Raspberry Pi Setup and Camera module install

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Required equipment

- Raspberry Pi 3 Model B+ (the latest version)

- Micro SD card
  - At least 8GByte

- USB keyboard/mouse for set up
  - After setting up, you can use Bluetooth keyboard and mouse

- TV or Computer monitor
  - cable/gender (e.g. HDMI-to-HDMI, HDMI-to-DVI, HDMI-to-VGA)

- Micro USB Power Supply
  - 5V/at least 2.5A

- Camera module for Raspberry Pi
  - Option) holder for camera and motor + sg90 servo motor 2ea

https://www.raspberrypi.org
https://projects.raspberrypi.org/en/projects/raspberry-pi-setting-up

Micro SD card set-up (1/2)

- **Raspbian install via NOOBS(**New Out Of the Box Software**)**

- **NOOBS:** an easy operating system installer which contains Raspbian.

- **NOOBS lite:** contains the same operating system installer without Raspbian pre-loaded. It provides the same operating system selection menu allowing Raspbian and other images to be downloaded and installed.

- NOOBS download site:

  - https://www.raspberrypi.org/downloads/noobs/

Raspbian: Operating System based on Debian linux

Micro SD card set-up (2/2)

- SD card format

  - https://sd-card-formatter.kr.uptodown.com/windows/download

- Making bootable disk image

  - https://sourceforge.net/projects/win32diskimager/

  - write Raspbian image which was downloaded on the previous page to SD card using win32 disk imager

- To start the OS install, turn on power cable, after inserting SD card on your Raspberry Pi

  - Note. Check your monitor, keyboard, mouse and LAN cable(if required) are connected

