

359: Automatic Door Opener V2

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Abstract

This Automatic Door Opener project mainly focuses on assistive technology for mobility impaired people. This project is developed as a microcontroller system using Intel Galileo board. It is to be controlled mainly using a mobile app and other digital devices. It can be installed at home, office, education institution or any other relevant places.

The primary outcome of this project is to assist mobility impaired people to open and close doors and at the same time to let the administrator to give access to only to authorized users to enable secure system. Automatic Door Opener system is created to assist mobility impaired individuals to live independently from other people, hence increase their productivity. It also increases the quality of their lives and the society as well.

Problem Statement / Objectives

Mobility impaired people have difficulty to move about as easily as other people. This could be due to a number of reasons such lack of strength to walk, physical defects, limited movement of arms or legs, or medical condition. The difficulty interferes with their normal daily-life activities to live like a normal human being. In consequence, it could also decrease the productivity or efficiency of their efforts. The objectives of this project are:

- to help the mobility impaired individuals to improve their daily activities to move about
- to reduce dependency of the mobility impaired individuals from other people
- to create a system which assist mobility impaired individuals to open and close a door
- to eliminate the use of physical key to open and close a door by having a keyless entry system
- to create a better secured environment for mobility impaired individuals by having a usable automatic door opener system

Background study / Literature Review

World Health Organization reported that more than one billion people in the world live with some form of disability, with whom about 200 million experience considerable difficulties in functioning. Nearly 10% of global population (650 million individuals) have disabilities and of this figure, about 10% (65 million individuals) require a wheelchair. Mobility devices, especially wheelchair, is a high indicator of disability. To make disabled people live more independently from other people, there are many devices that have been created for the purpose such as wheelchair.

It is found from online research that there are top four automatic door opener manufacturers provide variety of access controls to mobility impaired people. However, these automatic door openers are not cheap and do not use current technology and latest trend of using low-cost but powerful System on Chip (SoC) microcontrollers such as Raspberry Pi and Arduino. These door openers also do not have user database for security-purpose or record-keeping. The status of doors cannot be viewed in real-time in any location.

Methodology

Methodology used is V-Model system development lifecycle. There are five phases of system development with each phase has its own testing phase.

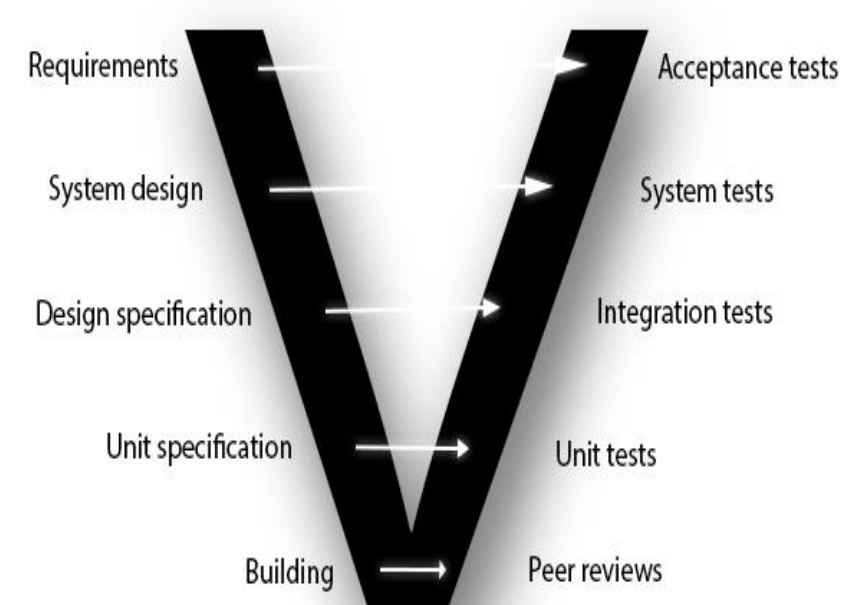
1. Requirements gathering stage: functional requirements, quality requirements and constraints of the project are gathered. Diagrams are created to model the requirements

2. System design phase: construction details of the system are specified based on the requirements. The correct system design is critical to develop the right working system in the next phase.

