

## 1. Variation of Camera Modules

Flat cable type

for example, the Physical Computing Lab Camera Module



- USB Cable type  
USB connected WEB camera .



## 2. Hardware Requirement

When the camera module is connected to the Tinker Board, the following equipment are required.

- (1) Camera module board
- (2) Tinker Board / Tinker Board S
- (3) Micro SD card
- (4) 5 V 2.5 A Power supply or more
- (5) HDMI cable
- (6) LAN cable
- (7) HDMI display
- (8) Mouse
- (9) Keyboard

(2) - (6), you can purchase "Tinker Board Complete Starter Kit". Please use it by all means.



### 3. Preparation of OS Target and assembly of equipment

Let's explain how to use above equipment with Tinker OS.

To use flat cable type camera, v2.0.4 or later Tinker OS required.

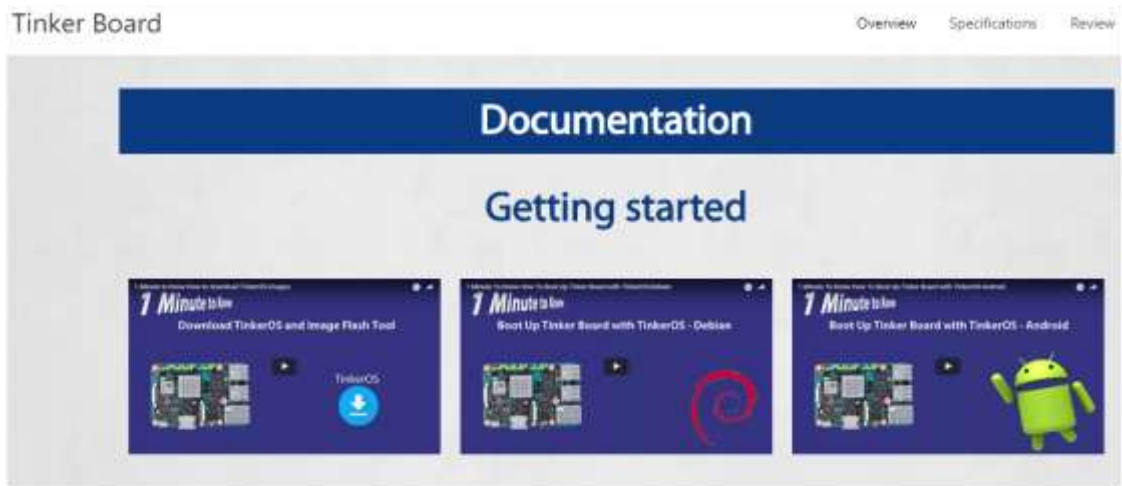
#### ① OS Installation

When using the Complete Starter Kit, installation process is needless, because the micro SD card with latest OS is included.

From the ASUS site, download the new image file of Tinker OS Debian and write it into micro SD card.

