Detecting people with a microcontroller a thermal camera and machine learning

Ali Şevki Şavk
Mehmet Yiğit Gül

Supervisor

Dr. Ali Ziya Alkar
Electrical and Electronics Engineering, Hacettepe University

Introduction

- This project is a system for detection of Covid-19 cases based on face temperature.
- The project allows for detection of possible Covid-19 cases from a far by measuring the temperature using a thermal camera.
- By detecting high face temperatures, the user can avoid getting into contact with possible Covid-19 cases.
- The product aims to slow down the spread of Covid-19.
- The project is a stand-alone product which can be further improved to be marketable.

Specifications and Design Requirements

- The project requires visual data in order to both do face detection and do temperature measurements.
- Face detection and temperature measurements need to be done simultaneously and repeatedly.

FIGURE 2: AN ILLUSTRATION OF THE EXPECTED OUTPUT

Solution Methodology

- In order to achieve a more accurate face detection, a daylight camera was added to the project.

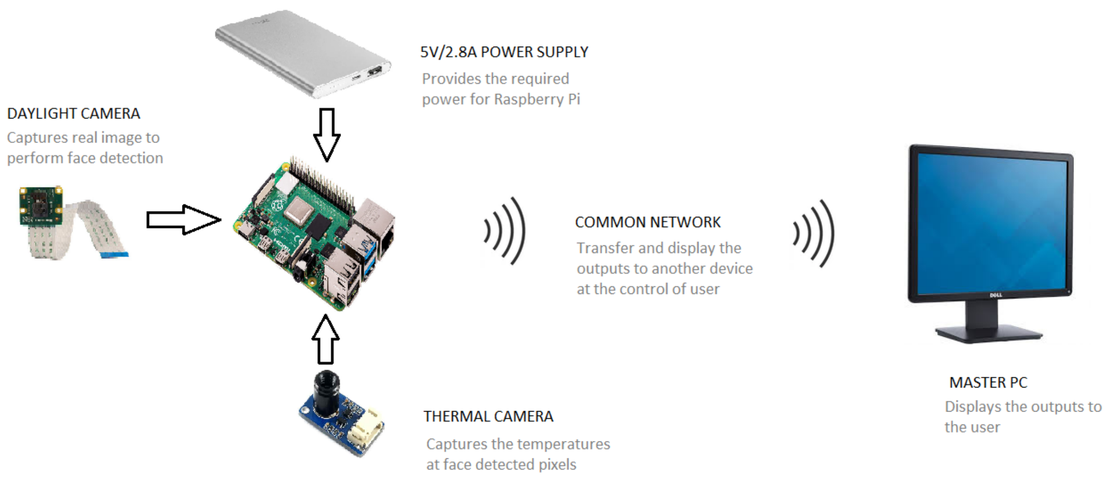

FIGURE 3 : AN OVERALL DESCRIPTION OF THE PROJECT COMPONENTS

- While the project is supposed to be a cheap solution, adding a daylight camera has a hude impact on the accuracy. This is a trade-off worth taking.
- Face detection is done by the image taken from daylight camera.
- The pixels seen by the thermal camera which correspond to the detected face are determined.
- According to the temperatures seen by the thermal camera, the face temperature is displayed near the face along with a green rectangle which indicates the face is detected.
- The user sees the real image and temperatures in the same screen.

Application Areas

- The main purpose of the product is to be used at narrow and closed environments or passages and control points where people tend to stay closer to each other and have a greater danger of spreading Covid-19.
- It can also be improved and adjusted for different applications.

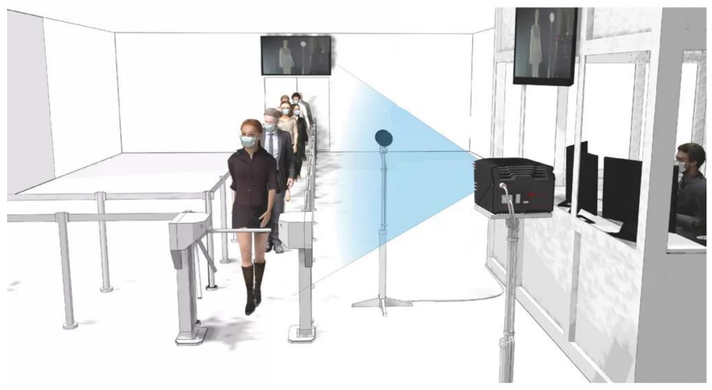

FIGURE 1: A DEMONSTRATION FOR USAGE OF THIS PROJECT

Results and Discussion

- Results accuracy was satisfying for commercial use but the accuracy of the results are limited by the performance of thermal camera. However, in sake of cost-efficieny of the product, we decided to proceed with this thermal camera because prices of the thermal cameras with high performance goes up to extreme prices.

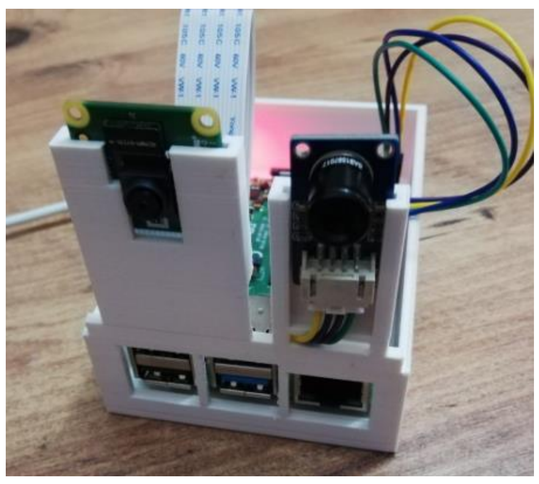

FIGURE 4: FINAL PRODUCT

FIGURE 5: RESULT OBTAINED IN PROJECT

- Possible future work: Performance of the main algorithm can be optimized and this project can be improved for tracking hands-free check in and check out times of an employee in a office.

References

- https://www.raspberrypi.org/documentation/hardware/camera/, Camera Module, Raspberry Pi
- https://www.iotforall.com Detecting People With a Raspberry Pi, a Thermal Camera and Machine Learning, Fabio Manganiello
- https://medium.datadriveninvestor.com/haar-cascade-classifiers-237c9193746b

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