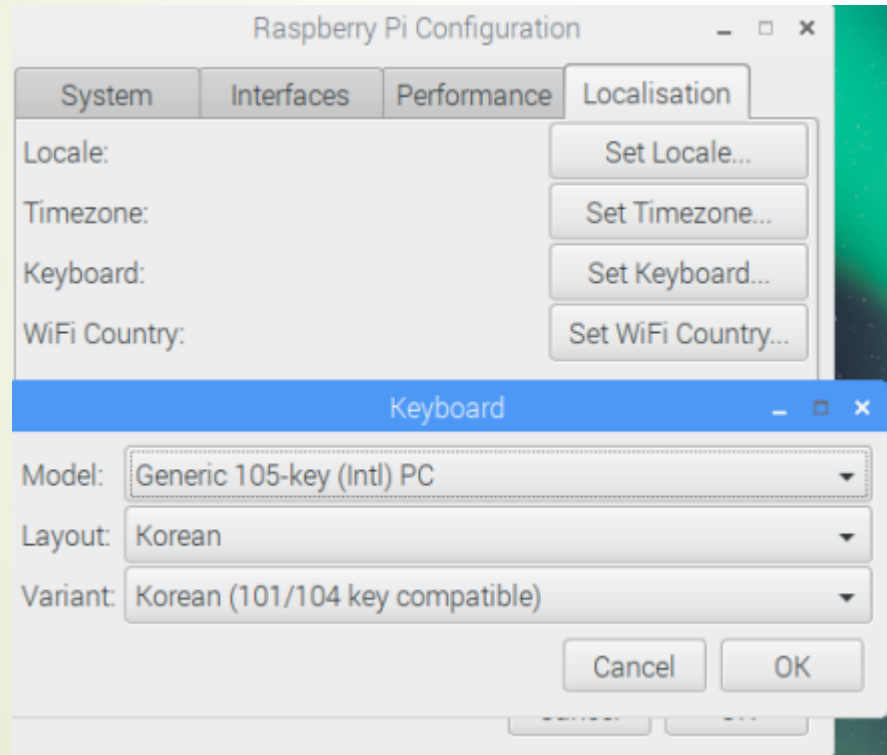# Raspbian Desktop screen after installation
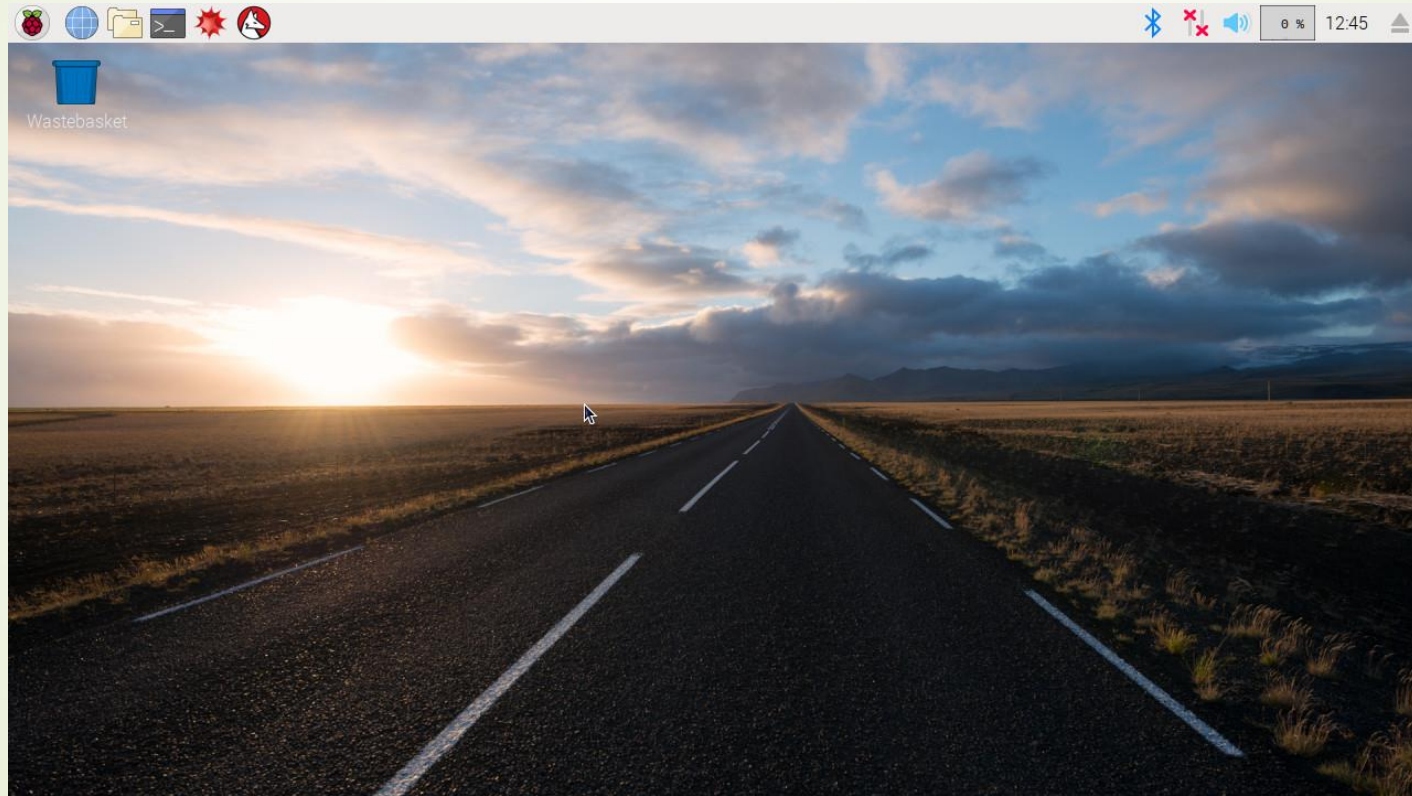
Environment setting(1/4)