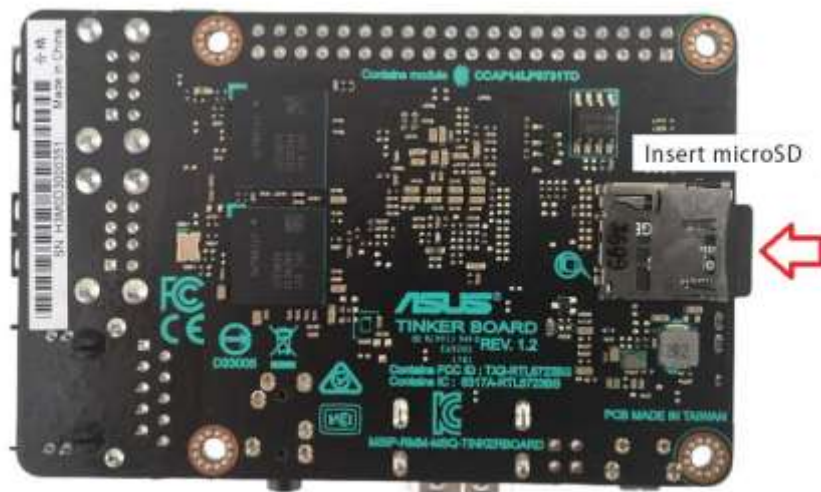
ASUS Website

<https://www.asus.com/us/Single-Board-Computer/Tinker-Board/>



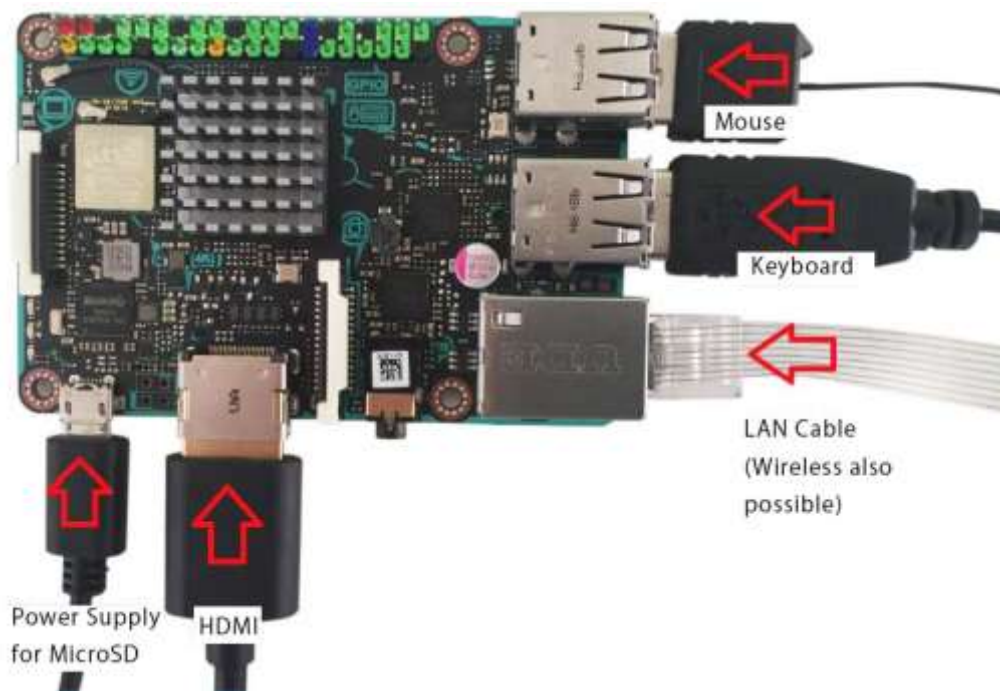
## ② Insertion of the micro SD card

Please insert OS written microSD card into the Tinker Board.



## ③ Connection of necessary equipment

Connect the mouse, keyboard, LAN cable (when using wireless it's not necessary), HDMI cable and power supply.



#### ④ Camera Connection

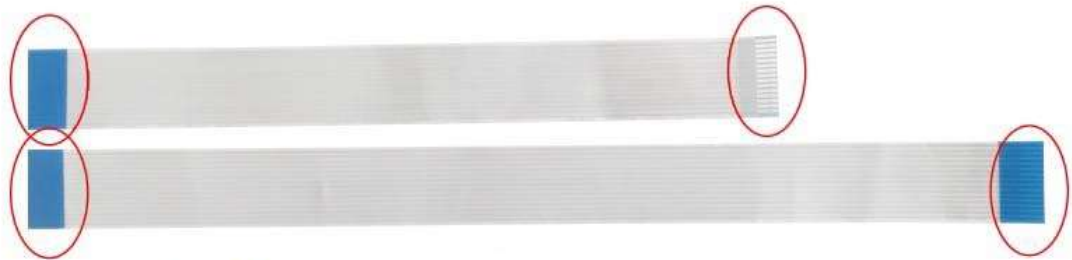
Before turning on the power, connect the camera. Please follow the procedure described as below.

#### 4. About the connection method of the camera.

##### 4.1 In the case of flat type cable camera module

A flat cable like the one shown below.

Both the sides have different faces.



Both the sides have same faces.

### 【Examples of flat cables】

There are two types of cables with two contacts where in one type both the ends have same faces, and the other both the ends have different faces.

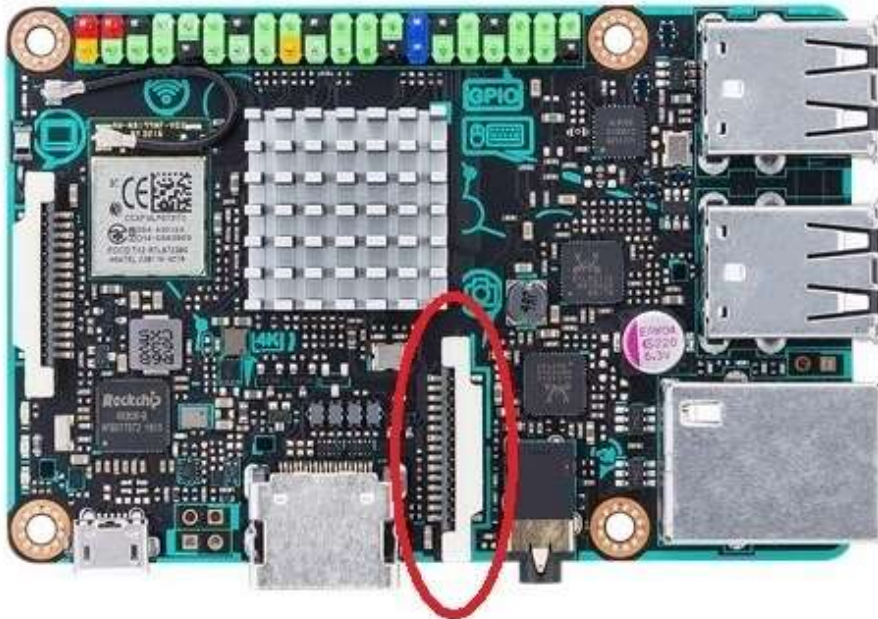
These two are not compatible. Replacing the camera module may result in malfunction of the camera module or Tinker Board main unit.

