# FACE MASK DETECTION & TEMP GATE

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# List of Symbols and Abbreviations

Please insert here any symbols and abbreviations that you commonly use in your report.

Example:

| | |
|---|---|
| CTE | College of Telecom & Electronics |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

## Acknowledgments

We would like to express our gratitude for everyone who helped us during the graduation project starting with endless thanks for our supervisor Dr. Jaber al-yamani who didn't keep any effort in encouraging us to do a great job, providing our group with valuable information and advices to be better each time. Thanks for the continuous support and kind communication which had a great effect regarding to feel interesting about what we are working on.

# Abstract

in this report we will show you how we run the face mask detection and temperature will be measured by thermal camera AMG8833

# Chapter 1: Introduction

The world is fighting with Covid19 pandemic. There are so many essential equipments needed to fight against Corona virus. One of such most essential is Face Mask. Firstly face mask was not mandatory for everyone but as the day progresses scientist and Doctors have recommended everyone to wear face mask. Now To detect whether a person is wearing Face Mask or not, we will use Face Mask Detection Technique. Face Mask Detection Platform utilizes Artificial Network to perceive if a person does/doesn't wear a mask.,also The temperature will be measured by thermal camera AMG8833

# Chapter 2: Theoretical background

## 2.1 Raspberry pi

### 2.1.1: Introduction of raspberry pi :

Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation. Early on, the Raspberry Pi project leaned towards the promotion of teaching basic computer science in schools and in developing countries. Wikipedia
Operating system: FreeBSD; Linux; NetBSD; OpenBSD; Plan 9; RISC OS; Windows 10 ARM64; Windows 10 IoT Core
Power: 5 V; 3 A (for full power delivery to USB devices)
Storage: MicroSDHC slot
Introductory price: : US$35 (Pi 4 2 GiB); US$55 (Pi 4 4 GiB); US$75 (Pi 4 8 GiB);
Release date: 24 February 2012; 8 years ago (Original); 24 June 2019; 16 months ago (Current)
Date introduced: February 29, 2012 .

### 2.1.2: Specifications of raspberry pi

| | Raspberry Pi 3 Model B | Raspberry Pi Zero | Raspberry Pi 2 Model B | Raspberry Pi Model B+ |
|---|---|---|---|---|
| Introduction Date | 2/29/2016 | 11/25/2015 | 2/2/2015 | 7/14/2014 |
| SoC | BCM2837 | BCM2835 | BCM2836 | BCM2835 |
| CPU | Quad Cortex A53 @ 1.2GHz | ARM11 @ 1GHz | Quad Cortex A7 @ 900MHz | ARM11 @ 700MHz |
| Instruction set | ARMv8-A | ARMv6 | ARMv7-A | ARMv6 |
| GPU | 400MHz VideoCore IV | 250MHz VideoCore IV | 250MHz VideoCore IV | 250MHz VideoCore IV |
| RAM | 1GB SDRAM | 512 MB SDRAM | 1GB SDRAM | 512MB SDRAM |
| Storage | micro-SD | micro-SD | micro-SD | micro-SD |
| Ethernet | 10/100 | none | 10/100 | 10/100 |
| Wireless | 802.11n / Bluetooth 4.0 | none | none | none |
| Video Output | HDMI / Composite | HDMI / Composite | HDMI / Composite | HDMI / Composite |
| Audio Output | HDMI / Headphone | HDMI | HDMI / Headphone | HDMI / Headphone |
| GPIO | 40 | 40 | 40 | 40 |
| Price | $35 | $5 | $35 | $35 |

Figure2.1.2: Specifications of raspberry pi

## 2.2 Thermal camera AMG8833

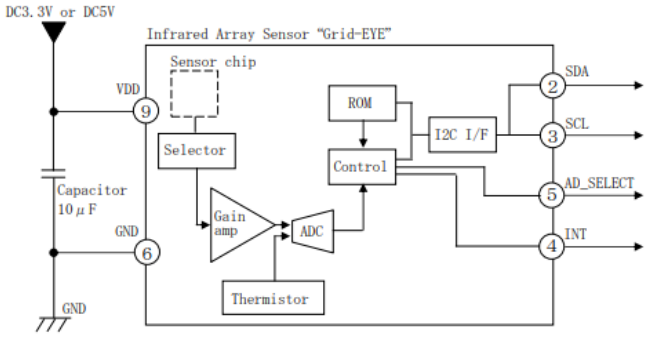
### 2.2.1 Introduction of Thermal camera AMG8833

Panasonic's AMG8833 Grid-EYE is an 8x8 array of IR thermal sensors. When connected to your microcontroller (or raspberry Pi) it will return an array of 64 individual IR temperature readings over I2C.

