



ECE-196 Hardware Project Presentation

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The team

Sizhe Fan

Facial Recognition

System Developing

Xianglong Wang

Temperature detecting

Prototype realization

Xiaoshuo Yao

GUI

General Design

Backgrounds



COVID-19 pandemic is undoubtedly the most important event in 2020, people's lives are affected by it in many ways. We can no longer go to restaurants, go on travels, and most importantly, for students, we can't safely go back to schools.

One most important and measurable symptom of COVID-19 is fever. So is it possible to check one's temperature before he/she enter a classroom to minimize the possibility of COVID-19 outbreaks in the schools?



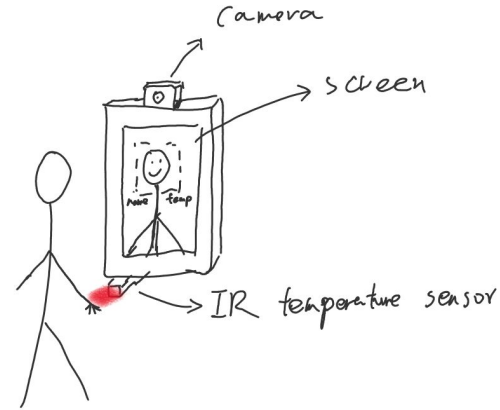
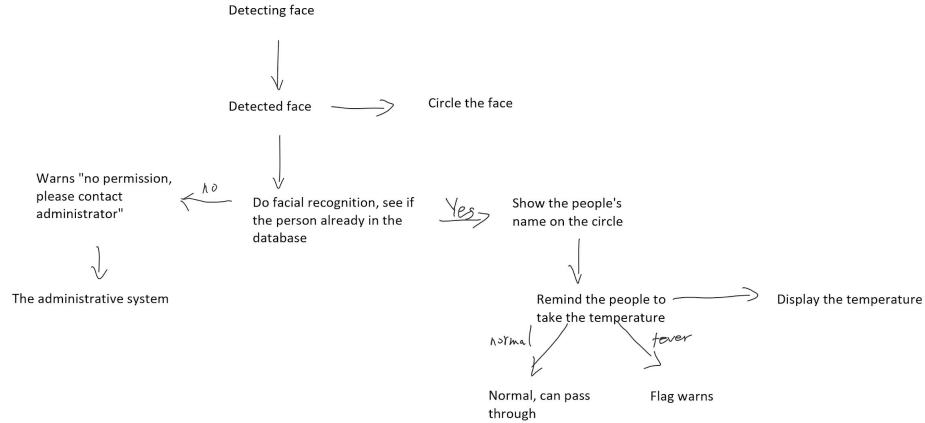
Our Project:

Joint Intelligent Thermometer (JIT)

--For “private” public
areas (e.g. schools)

An access control system based on
Raspberry Pi with ability of real
time facial recognition, taking and
recording the body temperature.

Some early ideas of the system (And awful drawings)