Be sure to make use of the cable attached with the camera module

When you are connecting a flat cable type camera module, make sure to turn off the Tinker Board power.

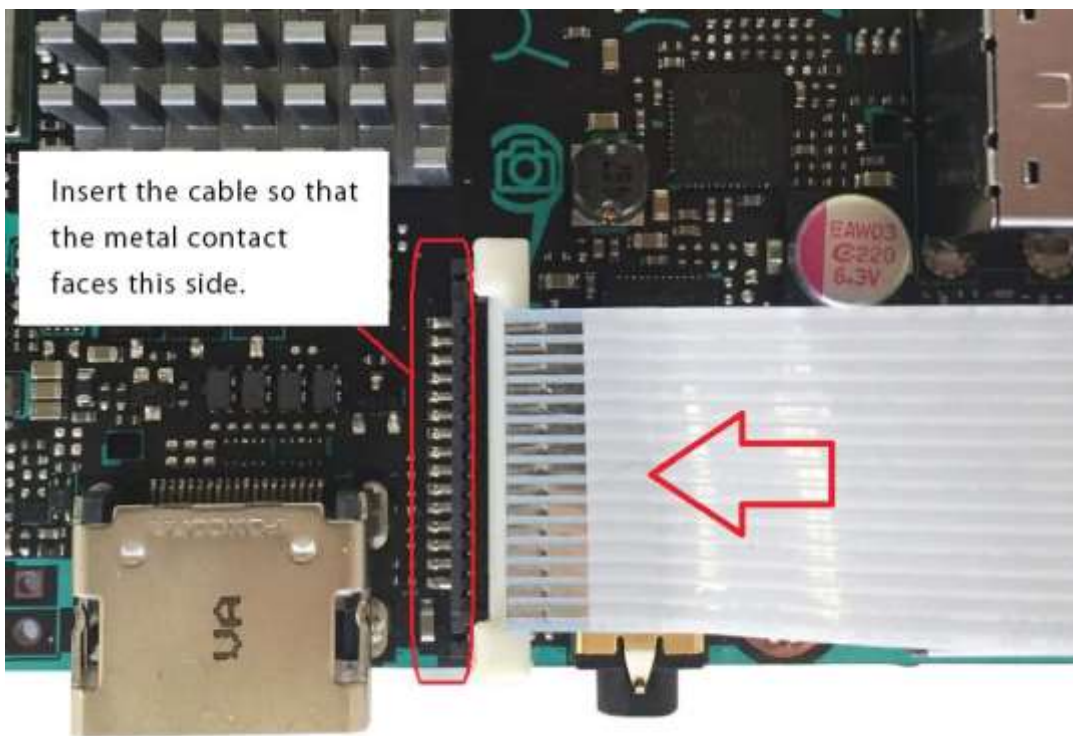
The Tinker Board has a display connector and a camera connector. Please be careful with the distinct shape of the connector because the connectors shape is similar.

The position of the camera connector is shown as below.