### 2.2.2 Specifications of Thermal camera AMG8833

3. Drawing : AMG8851 Product drawing

4. Characteristics
4-1 Internal circuit




*④INT terminal normally has same voltage as VDD. When interrupting, same as GND(0V).
*Regarding of recommended external circuit, please refer to section 4-9.

| | | |
|---|---|---|
| Panasonic Corporation<br>Automation Controls Business Unit | DESIGNED | DATE : Aug. 30. 2011 |
| | CHECKED | REFERENCE ONLY |
| | ENACTED | |

Figure2.2.2: Specifications of raspberry pi

| TITLE | SPECIFICATIONS FOR Infrared Array Sensor | PAGE 2/26 |
|---|---|---|
| NAME | Infrared Array Sensor "Grid-EYE" | AMG88** |

4-2 Main Functions

| Item | Value |
|---|---|
| Pixel number | 64 (8×8 Matrix) |
| External Interface | I²C (fast mode) |
| Frame rate | Typ. 10 frames/sec or Typ. 1 frame/sec |
| Operating Mode | Normal<br>Sleep<br>Stand-by (10sec or 60sec intermittence) |
| Output Mode | Temperature Output |
| Calculate Mode | No moving average or Twice moving average |
| Temperature Output Resolution | 0.25℃ |
| Number of Sensor Addresses | 2 (I²C Slave Address) |
| Thermistor Output Temperature Range | -20℃~80℃ |
| Thermistor Output Resolution | 0.0625℃ |

4-3 Absolute Maximum Ratings

| Item | Specification | Terminal |
|---|---|---|
| Applied voltage | -0.3~6.5V | VDD, VPP |
| Input/Output voltage | -0.3~Vdd+0.3V | SCL, SDA, AD_SELECT |
| Output current | -10~10mA | INT, SDA |
| ESD (Human Body Model) | 1kV | All Terminals |
| ESD (Machine Model) | 200V | All Terminals |

4-4 Ratings

| Item | Specification | |
|---|---|---|
| | High gain | Low gain |
| Applied voltage | 3.3V±0.3V or 5.0V±0.5V | |
| Temperature Range of Measuring Object | 0℃~80℃ | -20℃~100℃ |
| Operating temperature | 0℃~80℃ | -20℃~80℃ |
| Storage temperature | -20℃~80℃ | |

Figure2.2.2: Specifications of raspberry pi

## 2.3 OVcamera 5647

### 2.3.1 Introduction of OVcamera 5647

**In order to meet the increasing need for Raspberry Pi compatible camera modules. The Arducam team now released another add-on mini camera module for Raspberry Pi series boards which is fully compatible with the official one**

**The board itself is tiny, at around 25mm x 24mm, which makes it perfect for mobile or other applications where size and image quality are important. It connects to Raspberry Pi by way of a short ribbon cable. The camera is connected to the BCM2835/BCM2836 processor on the Pi via the CSI bus, a higher Bandwidth link that carries pixel data from the camera back to the processor. This bus travels along the ribbon cable that attaches the camera board to the Pi**

### 2.3.2 Specifications of OVcamera 5647

**Feature**

5MP resolution with Omnivision 1/4'' OV5647 CMOS sensor
Fixed Focus
Support Raspberry PI 2B/3B/B+
High quality image
SCI interface
Dimension: 25mm*24mm*9mm
Up to 90fps at VGA
Video: 1080P at 30 fps with codec H.264 (AVC)

