# **TEAM12 Division of labor scheme**

# **Embedded Systems and Hardware Development**

Responsible person: Peining Liu (2615219L)

Main responsibilities: Responsible for the selection, integration and driver development of all hardware modules.

Specific tasks:

1. Hardware selection and procurement

-Select a suitable infrared camera, fingerprint identification module, matrix keyboard, motor driver and relays, etc

-Ensure that each module is compatible with Raspberry Pi, consult the data manual to avoid communication conflicts.

2. Hardware circuit design and welding

-Connect the infrared camera (I2C / SPI), fingerprint sensor (UART / SPI), and matrix keyboard (GPIO).

-Connect the motor drive module to the switch controlling the electronic lock.

-Commissibug the power supply scheme to ensure the sensors and motor work properly under different loads.

3. Drive development & equipment communication

-Write the communication code for the Raspberry Pi and each sensor (C + + / Python).

-Debug the transmission of face recognition data (infrared camera Raspberry Pi).

-Ensure the accurate transmission of the fingerprint identification module data.

-Open the generator control logic (open / close the lock).

4. Equipment optimization

-Solve hardware interference problems (such as the performance of infrared cameras under different lighting conditions).

# **Software-System Communication**

Responsible person: Hao Sun (2955851S)

Main responsibilities: Responsible for the software development, database management and remote communication of the authentication system.

Specific tasks:

1. Certification algorithm development

-Face recognition: OpenCV + DLib for face detection and matching.

-Fingerprint recognition: extract the fingerprint feature value and compare it with the database to realize identity authentication.

-Password verification: Develop a matrix keyboard input processing program to determine whether the input is correct.

2. Database and local storage

-Design the SQLite / MySQL database to store user information (face features, fingerprint ID, password).

-Record the access log, including timestamps, authentication results, etc.

# **Remote monitoring and automation control**

Responsible person: Mengyang He (3030975H)

Main responsibilities: Design the remote control system to realize the networking function of the intelligent lock.

Specific tasks:

1. Remote alarm system

-When someone attempts illegal access (wrong password / fingerprint), trigger:

-The buzzer rings out

-The screen displays "ACCESS DENIED"

-Send alert messages via LAN (LAN) or MQTT.

2. Motor control

-Design automatic unlocking logic (such as 3 consecutive error input, lock for 5 minutes).

-Optimize the motor drive code to ensure smooth locking opening.

3. Data acquisition & log management

-Collect the authentication data and record the time, method (face / fingerprint / password), success / failure of each visit.

-Design the exception detection mechanism to automatically send a remote notification if multiple failures in a short time.

3. Remote API development

-Develop API to remotely view logs and control locks.

-API endpoint example:

Get the authentication records

Remote unlock

Trigger remote alert

4. User interface (Web / APP side)

-Design of the remote management interface.

-Provide real-time status display (current lock status, most recent access record, etc.).

# **Product Testing and Quality Assurance**

Responsible person: Hao Zhang (3028132Z)

Main responsibilities: Responsible for testing the stability and ease of use of the system, and proposing the optimization scheme.

Specific tasks:

1. Functional test

-Test whether all the authentication methods are accurate (face, fingerprint, password).

-Record the error rate and analyze the robustness of the system.

2. Environmental adaptability test

-Light change: test the effect of different brightness and angles during face recognition.

-Humidity test: Test the fingerprint sensor performance in a wet / dry environment.

3. Pressure test

-Simulate large numbers of user logins, testing the database and processing capabilities.

-Detects the response time of the remote API at high concurrency.

# **Social Media Promotion**

Responsible person: Chengyi Lyu (2960858L)

Main responsibilities: Responsible for promoting products, making publicity content, and increasing exposure.

Specific tasks:

1. Social media operations

-Maintain the Instagram and Github accounts.

-Regularly release product developments, development progress, and demonstration videos.

2. Product presentation

-Take a video of the product to show how to unlock the human face / fingerprint.

-Publish the user guide & technical documentation to let more people know about the product.

3. User feedback management

-Collect feedback from early users and organize improvement suggestions to the development team.