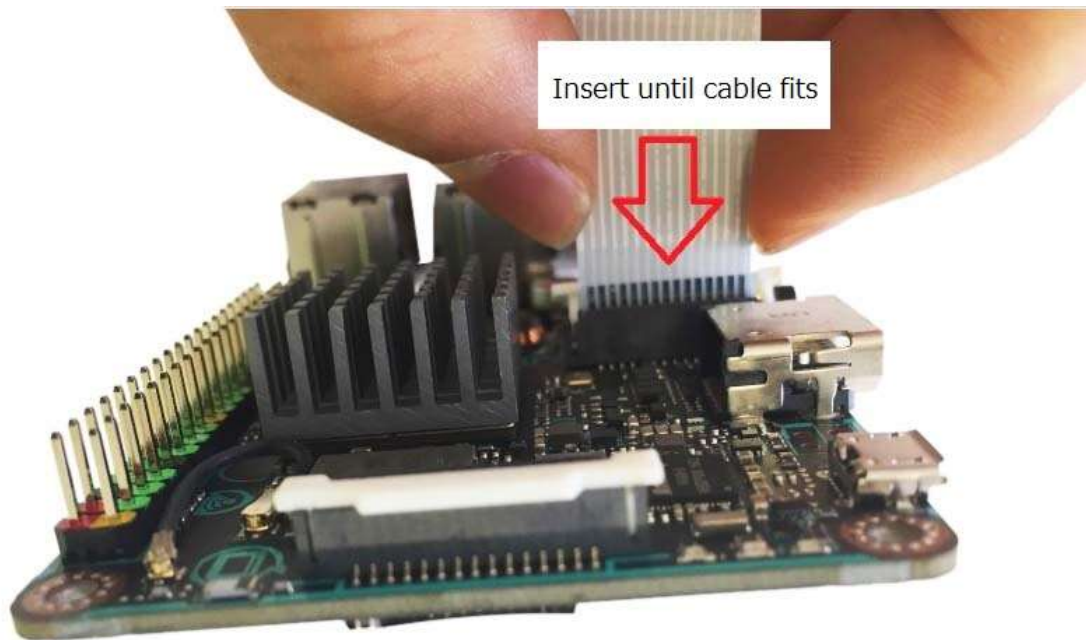
Camera Connector

Please insert the flat cable so that the side with the metal point of contact turns towards to the HDMI connector side.

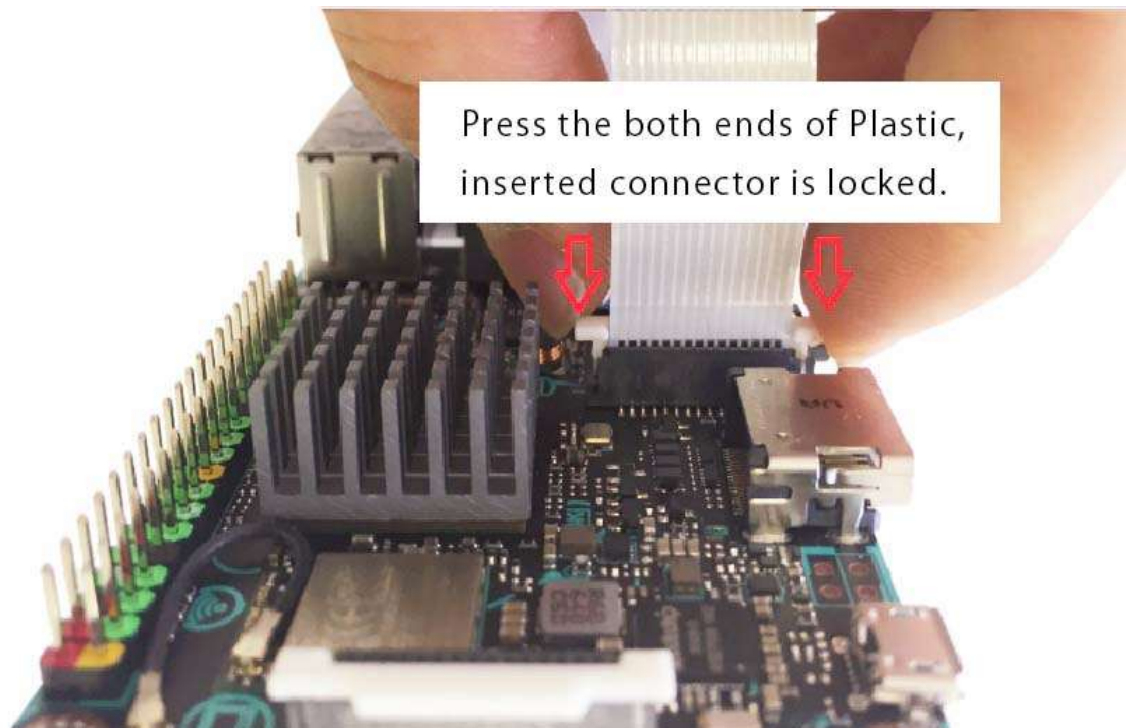


Insert the cable into the connector until it fits.

Be careful if the cable is not inserted properly the camera does not work.



After inserting, please push the both ends of white plastic and lock it.



After connecting the cables, start the Tinker OS.

Even with a flat cable type camera module, because of incompatibility of the shape and specification of the connector certain things that can not be used with the Tinker Board. Even though the specification is met, but the driver is not prepared in Tinker OS for certain type of camera modules.

In our web store we are dealing with the following five different types of camera module verified with Tinker Board .

Camera module for Tinker Board (Adjustable Focus) [TSI-TB039-AF (B)]

Camera module for Tinker Board (Fisheye Lens) [TSI-TB039-FL (G)]

night vision camera module for Tinker Board (Fixed Focus) [TSI-TB039-FF (E)]

night vision camera module for Tinker Board (Adjustable Focus) [TSI-TB039-NAF (F)]

night vision camera module for Tinker Board (Fisheye Lens) [TSI-TB039-NFL (H)]



## 4.2 In the case of USB cable Type Camera

Even while Tinker Board is running, once the cable is connected with the Tinker Board will starts recognize.