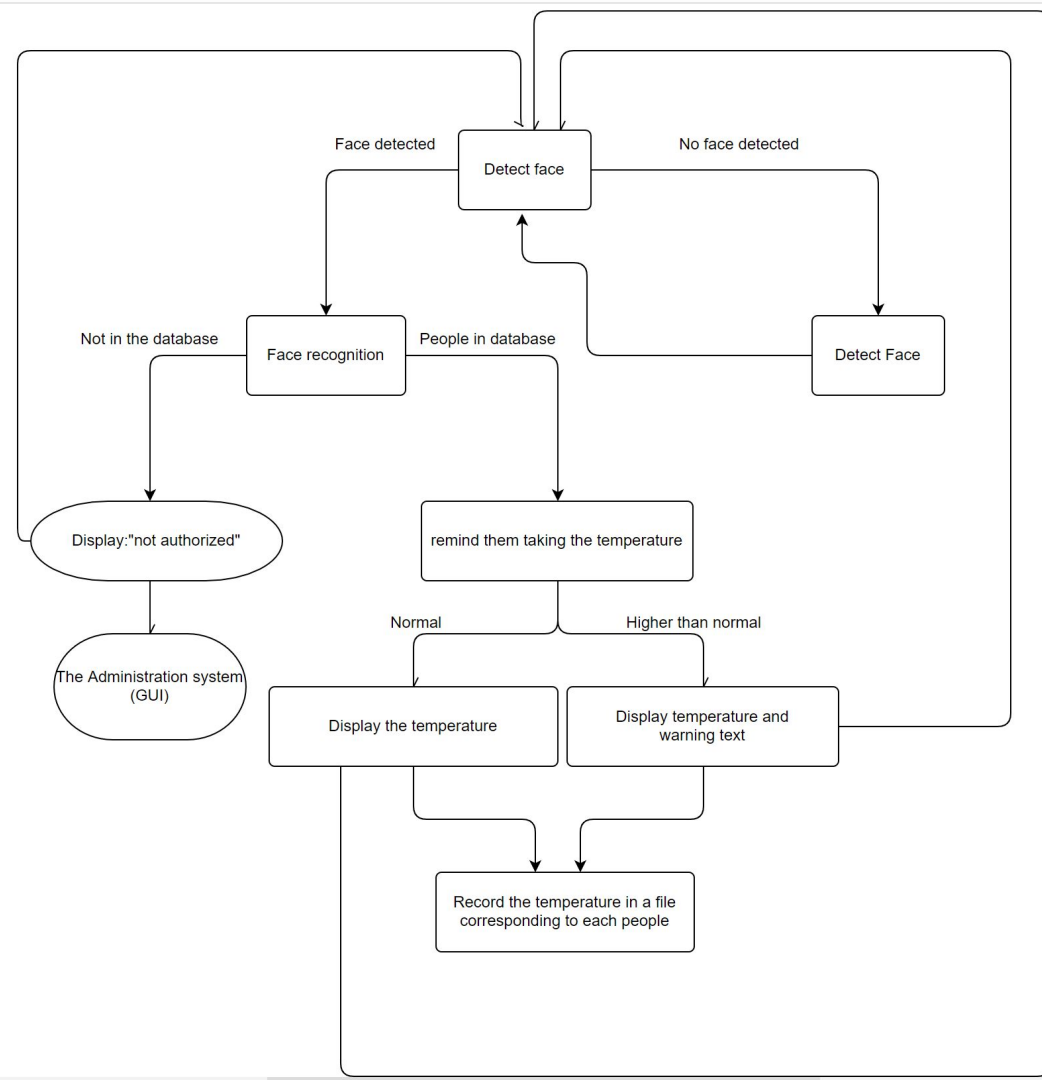
Main program

- Display the camera with face circled(face detection)
- Facial recognition
- Read the temperature
- Save the temperature data associated with the people
- Display the name of the people and the temperature