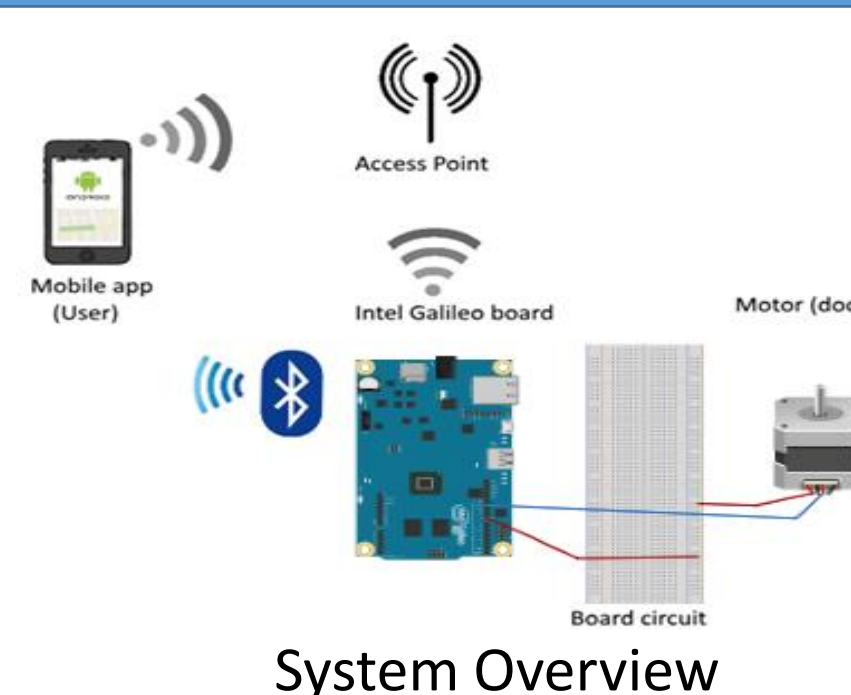
3. Design specification phase: describes how the requirements will be achieved. System architecture is chosen and designed.

4. Unit specification phase: design of the modules or units of the system are specified. It is important that the subsystems are compatible so that they could be integrated into a whole system later during the integration testing.

