br0 eth0 eth1 eth2
```

**Note: you must first switch on and connect the other raspberry pis before adding the interfaces to the bridge**

Running the command `sudo brctl show` show give an output similar to the following:

```
bridge name bridge id          STP enabled interfaces
br0        8000.dca632ea7185    no          eth0
                                           eth1
                                           eth2
```

you must also add the following lines to `/etc/network/interfaces` (if not already there):

```
iface eth2 inet manual
iface eth1 inet manual
iface eth0 inet manual

# Bridge setup
```

```
iface br0 inet static
    bridge_ports eth0 eth1 eth2
    address 192.168.0.2
    netmask 255.255.255.0
    gateway 192.168.0.1

auto br0
iface br0 inet manual
bridge_ports eth2 eth1 eth0
```

Finally run `sudo systemctl restart dhcpcd.service` in order for the changes to take effect. \*\*Note that we have to run `sudo brctl addif br0 eth0 eth1 eth2` every time we reboot the Raspberry Pis

We should now be able to simultaneously ping RPi1 and RPi2 from RPi0

## Running the program

The `cam.py` should be added to all Raspberry Pis. The `simpleServer.py` and `main_server.py` should only be added to the main controlling Raspberry Pi (RPi0) while the `simpleclient.py` and `main_client.py` should be put in the secondary Raspberry Pis (RP1 and RP2). An folder name `images` should be created in the same directory as the python scripts on each Raspberry Pi.

We must now ssh into RP1 and RP2 from RP0 or another computer. `main_server.py` should now be run on RP0 before running `main_client.py` on RP0. We should now be able to capture images using the pushbutton trigger and see the images captured from RP1 and RP2 appear in the `images` folder on RP0.