Development of Homestay Door Locking System

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Abstract: Short term home rent is becoming more popular and trending lately due to its affordable rates and more value for money. Compared to staying in hotel or serviced apartments, it is more convenient and much cheaper to spend holiday in homestay for the majority of people. However, there are some issues of homestay especially related to safety issues. One of the most compelling issues is the authorised access of the homestay that is easily abused. Therefore, this project is intended to develop a reliable keyless door locking system to improve safety in homestay. The developed locking system offers flexible and convenient to guest, yet it is more secured than the conventional locking system. The prototype of locking system presented in this paper also has high potential to be installed in homestay.

Keywords: Keyless Locking, Secured Locking, IOT Security

1. Introduction

Smart door lock or digital key technology was born as a solution for conventional key systems that use physical keys. Digital door locks, which mostly use passwords, are considered more practical and comfortable than conventional lock systems that use physical-shaped keys [1,2]. Home passwords can even be changed at any time so that users do not have to worry about people knowing their home passwords [3,4]. To meet today's supply and demand, smart locks also work with smartphones. Comes with apps that allow its users to take full control of the key, the smart lock brings a completely new idea of incorporating aspects of convenience and security to life [5-8]. With the app, homeowners can also provide access to others when needed. Homeowners can also keep track of who uses the smart lock to improve security and comfort [9,10]. In addition, this smart lock also allows for integration in this home automation era [11].

The result of this development is the idea that its users can have the convenience of locking the door instead of the more traditional locks. Instead of carrying keys everywhere, people prefer to have no keys at all. Digital door lock comes with various access modes, such as PIN codes, RFID cards with sensors, biometric cards with barcodes, and more [12-14]. Moreover, digital door locks also come with alarm features aimed at improving key security [15].

2. Methodology

This section will present the methodology used to develop the proposed waste segregation system. The first subsection presents the overall block diagram of the system, followed by the flow chart of process mechanism and finally the details of each mechanism.

2.1 Block Diagram

Homestay door lock applications include advanced security features such as Arduino UNO microcontroller, 3x4 Matrix Keypad, servo motor, LCD display and buzzer as depicted in Figure 1. The microcontroller will receive the input signals from keypads. The keypad and servo motor interfaced to the controller is used as the password entry system to open/close the door automatically. The use of this component is low cost and easy installation.
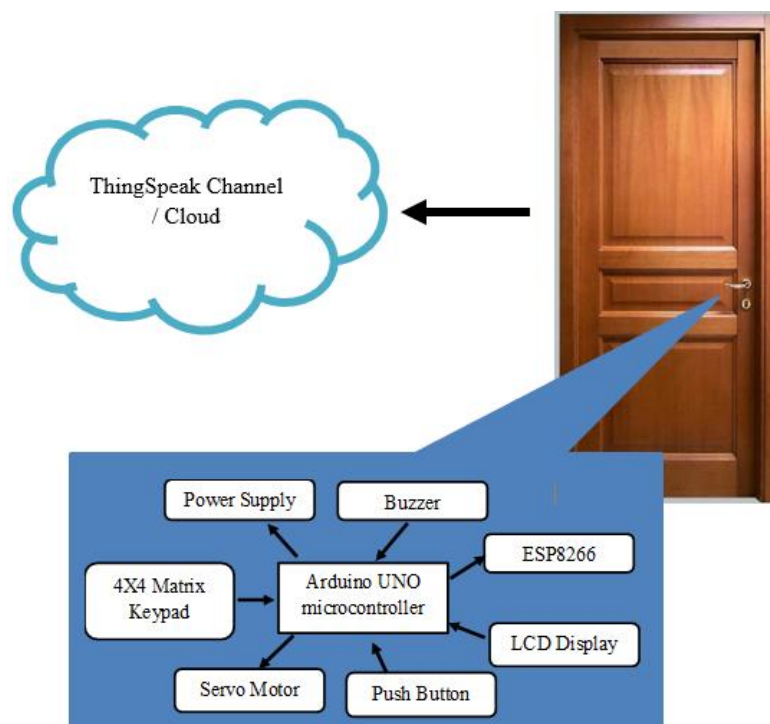