**Specification**

| | |
|---|---|
| Model No | CMT-5MP-RP-OV5647-X010 |
| Sensor | 1/4'' Omnivision OV4647 |
| Pixel | 5 Mega Pixels |
| Most effective pixels | 2592 x 1944 |
| Pixel Size | 1.4 um x 1.4 um |
| Focus type | Fixed focus |
| FOV | 62° |
| Image format | VGA |
| Color | 24-Bit True color |
| Lens construction | 4G+IR650 |
| Aperture | F2.4 |
| Operating temperature | -20℃ to 70℃ |
| Dimension | 25mm x24mm |
| Power consumption | 90Wm/30uW |
| Voltage | 1.7V-3.0V |
| Pin Number | 15 Pin |
| Output signal | YCBCR4:2:2, RGB565, RAWRGB |
| Frame rate | 30fps |

Figure2.3.2: Specifications of OVcamera 5647

# Chapter 3: working

**3.1 Week1&2 : My Partner Ahmed and I We Were Thinking About Our Graduation Project , Then Due to The Current Pandemic We Decided To Chose the Face Mask Detection & Temperature gate , then we tried to order the Components From AliExpress but we couldn't Find the AMG8833 IR 8*8 so we bought it from Al-Ahmad Electronics Est , and we ordered the raspberry bi4 and the camera OV5647 From AliExpress .**

**3.2 Week3&4&5 : After we ordered the components , We Were Looking for the perfect codes that it'll work with the each component then we found 3 codes for the face mask detection and Thermal Camera AMG8833 . on Thursday 1 October 2020 we received the raspberry bi4 and the camera OV5647 From AliExpress .**

**3.2.2 Why Thermal Camera AMG8833 ? The AMG8833 is the next generation of 8x8 thermal IR sensors from Panasonic, and offers higher performance than it's predecessor the AMG8831. The sensor only supports I2C, and has a configurable interrupt pin that can fire when any individual pixel goes above or below a thresholds that you set .**

**3.2.2Why Camera OV5647 ?** In order to meet the increasing need for Raspberry Pi compatible camera modules. The Arducam team now released another add-on mini camera module for Raspberry Pi series boards which is fully compatible with the official one

The board itself is tiny, at around 25mm x 24mm, which makes it perfect for mobile or other applications where size and image quality are important. It connects to Raspberry Pi by way of a short ribbon cable. The camera is connected to the BCM2835/BCM2836 processor on the Pi via the CSI bus, a higher Bandwidth link that carries pixel data from the camera back to the processor. This bus travels along the ribbon cable that attaches the camera board to the Pi

The sensor itself has a native resolution of 5 megapixels and has a fixed focus lens onboard. In terms of still images, the camera is capable of 2592 x 1944 pixel static images, and also supports 1080p30, 720p60 and 640x480p60/90 video .

