Secure Door Opener

Team Members:

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Faculty Advisor:

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Client:
Dr. Marius Silaghi - Graduate Professor at Florida Institute of Technology

Meeting Dates:

Date	Topic
January 23, 2022	Semester 2 kickoff meeting.

Goal and Motivation:

Motivation-

The motivation behind this project is producing a secure and easy to use product that maintains the functional security of an upgraded door lock while integrating additional modern connectivity features into a door lock. Our primary goal is to integrate a secure mobile application into the physical security system to maintain the security of the overall system while adding flexibility for the end user to easily allow/disallow access on the fly without the need for additional setup or personnel.

Currently network attached secure locks follow two paths, financially and technically expensive gear that needs to be maintained by a dedicated team, or cheaper alternatives that sacrifice the security of the system in exchange for ease of access. Many enterprise solutions are expensive to maintain and require professional installation to convert a security system into a larger system, and will require a dedicated security team to permit access and fix issues when the system fails. While consumer solutions suffer from security flaws and minimal integration with other systems. These consumer solutions also sacrifice functionality tending to lean towards a singular way of accessing the lock other than a physical key.

Goal-

Our product is designed to maintain the security of enterprise solutions while leaving behind the issues of enterprise scale that requires dedicated personnel and professional installation. The ability for the lock to recognize who is attempting to access an area via facial recognition allows for users to dynamically configure who will have automatic access to the system. Additionally integration with a mobile application allows for a dynamic security environment that is designed to fit around the dynamic security needs of an individual. The mobile application will provide the ability to remotely monitor doors as well as lock or unlock them remotely.

Approach:

Verify that your home really is secure.

Worried that someone left that door unlocked when they left for the night? Check right from within the app and monitor your doors status. Multiple locks? No problem, our app lets you monitor all of the locations and ensure that your safety remains your number one priority.

Customize who has access to your locks

Grant access to those you trust from right within the app. Add and remove remote lock and unlock permission from anyone on your trusted list. Your trusted list will be built directly from our visual detection system so there will be no setup to begin granting access to those you trust.

Unlock your door with just your face.

Let your door decide who it lets in.Our secure lock will determine who is trying to unlock your door and let you make the decision to unlock the door. Your friends and family will be recognized and welcomed right in, while potential intruders are going to be left outside.

Check who is at the door.

Get notified when someone is at your door right inside your app. Is your friend

Dropping off your kids back at home or is something more sinister going on. Make the final decision to unlock your front door with visual verification from right inside the app.

Secure your home from anywhere in the world.

Expecting visitors while you are not home? Stop hiding that spare key underneath your matt and let your phone unlock your door for you. With the power of your phone let the Secure lock unlock your door right from your phone. Rushing to work and forget to lock the door? Lock that door right from your phone and never worry about your home not being secured when you are not there.

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Novel Features:

Facial recognition software built into the integrated camera.

Users will be able to control who has access to automatically unlock the door using the built in camera and facial recognition software.

Visual notifications of an individual attempting to access the door.

Users will be notified within the mobile application that an individual is requesting access to the door providing a clear image of the individual to the end user. The user will then be able to approve/deny access to the door based on the provided information.

Remote lock/unlock from a mobile device.

Users will be able to remotely unlock and lock the door from within the application.