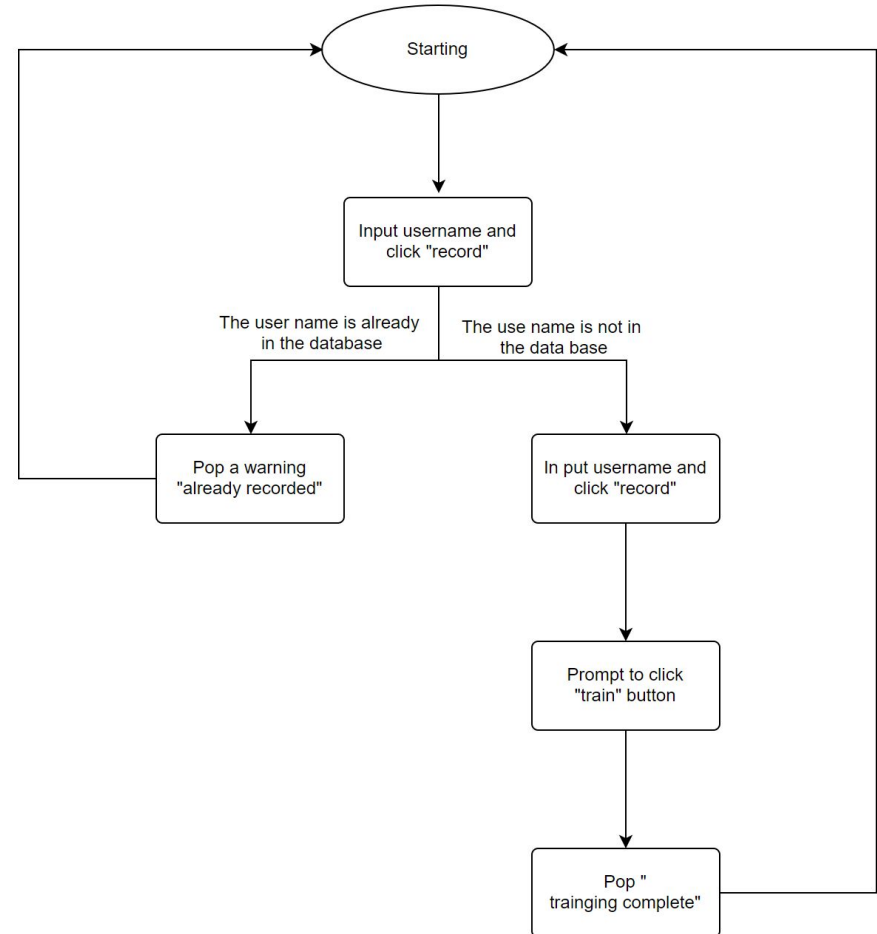
Administrative system

- Display the camera
- Cut the camera video (face detection) -> make an image dataset
- Dataset storage
- Train the model
- GUI

Work Flow of the Main System



Work Flow of The Administration System



Introduction to the System & Development

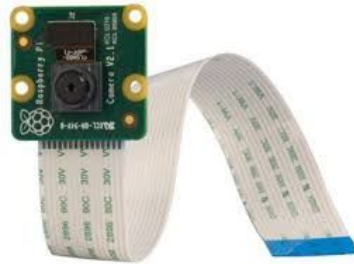
System Description:

The system is consisted of 4 parts: a Raspberry Pi, a Pi-camera, an IR-temperature Sensor, and a screen.