5. Building phase: assembles the system hardware and codes the system software



Implementation

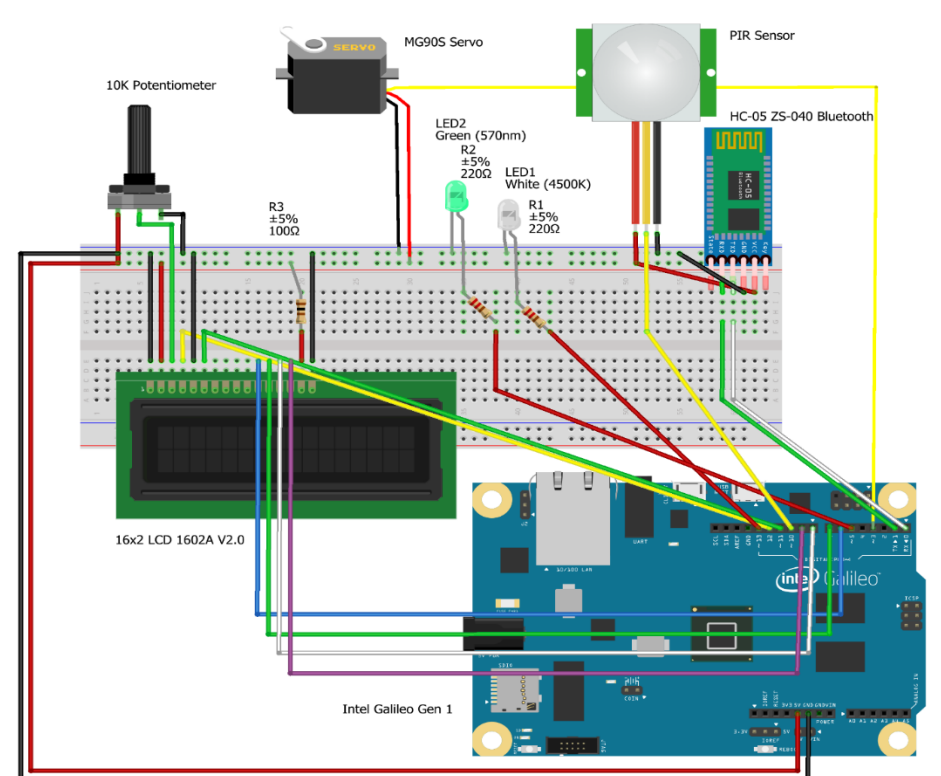


Functional Requirements:

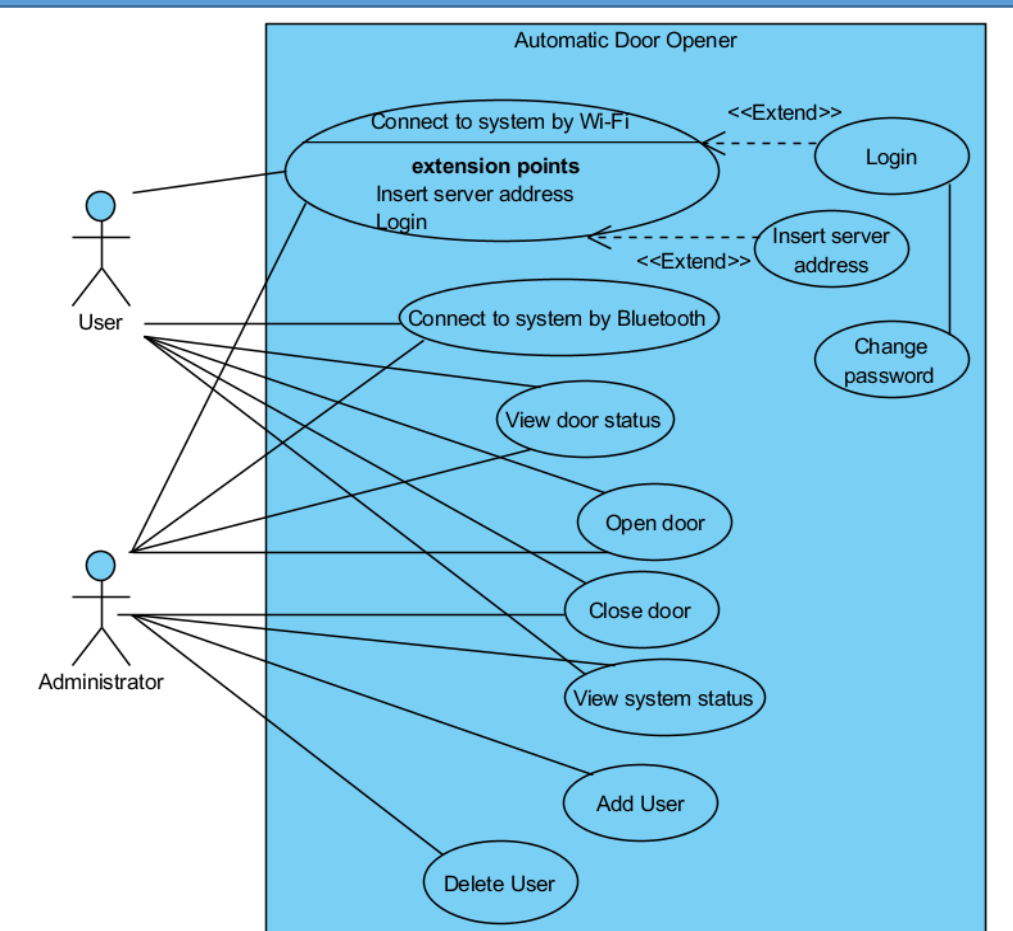
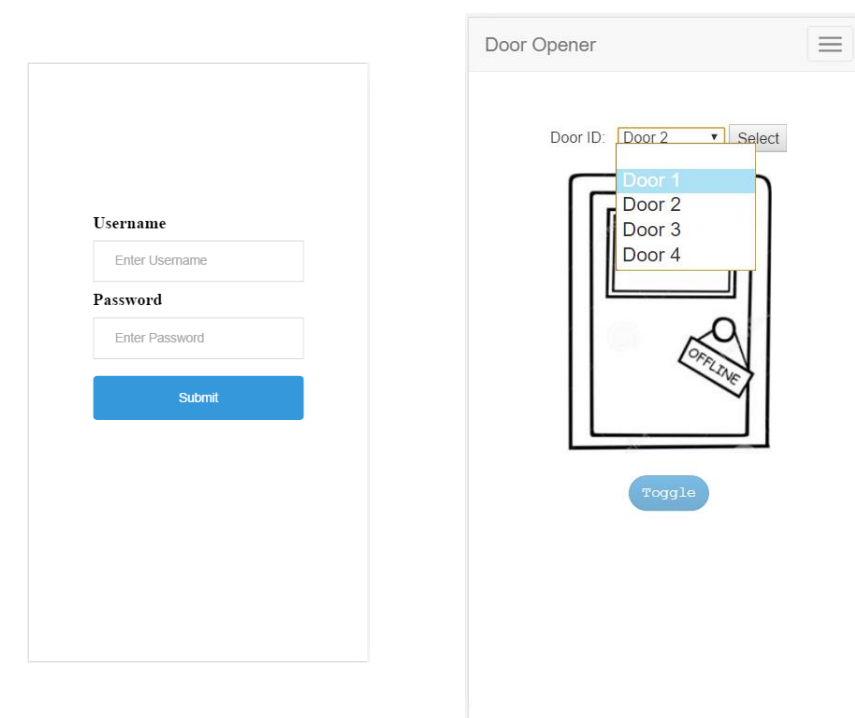
1. View door status
2. Open/close door
3. Change password
4. Add/delete user
5. View system status
6. Wireless communication (Wi-Fi & Bluetooth)
7. Servo (door) operation
8. Motion sensor