**3.3Week6 : After we received the components we tried to run the codes of the both of AMG 8833 and the camera OV5647**

**At first I started with the camera OV5647 then I took one picture and I recorded a video**

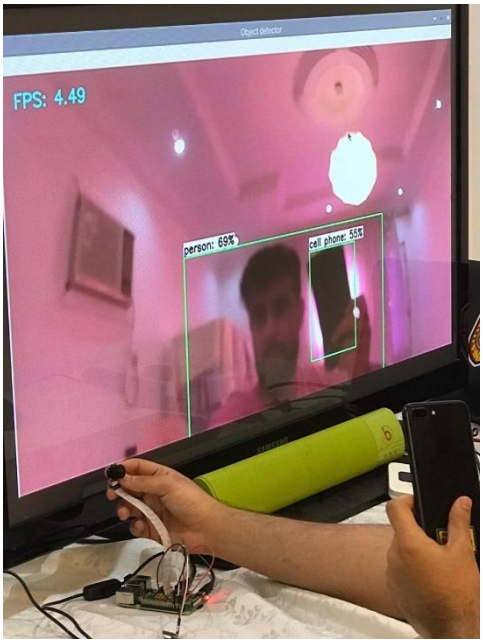



Figure3.3: camera OV5647

**3.3.3 week6 : Then I Downloaded the code of the thermal camera AMG8833**

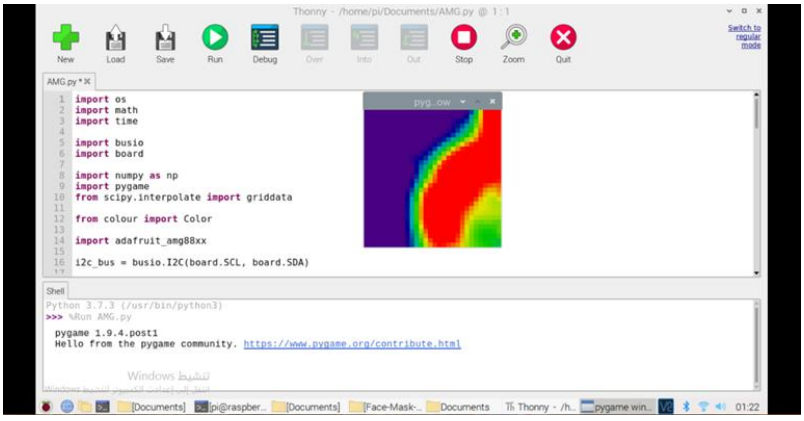



Figure3.3.3: thermal camera AMG8833

**J3.4Week 7&8&910&11 : in these week we tried to run the code of the (Face mask detection)**

**Then we took a pic with and without picture and here is the pictures**

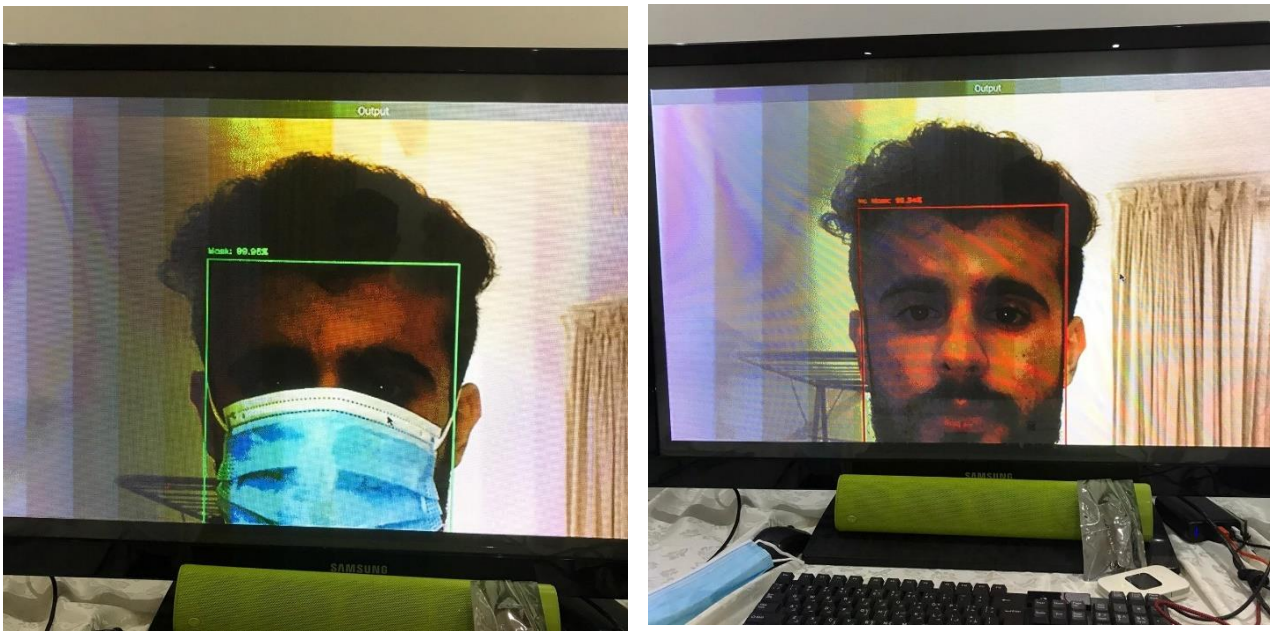



Figure3.4.1: code face mask detection

**Then we tried to run the AMG sensor and the face mask detection together and here is the picture**


Figure3.4.2: code face mask detection and AMG833

**U3.5Week 7&8&910&11 :**

**The problems we faced in the AMG8833 sensor , camera OV5647 , When we were trying to run the face mask detection code there was an error which is in the requirements.txt file and we had to change each library num in that file**