However, Depending on the compatibility of the camera, certain things may not be recognized even when connected, so it is necessary to gather information in advance, such as check the QVL list.

## 5. Camera Setting and Connection confirmation Method

### 5.1 In the case of Flat type cable

#### Setting Method

If the camera module is verified one, it is not necessary to set up the OS or install driver software.

You can make use it as soon as you connect the camera module to the Tinker Board and start the OS.

#### Confirmation Method

If the camera module is recognized by the Tinker OS, a device file called `/dev/video *` (\* is a number such as 0, 1, 2, 3 etc.) has been created.

### 5.2 In the case of USB type cable

#### Setting Method

Normally, preliminary setting is not necessary, just connect it to the Tinker Board's USB connector and it will be recognized.

#### Confirmation Method

If the camera module is recognized by the Tinker OS, a device file called `/dev/video *` (\* is a number such as 0, 1, 2, 3 etc.) is created.

Also, when you execute the `lsusb` command, a list of the devices connected via USB to the Tinker Board is displayed.

If there is a connected USB camera in the list, it is recognized as a USB device.

## 6. How to use the camera Module

### 6.1 Application to use

Even if the camera module is recognized by Tinker OS, the corresponding data format and resolution are different for each camera module, and the available applications may be different.

Here, we will show how to use the software called Gstreamer for the flat type cable camera module, and Cheese and gvcview for the USB cable type camera.

### 6.2 Camera Image Preview

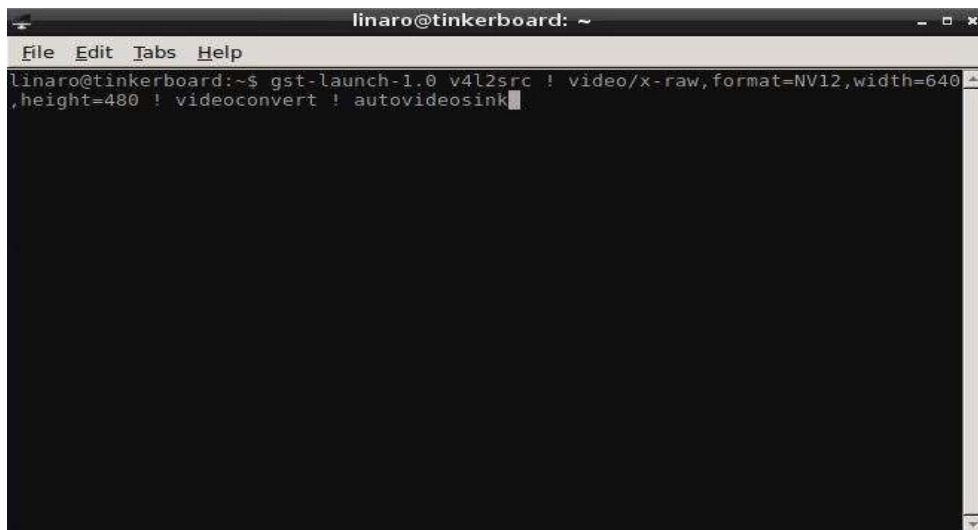
#### In case of Flat type cable

Gstreamer is used.

Gstreamer is an application that runs on the command line and is installed by default in Tinker OS.

Open LXTerminal from the Tinker OS menu and type the following command line.

```
$gst-launch-1.0 v4l2src ! video/x-raw,format=NV12,width=640,height=480 ! videoconvert ! autovideosink
```

A screenshot of a terminal window titled "linaro@tinkerboard: ~". The window has a menu bar with "File", "Edit", "Tabs", and "Help". The terminal shows the command: "linaro@tinkerboard:~\$ gst-launch-1.0 v4l2src ! video/x-raw,format=NV12,width=640,height=480 ! videoconvert ! autovideosink". The command is followed by a cursor. The rest of the terminal area is black, indicating that the command is running and the output is not visible in this view.

```
linaro@tinkerboard:~$ gst-launch-1.0 v4l2src ! video/x-raw,format=NV12,width=640,height=480 ! videoconvert ! autovideosink
```

When it starts, a preview window of the camera image opens.