System Modules:

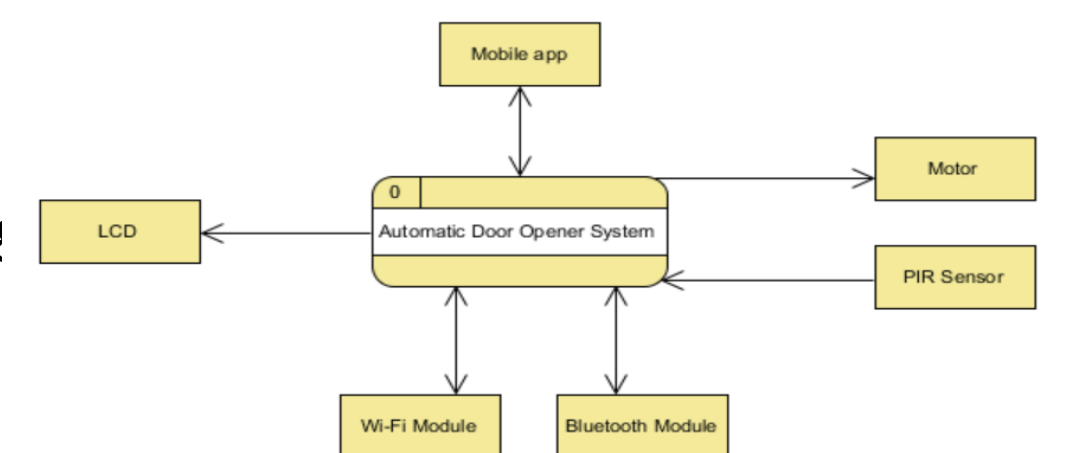
1. Mobile app
2. Bluetooth
3. Wi-Fi
4. Motor
5. LCD
6. Motion sensor