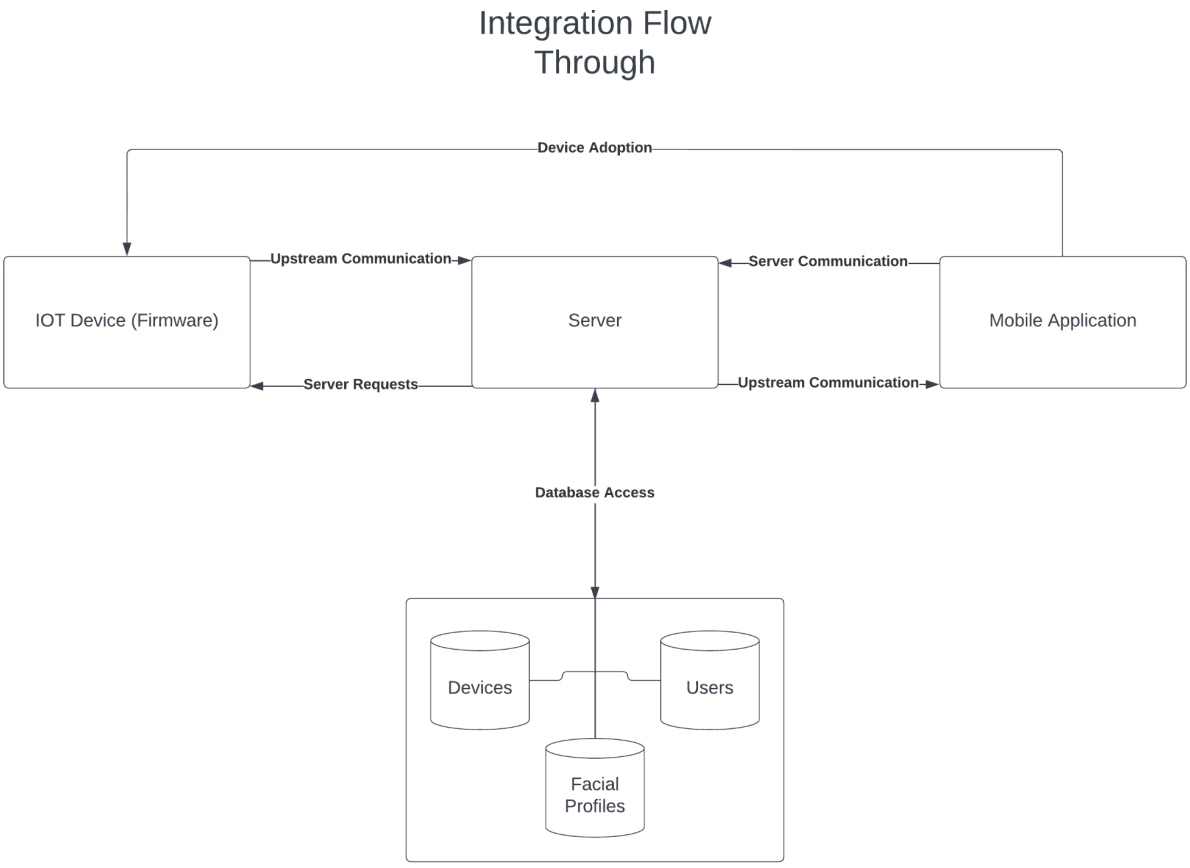
Technical Challenges:

Facial recognition: Making the facial recognition software actually compare faces instead of just analyzing an image and determining whether or not there is a face in the picture. This will be the last subsystem that needs to be developed on the software side.

Integrating the systems: Allowing multiple systems to communicate with each other is not a simple process if you are designing a system to adopt new devices at will. Care is needed to ensure that functionality remains while flexibility is established within the system. As well ensuring that these measures are performed while maintaining the security of the system is paramount to our primary goal.

Using the hardware: Learning the new system to communicate on the hardware level is a larger challenge than initially anticipated. Generating the needed signals to communicate with physical hardware as well as communicating with an onboard camera is important to do it simply and efficiently.

Design:



The system is split into three distinct parts, the Mobile application, the Backend API service, and the IOT Device that is hosted on a Raspberry PI. We are communicating with the IOT device via a web server located on the device and the Cloud Server that manages messages from the Application and the IOT device. All users are treated the same however they are managed based on a token authentication system that is managed by the database that is located alongside the API.

Evaluation:

Speed: The way we can measure the speed of our project is to measure how long it takes for each of our subsystems to complete their tasks. This can be done by using a time library in each of the programming languages we used. We can also measure the total time it takes for the entire system to complete the task. More specifically we can measure the time it takes for the door to unlock.

Security: We can measure the security of our system by putting people in front of the door and seeing if the facial recognition will send a positive match. If they are the correct people and responses then we know if it works.

Usability: We can measure the usability of our app by asking for feedback from our user during the development process. This will affect the usability of the app because the layout and color scheme can change as we get feedback.

Progress Summary:

Task	Completion	To do
Facial recognition	80%	Face comparaison
App Development	75%	UI updates from API
API	60%	Message Bus Message passthrough to IOT device IOT registration
IOT Device	15%	Addition of Web service, Communication between API and local IOT

Milestone 4 itemized tasks:

- App GUI Completion
- API Completion
- Facial Comparison
- Web Server setup within Raspberry Pi

Milestone 5 itemized tasks:

- Final Integration Between all Systems
- Conduct evaluation and analyze results
- Create poster for Senior Design Showcase

Milestone 6 itemized tasks:

- Test/demo of the entire system
- Conduct evaluation and analyze results
- Create user/developer manual
- Create demo video

Task matrix for Milestone 4:

	Luke	Chris	Warren	James
App GUI completion	15%	15%	15%	55%
API Completion	55%	15%	15%	15%
Facial Comparison	15%	55%	15%	15%
Web Server setup on Raspberry Pi	15%	15%	55%	15%

Description planned task for Milestone 4:

App GUI completion-

A last pass on the App GUI needs to be completed, Refining the dashboard, device listing, and account information pages

API Completion-

Complete the message bus for the API and prepare pass through commands for the Raspberry PI and App for complete integration

Facial Comparison-

Final touches on the facial recognition component of the system allowing for the ability to save and evaluate unknown faces against a registry of known saved individuals.

Web Server setup on Raspberry Pi-

Need to setup the communication between the API backend and the Raspberry PI to control the hardware located on the PI.

Approval from Faculty Advisor

"I have discussed with the team and approved this project plan. I will evaluate the progress and assign a grade for each of the three milestones."

Signature: _____ Date: _____