Raspberry Pi



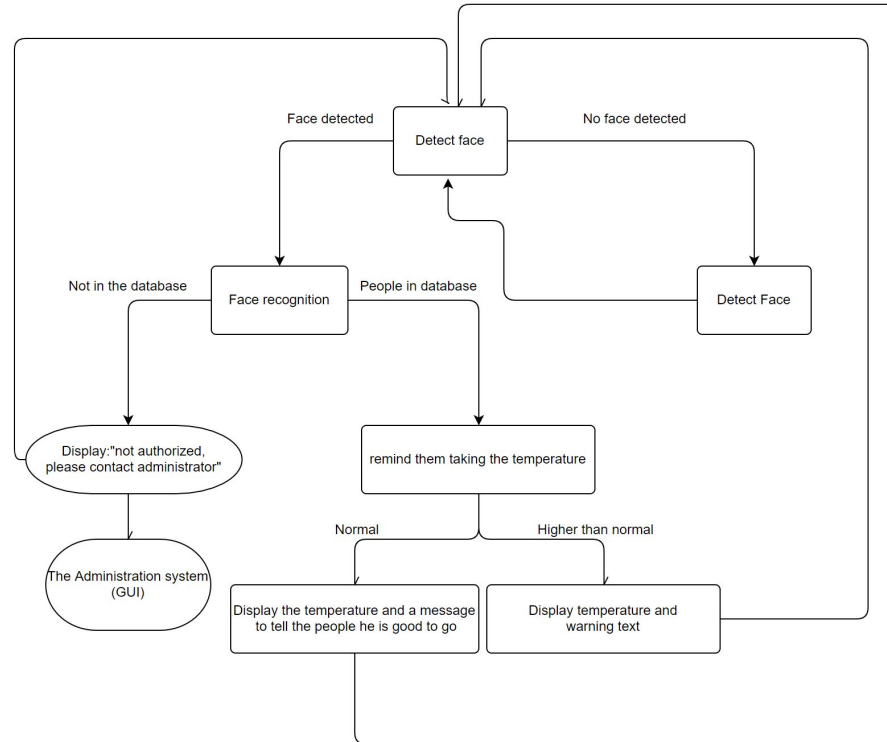
Pi-camera



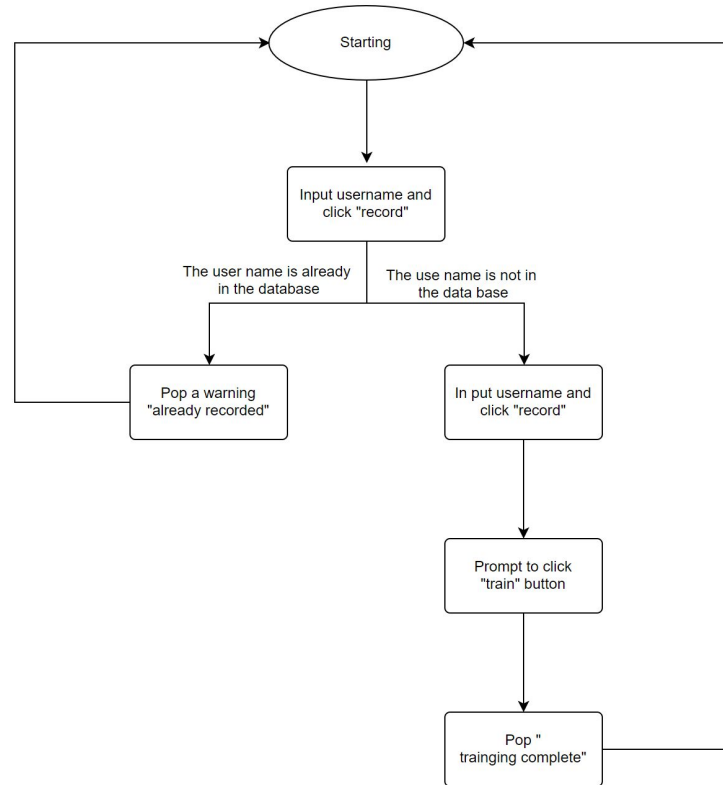
IR-temperature
Sensor



Work Flow of the Main System



Work Flow of The Administration system



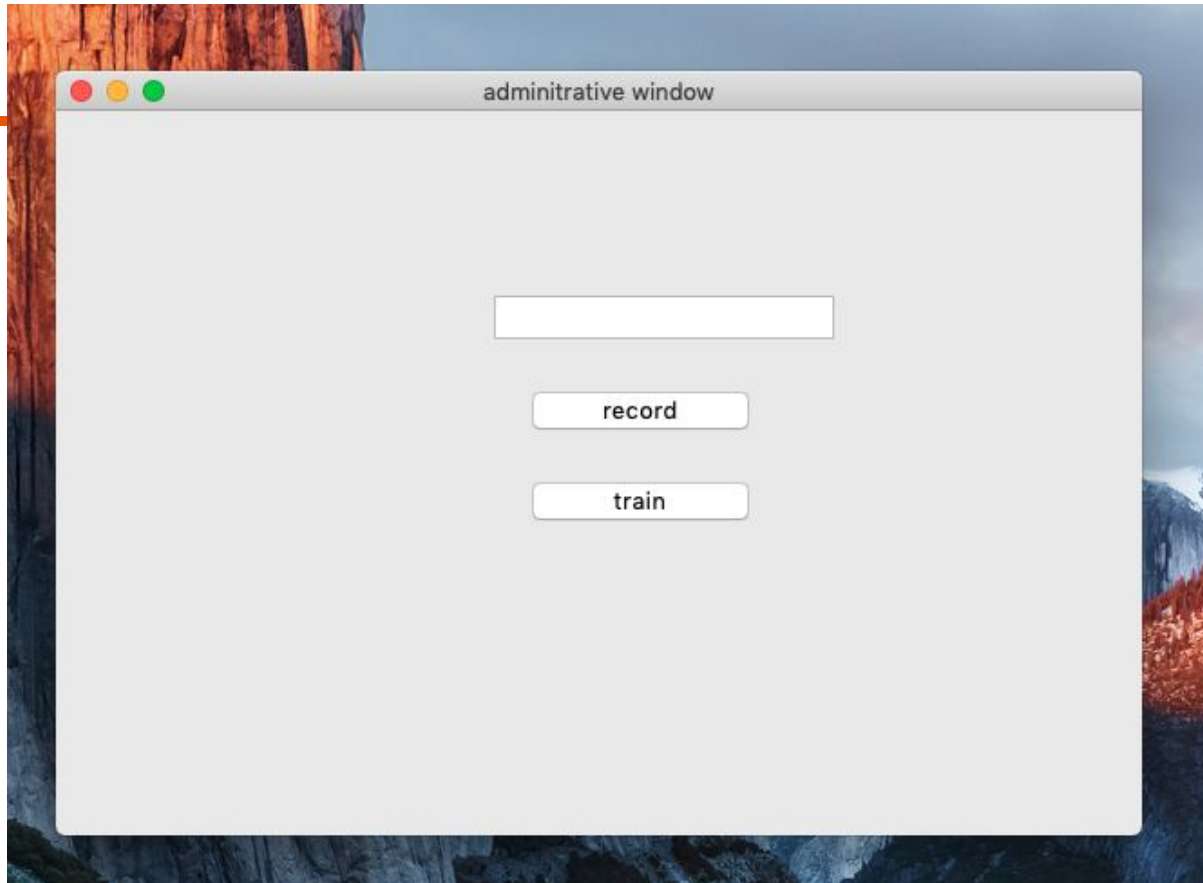


UI

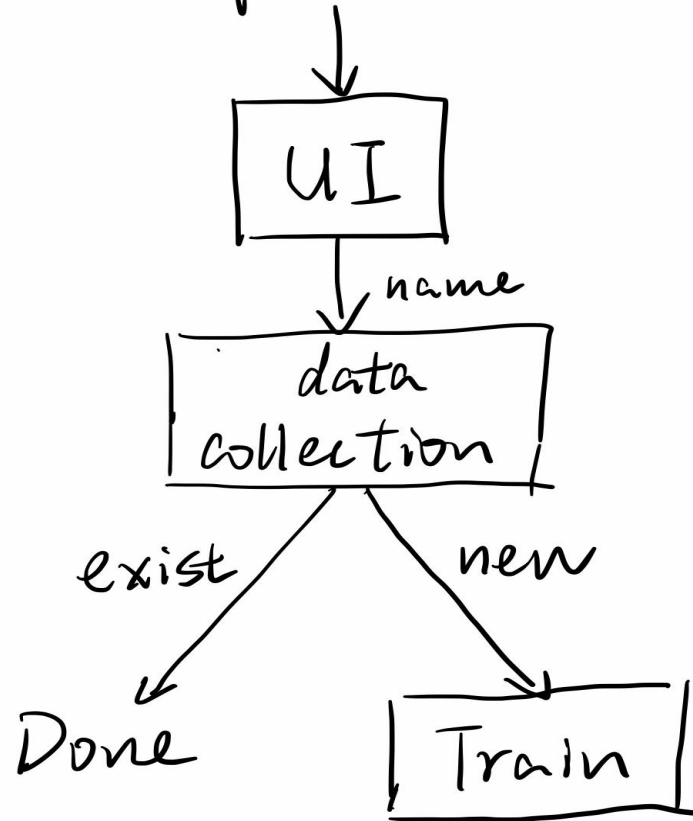
Data
collection


Train

Recognition



Administrative: Input Name
(Manager)






Main System:
(Recognizer)

Recognition.

 jupyter Chris.txt ✓ 5 minutes ago

文件 编辑 查看 语言

```
1 39 at 04/12/2020 04:49:12
2 36.5 at 04/12/2020 04:54:13
3 34 at 04/12/2020 04:55:31
4
```

```
▼ #read in the names from a csv  
▶ def read(path):↔
```