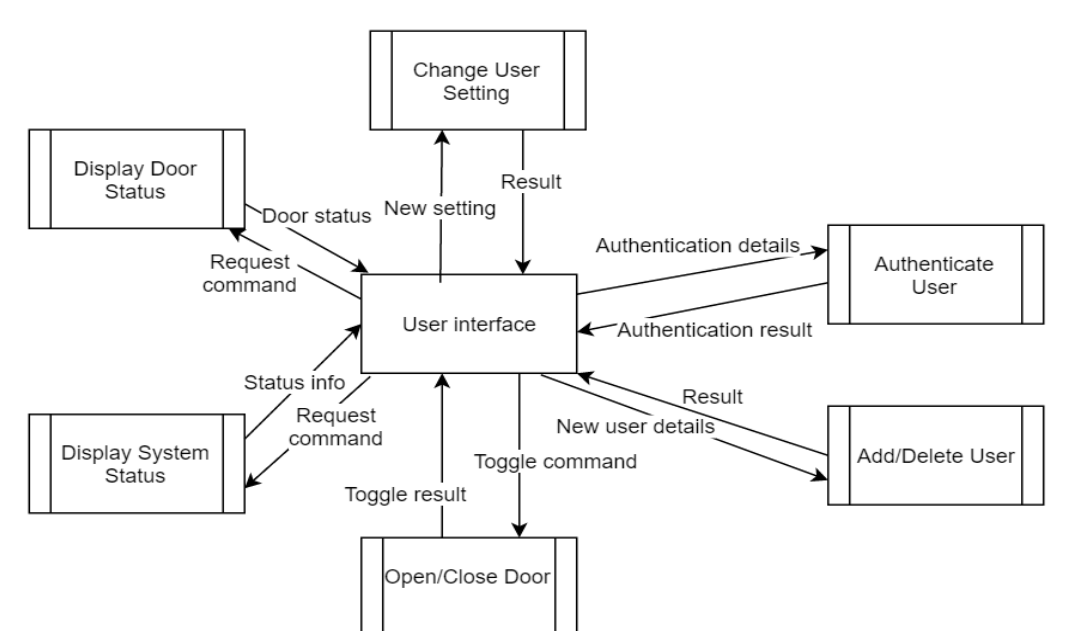
Breadboard view



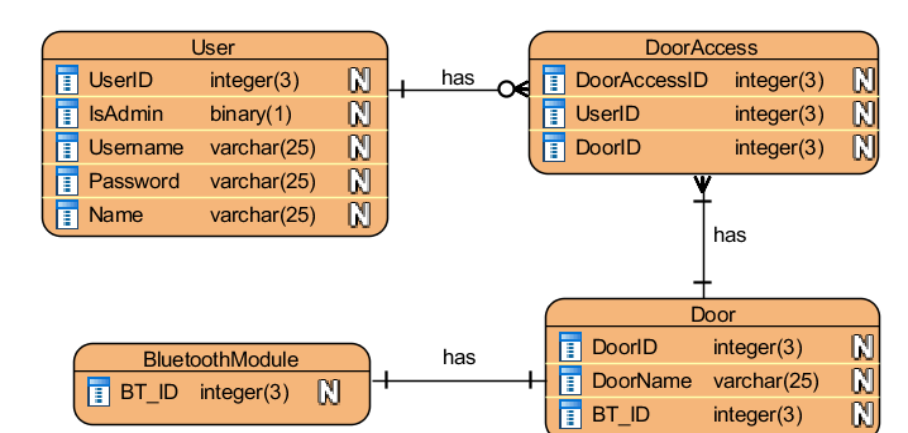
Use case diagram



Context diagram



Level-0 data flow diagram



Entity relationship diagram

Conclusion

Using embedded system such as Intel Galileo board enables developers to build more advanced devices such as the automatic door opener system in this project. Most of the existing automatic door opener system that I found do not implement the SoC board like Intel Galileo to enhance their system. From the completion of this final year project, I believe that the use of SoC board, or IoT in general, have bright prospect in the development of modern devices in this era of information and technology.