In the case of USB type cable

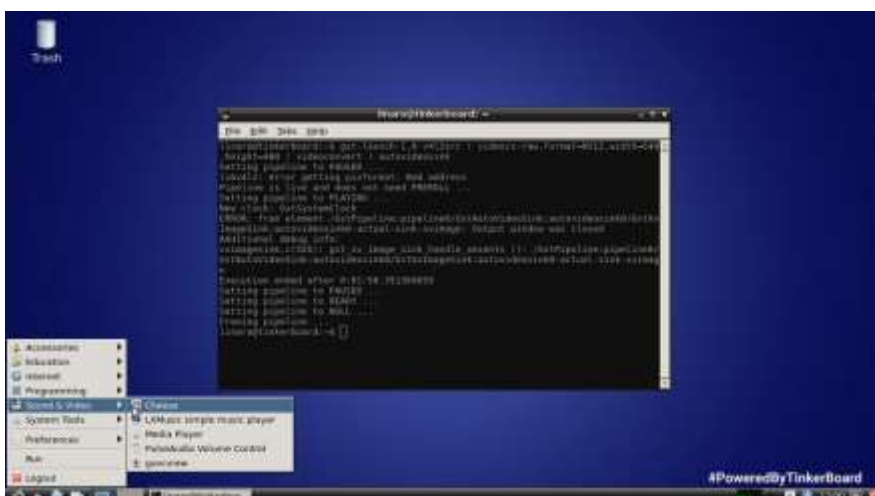
Application such as Cheese and guvcview can be used.

Each installation in LXTerminal,

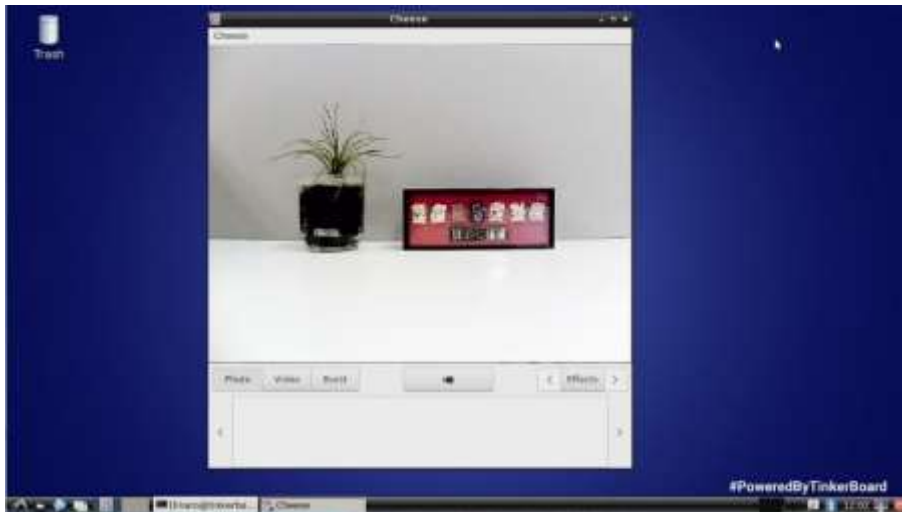
```
sudo apt-get install cheese
```

```
Sudo apt-get install guvcview
```

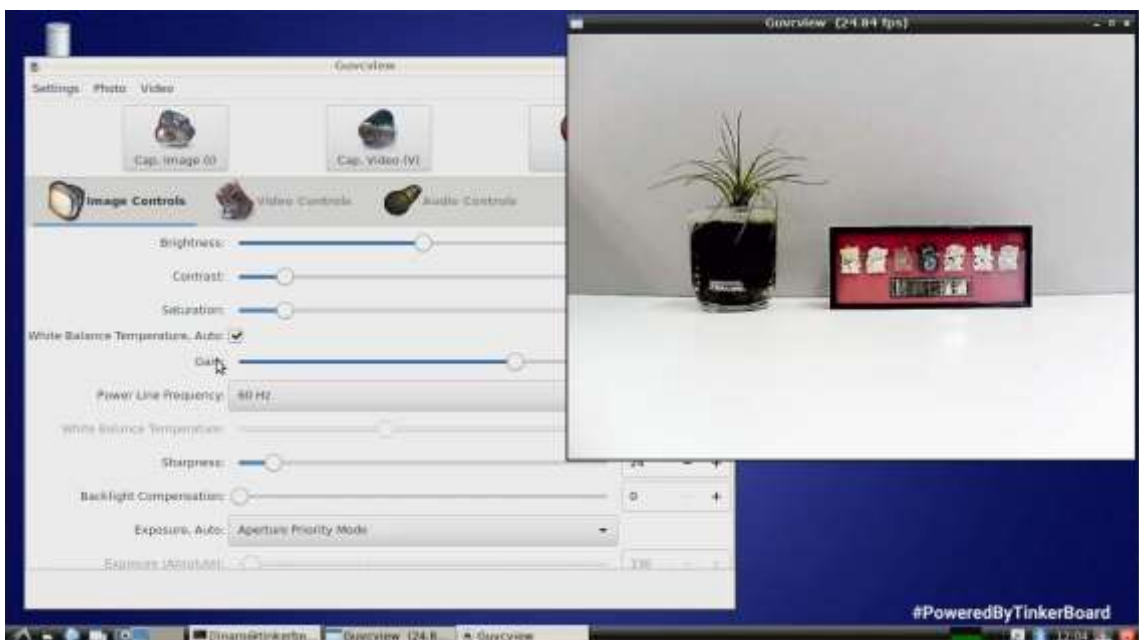
When installation is completed, it can start now from the item of “Sound&Video” on the menu of the GUI.