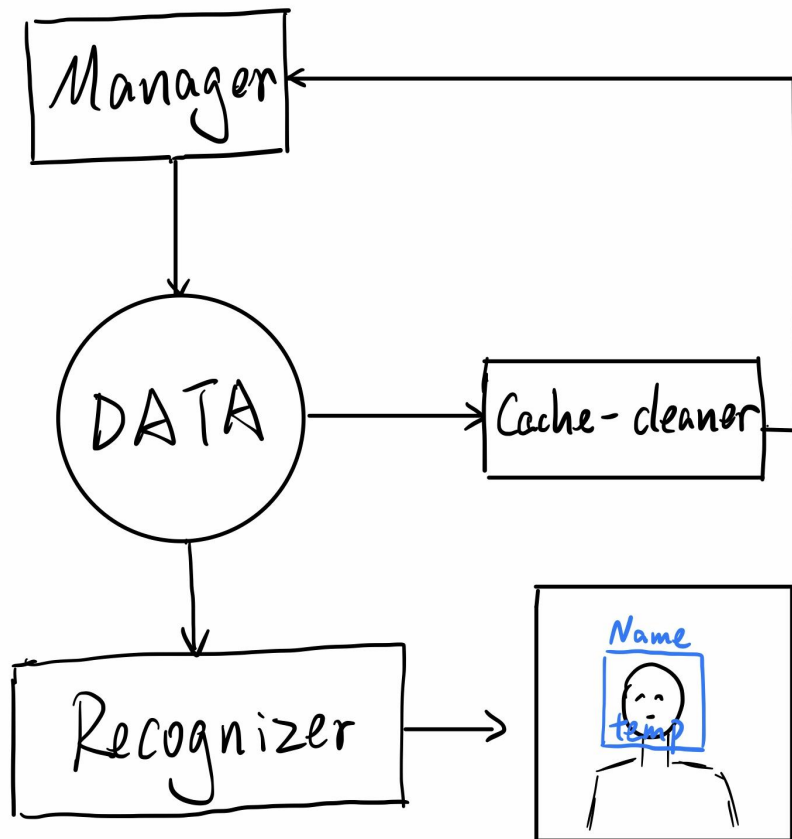
```
▼ #write name to the csv file  
▶ def write(name):↔
```

```
▼ #check if user face already exist  
  #return true if exist  
  #return false and creat new user's temperature file  
▶ def check(name, userList):↔
```

```
▼ # open the camera and capture the face  
  # store the captured face in the dataset file  
▶ def capture(userList):↔
```

```
▼ # train the collected faces  
▶ def train():↔
```

```
▼ # clean all the data  
▶ def clean():↔
```



Problems of the Current System and Possible Ways of Improvement

Current Problems:



1. The temperature sensor is not accurate enough. (affect the usefulness)

Fix For (1):

2. The performance of the Raspberry pi is not perfectly suitable for this project, after a while, the program may breakout because of Raspberry pi overheat.

Fix For (2):

3. People must remove their masks to get recognized. (Dangerous!)

next

Fix For (1):



Use an IR camera to take the temperature

Pros: May get a more accurate temperature

Integrate the temperature system and the video system together, reduce components

Cons: Expensive (Starting from ~200\$) (The reason of not using it)

Can also be affected by ambient temperature

[Current Problems:](#)

Fix For (2):



A better cooling system:

Pros: Cheap, easy to accomplish

Cons: Can't solve performance shortage

Or use some other open source hardware optimized for AI usage (like Nvidia Jetson)

Pros: better performance

Cons: More expensive, need optimize the codes to utilize the extra performance

[Current Problems:](#)

Fix For (3):



Better facial recognition algorithm that can distinguish people with masks

Pros: We can probably publish a paper if we can solve the problem :)

Cons: Too hard :(

[Current Problems:](#)

Other Possible Improvements



1. Add a system to upload the temperature data to remote server
2. Better database (than .csv file and .txt files)
3. IoT compatibility of interact with other smart devices like smart door locks



Thank You!

Demo of the project:

https://youtu.be/_w_8O7UCp0M

Presentation Video:

https://drive.google.com/file/d/1MFE_8gG5FRXGonKlbep9i64R7oYkKiuA/view?usp=sharing