➡ ![raspberry pi icon] the left-top Pi icon click > Preference > Raspberry Pi Configuration
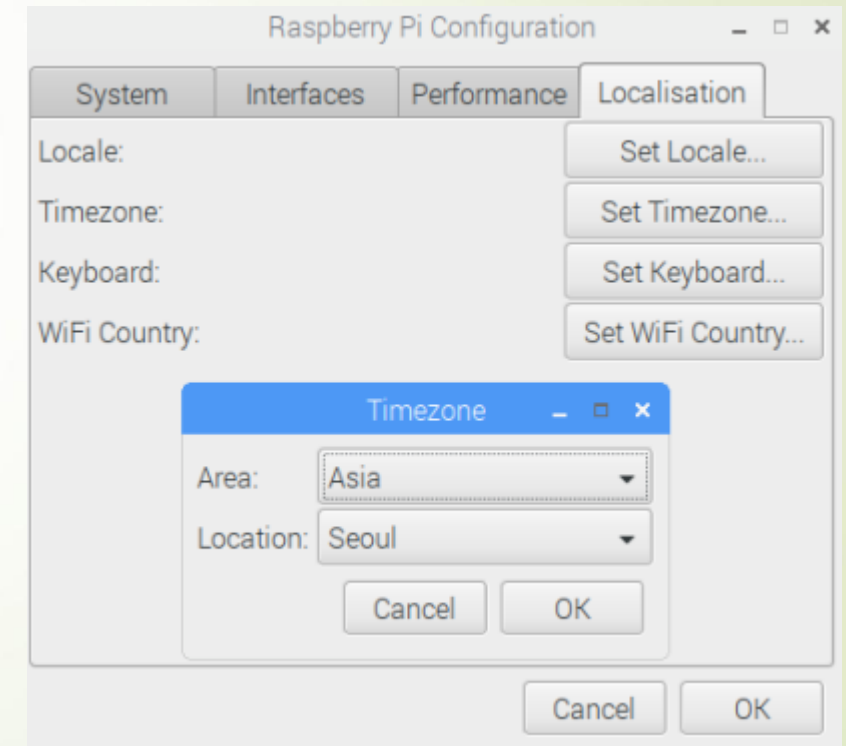
Environment setting (2/4)

- Raspberry Pi Configuration

Environment setting (3/4)

- IP setting
  - In case of Dynamic IP:
    - No need to set up
  - In case of Static IP:
    - sudo nano /etc/dhcpcd.conf
      - interface eth0
      - static ip_address=xxx.xxx.xxx.xxx
      - static routers= xxx.xxx.xxx.xxx
      - static domain_name server= xxx.xxx.xxx.xxx

Environment setting (4/4)