When Cheese is started, a window with a control panel is displayed below is the preview image of the camera as shown below.



As for guvcview,  
Similarly to cheese, the control window and the preview window will open.



## 6.3 Photo of the still image

**In the case of flat type cable**

Type the following command line.

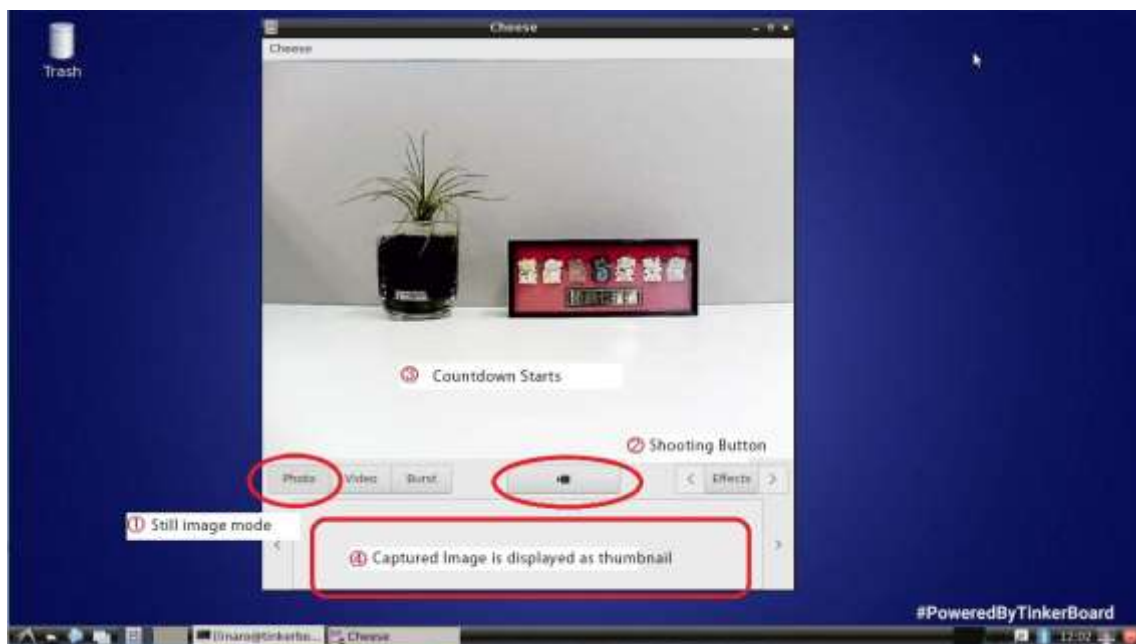
```
gst-launch-1.0 v4l2src num-buffers=10 ! video/x-raw,format=NV12,width=640,height=480 ! jpegenc ! multifilesink location=image.jpg
```

The image is saved as image.jpg.