| | |
|---|---|
| import busio | pip install adafruit-circuitpython-bme280 |
| import numpy as np | pip install numpy |
| import adafruit_amg88xx | pip install Adafruit_AMG88xx |
| from scipy.interpolate import griddata | pip install scipy |
| tensorflow>=1.15.2 | tensorflow>=1.14.2 |
| keras==2.3.1 | keras==2.2.1 |
| imutils==0.5.2 | imutils==0.5.3 |
| numpy==1.18.2 | numpy==1.19.4 |
| opencv-python==4.2.0 | opencv-python==3.1.0 |
| matplotlib==3.2.1 | matplotlib==3.3.2 |
| argparse==1.1 | argparse==1.4.0 |
| scipy==1.4.1 | scipy==1.5.4 |
| scikit-learn==0.23.1 | scikit-learn==0.23.2 |
| pillow==7.2.0 | pillow==8.0.1 |
| streamlit==0.65.2 | streamlit==0.70.0 |
| Hd5f | Pip3 install hdf5 |

Table 3-5: the problems we faced

# Chapter 4: Conclusion

We were able to work on the Raspberry Pi and the Linux system. We encountered many problems and were able to solve them with some difficulty because this is the second time that we used the Linux system and the Python language, in the end the graduation project was run completely successfully.

# References

https://github.com/chandrikadeb7/Face-Mask-Detection

https://learn.adafruit.com/adafruit-amg8833-8x8-thermal-camera-sensor/raspberry-pi-thermal-camera

*Basic format for patents (when available online):*

[24] Name of the invention, by inventor's name. (year, month day). *Patent Number* [Type of medium]. Available: site/path/file

*Example:*

*[25]* Musical toothbrush with adjustable neck and mirror, by L.M.R. Brooks. (1992, May 19). *Patent D 326 189* [Online]. Available: NEXIS Library: LEXPAT File: DESIGN

*Basic format for conference proceedings (published):*

*[26]* J. K. Author, "Title of paper," in *Abbreviated Name of Conf.*, City of Conf., Abbrev. State (if given), year, pp. xxxxx.

*Example:*

[27] D. B. Payne and J. R. Stern, "Wavelength-switched pas- sively coupled single-mode optical network," in *Proc. IOOC-ECOC*, 1985, pp. 585–590.

*Example for papers presented at conferences (unpublished):*

[28] D. Ebehard and E. Voges, "Digital single sideband detection for interferometric sensors," presented at the 2nd Int. Conf. Optical Fiber Sensors, Stuttgart, Germany, Jan. 2-5, 1984.

*Basic format for patents:*

[29] J. K. Author, "Title of patent," U.S. Patent *x* xxx xxx, Abbrev. Month, day, year.

*Example:*

[30] G. Brandli and M. Dick, "Alternating current fed power supply," U.S. Patent 4 084 217, Nov. 4, 1978.

*Basic format for theses (M.S.) and dissertations (Ph.D.):*

[31] J. K. Author, "Title of thesis," M.S. thesis, Abbrev. Dept., Abbrev. Univ., City of Univ., Abbrev. State, year.

[32] J. K. Author, "Title of dissertation," Ph.D. dissertation, Abbrev. Dept., Abbrev. Univ., City of Univ., Abbrev. State, year.

*Examples:*

[33] J. O. Williams, "Narrow-band analyzer," Ph.D. dissertation, Dept. Elect. Eng., Harvard Univ., Cambridge, MA, 1993.

[34] N. Kawasaki, "Parametric study of thermal and chemical nonequilibrium nozzle flow," M.S. thesis, Dept. Electron. Eng., Osaka Univ., Osaka, Japan, 1993.

*Basic format for the most common types of unpublished references:*

[35] J. K. Author, private communication, Abbrev. Month, year.

[36] J. K. Author, "Title of paper," unpublished.

[37] J. K. Author, "Title of paper," to be published.

*Examples:*

[38] A. Harrison, private communication, May 1995.

[39] B. Smith, "An approach to graphs of linear forms," unpublished.

[40] A. Brahms, "Representation error for real numbers in binary computer arithmetic," IEEE Computer Group Repository, Paper R-67-85.

*Basic format for standards:*

[41] *Title of Standard*, Standard number, date.

*Examples:*

[42] IEEE Criteria for Class IE Electric Systems, IEEE Standard 308, 1969.

[43] Letter Symbols for Quantities, ANSI Standard Y10.5-1968.