- Commands
  - Package management
    - sudo apt-get update: update the package list
    - sudo apt-get upgrade: upgrade all packages to the latest version
    - apt-get install package-name: install package-name
    - apt-get remove package-name: uninstall package-name but configuration file remains
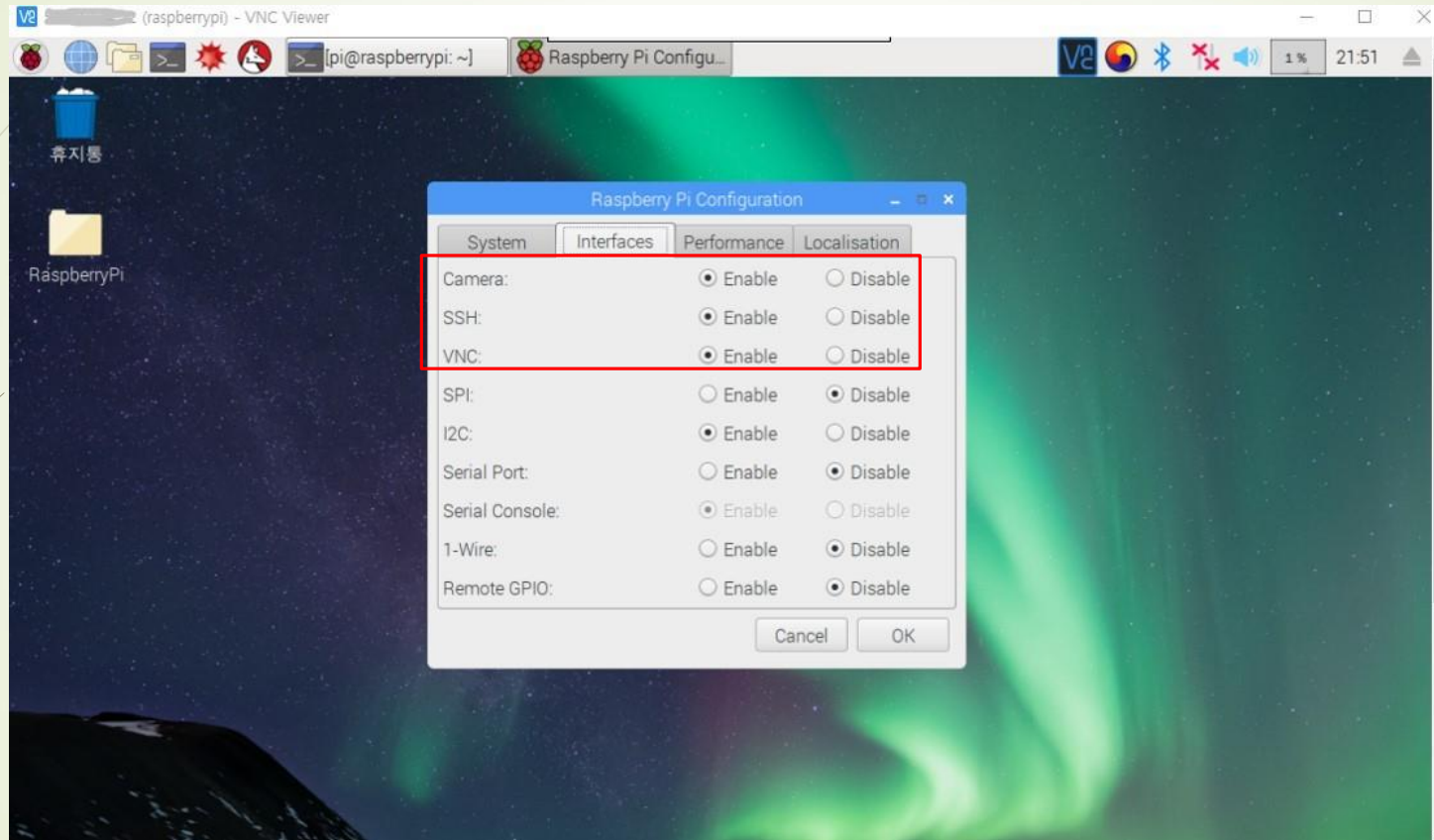   - apt-get purge package-name: : uninstall package-name including configuration fie
  - 한글 설정
    - sudo apt-get install fonts-unfonts-core
    - sudo apt-get install fcitx-hangul
    - reboot
    - 시작->시스템도구->Fcitx (라즈베리 부팅시 매번 실행해야 함)
    - 화면 상단 오른쪽 입력기 모양->마우스 오른쪽 버튼->현재 입력기 설정 (한글 확인)
    - 같은 곳 옆에 탭에 Global Config에서 입력기 전환 (편한 키로 설정, shift+space와 한영키)
  - System reboot
    - sudo reboot

VNC, SSH for Remote Connection

- VNC and SSH are used to connect Raspberry Pi remotely using your PC
- enable SSH and VNC in Raspberry Pi Configuration
- Install SSH and VNC on your PC
- VNC download: https://www.realvnc.com/en/connect/download/viewer/

VNC: Virtual Network Computing
SSH: Secure Shell

motion install for CCTV (1/2)