**In case of USB type cable**

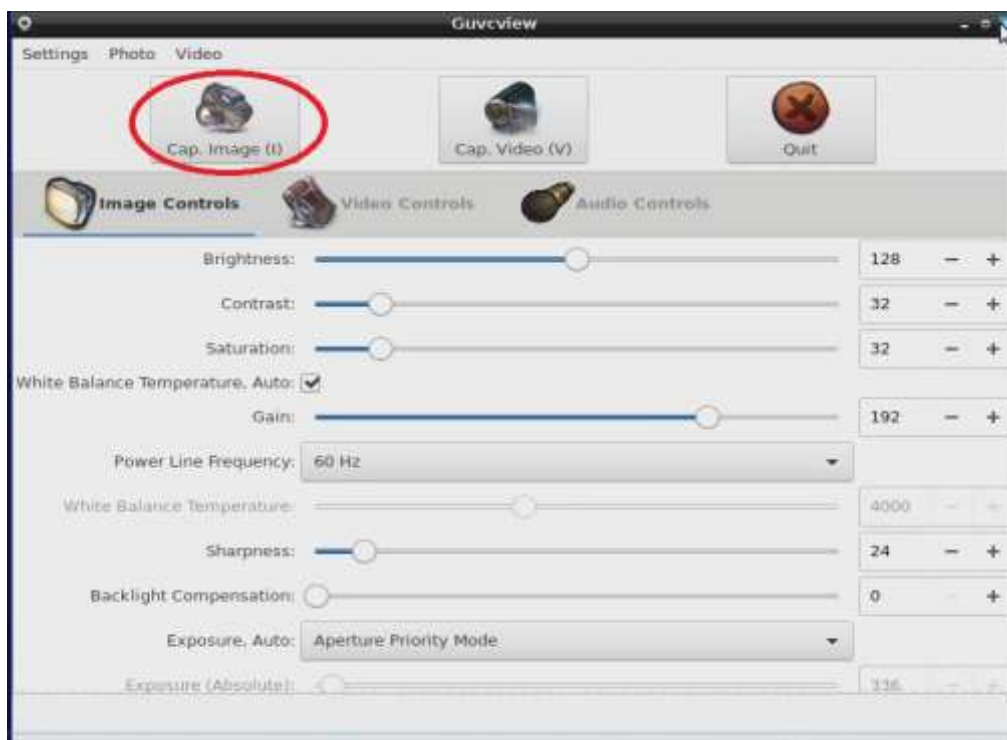
Shooting Photo using Cheese

- ① Press the Photo button in the middle window to switch to the Photo mode.
- ② Press the record mark button in the middle of the window.
- ③ The countdown starts from 3, and when it becomes 0, the photo is taken.
- ④ The captured image is displayed in the thumbnail area under the button. You can save it as a file by right-clicking and selecting the option “Save As”.



Shooting Photo using guvcview

- ① Press the “Cap. Image” button at the top of the guvcview control window.
- ② Still images are saved as a file named my\_photo-\*.jpg(\*=number).



## 6.4 Video recording

**In case of Flat type cable**

Type the following command line

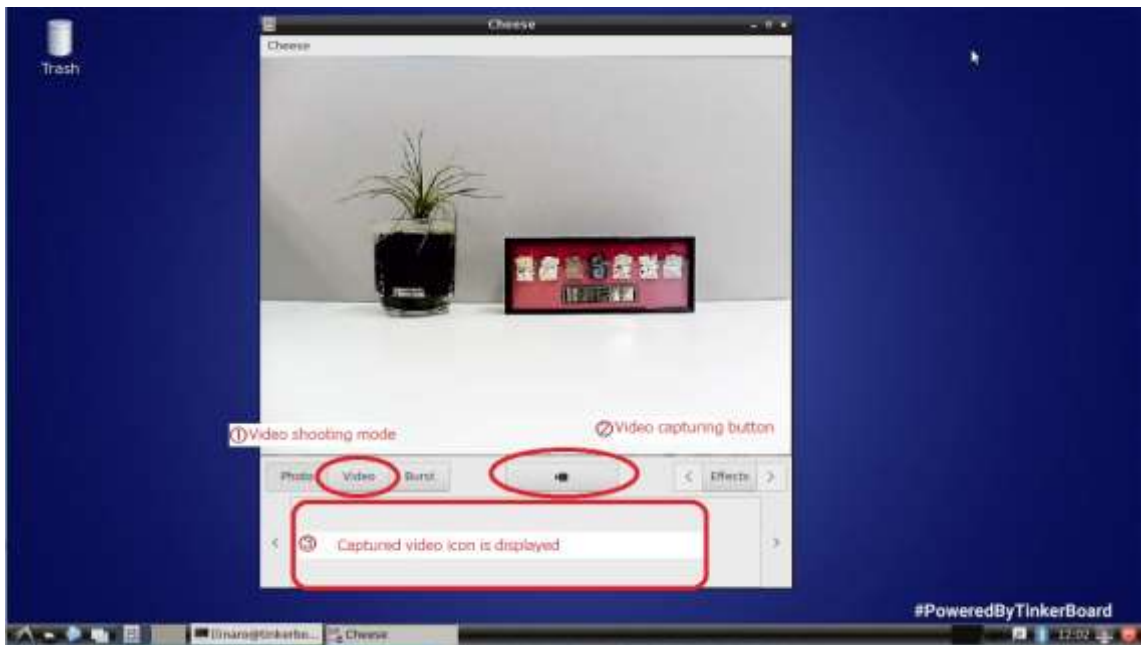
```
gst-launch-1.0 v4l2src num-buffers=512 ! video/x-raw,format=NV12,width=640,height=480,framerate=30/1 ! queue ! mpph264enc ! queue ! h264parse ! mpegtsmux ! filesink location=vg.ts
```

once you press “ctrl-C” it stops capturing video. And the Captured video file is saved as “vg.ts”.

**In case of USB type cable**

Video recording using Cheese

- ① To enter into the video recording mode, Press the Video button in the middle of the window.
- ② Press the record mark button in the middle of the window. The mark changes from the recording mark to this ■ mark, it means that video recording begins.
- ③ By pressing ■ mark button, the video tape (movie) icon is displayed in the thumbnail area under the button.
- ④ By right clicking the thumbnail and select the option “Save As”, then the file will be saved as a “webm” file.



#### Video recording using guvcview

- ① Press the “Cap. Video” button at the top of the guvcview control window.  
The name of the button will change to Stop Video.
- ② By pressing the “Stop Video” button, the video shooting ends and the video is saved as a filename my\_video-\*.Mkv(\*=number).