- sudo apt-get install motion –y
- sudo nano /etc/modules
  - # at the end of the file, add this line :
  - bcm2835-v4l2
- sudo vi /etc/motion/motion.conf
  - daemon on
  - stream_port 8081
  - stream_localhost off
  - target_dir /home/pi/Monitor
  - v4l2_palette 15
  - width 640 /height 480
  - framerate 10
  - output_pictures on
  - ffmpeg_output_movies off
  - stream_auth_method 1

motion install for CCTV (2/2)

- sudo nano /etc/default/motion
  - start_motion_daemon=yes

- mkdir /home/pi/Monitor

- sudo chgrp motion /home/pi/Monitor

- chmod g+rwx /home/pi/Monitor

- sudo service motion start
  - sudo service motion restart
  - Sudo service motion stop
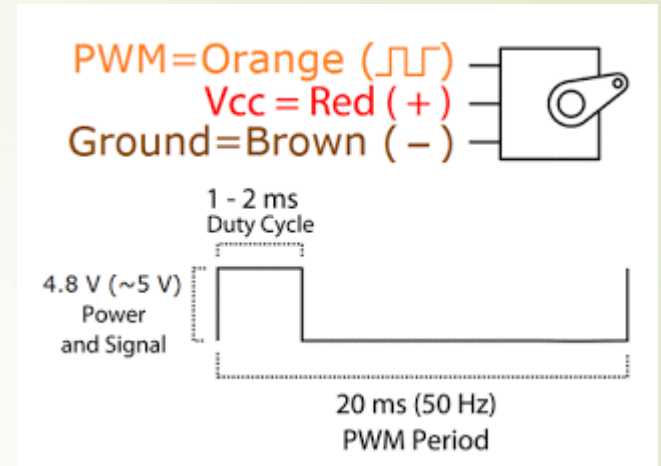
Raspberry Pi 3 B+ pin map
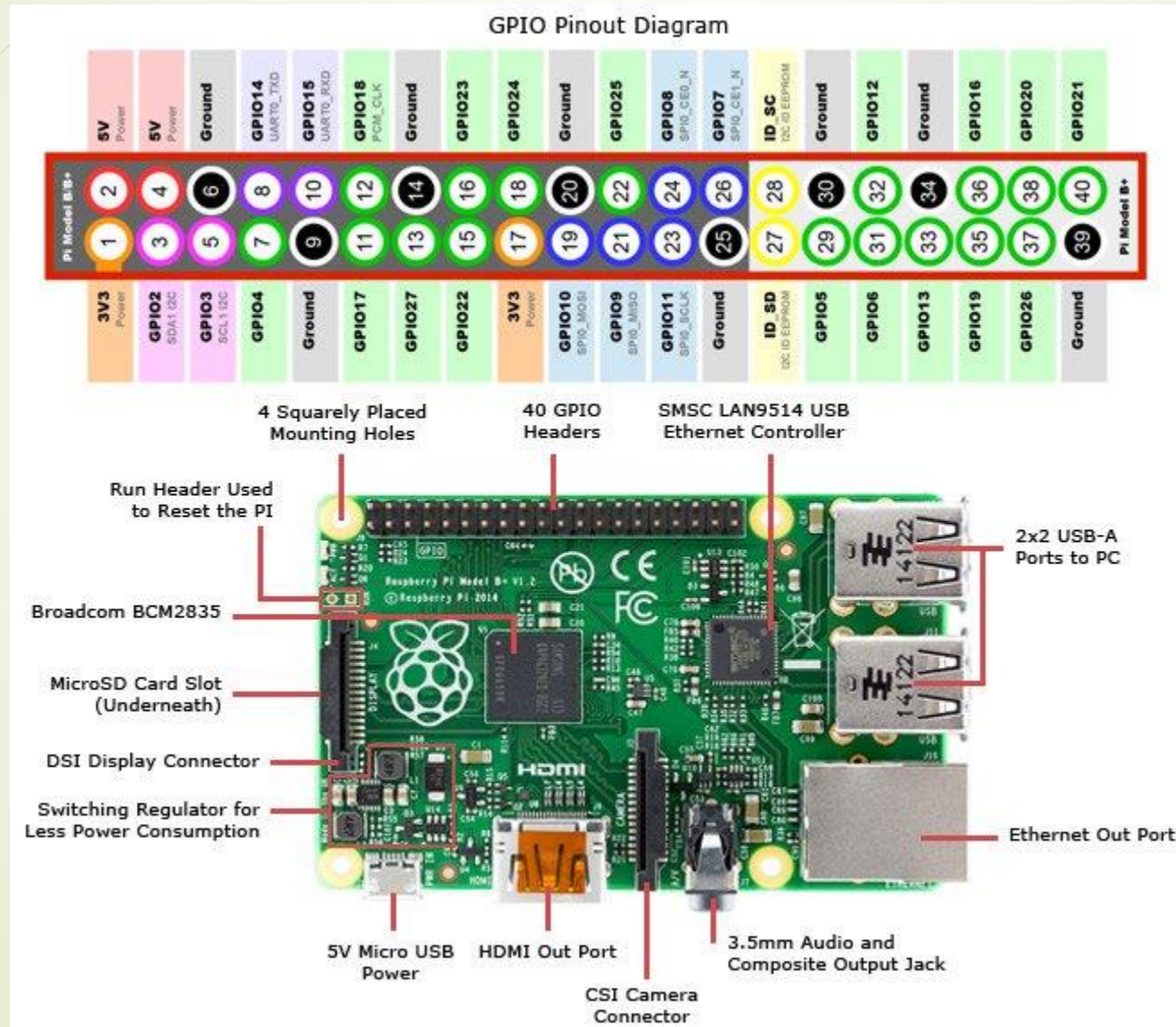
SG90 servo motor

- **The angle that the servo motor can move**
  - 0 degrees - the centre position with a 1.5 ms pulse
  - + 90 degrees with a ~2 ms pulse
  - - 90 degrees with a ~1 ms pulse.

- **Duty Cycle = Pulse Width * Frequency**

Given a 50 Hz frequency we can calculate the required duty cycle for any pulse width. For example:

- We need a 1.5 ms pulse to centre the servo, or a Duty Cycle = 0.0015 * 50 = 0.075 (i.e 7.5%).
- Similarly, 1 ms pulse (- 90 degrees) requires a Duty Cycle = 0.001 * 50 = 5%
- 2 ms pulse (+ 90 degrees), Duty Cycle = 0.002 * 50 = 10%
- Thus the duty cycle range should be from 5 - 10% with the centre at 7.5%.

출처: http://reefwingrobotics.blogspot.com/2017/02/raspberry-pi-and-towerpro-sg90-micro.html

Raspberry Pi + SG90 servo motor

```python
python code (sg90_test.py)
import RPi.GPIO as GPIO
import time
import sys

pin = 18  # PWM pin num 18, 4

GPIO.setwarnings(False)
GPIO.setmode(GPIO.BCM)
GPIO.setup(pin, GPIO.OUT)
p = GPIO.PWM(pin, 50)

direction = 1

#Duty cycle for PWM
MIN_VALUE = 2.5
MAX_VALUE = 12.5

dc = MIN_VALUE

p.start(dc)
```

```python
try:
    while True:

        p.ChangeDutyCycle(dc)
        time.sleep(0.5)

        if direction:
            dc+=0.5
        else:
            dc-=0.5

        if dc > MAX_VALUE:
            dc = MAX_VALUE
            direction = 0
        elif dc < MIN_VALUE:
            dc = MIN_VALUE
            direction = 1

except KeyboardInterrupt:
    p.stop()
finally:
    GPIO.cleanup()
```