Figure 1: Block diagram of the proposed system

2.2 Flow chart

The flow of the recycle system is shown in Figure 2. The process starts by user or guest authorisation through password validation. In this stage, the user need to key in the correct password, which is given by the host. Once the password is validated by the system, the door will be unlocked automatically. There is a small delay between password validation and the door being unlocked. The moment the door is unlocked, tis data will captured by the system and stored in the data cloud. Apparently, all the data of guest going in and out of the homestay will be recorded in real time in the cloud. These data could be retrieved by the homestay host for data record and analysis. The data analysis could help the host to see the booking and utilisation of the homestay for future plan.
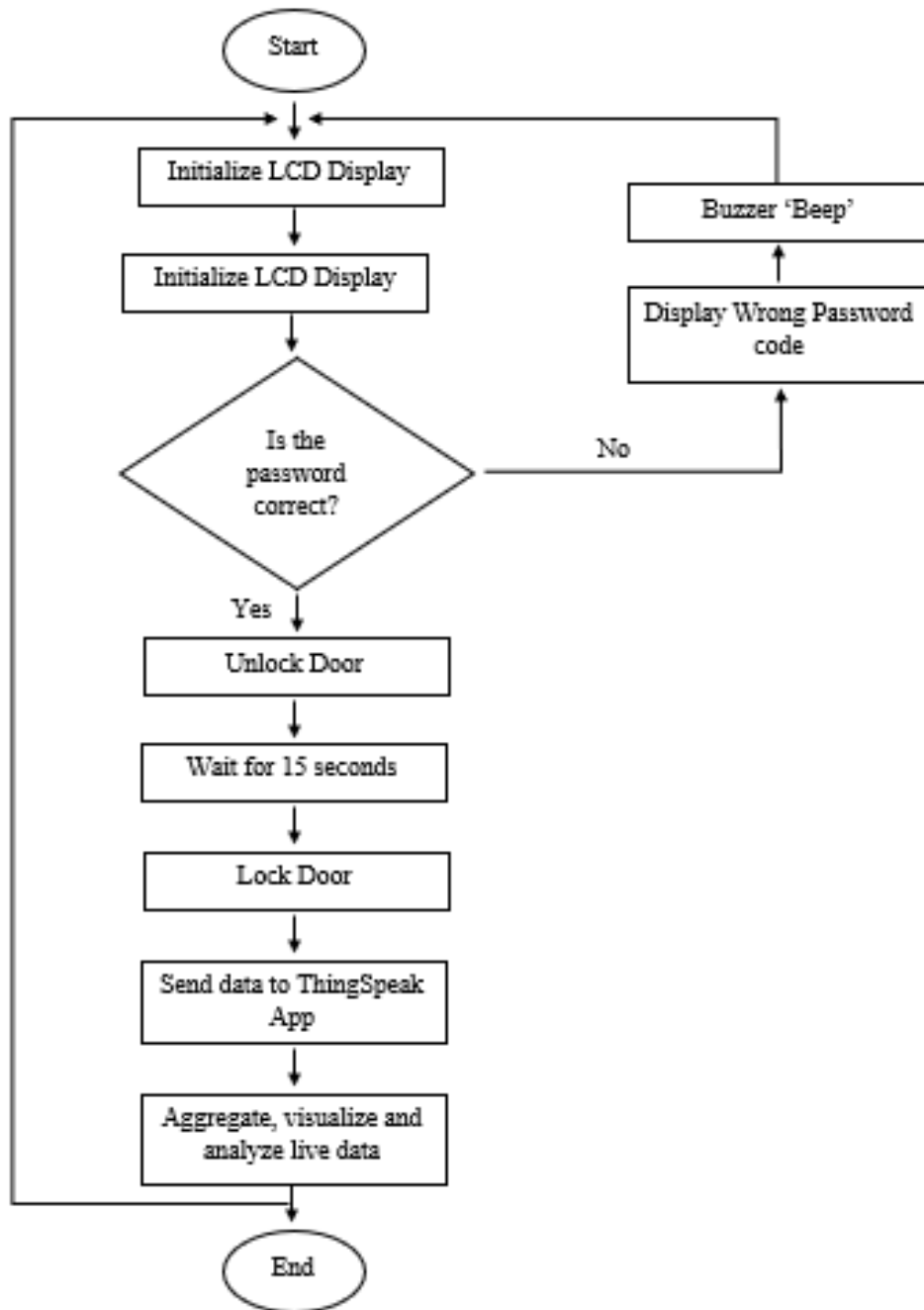
Figure 2: Flow chart of the door locking system

3. Results and Discussion

3.1 Physical system

Figure 3 shows the whole prototype of the developed door locking system. The user will key in the password through keypad and the LCD display will show the related message to the user.
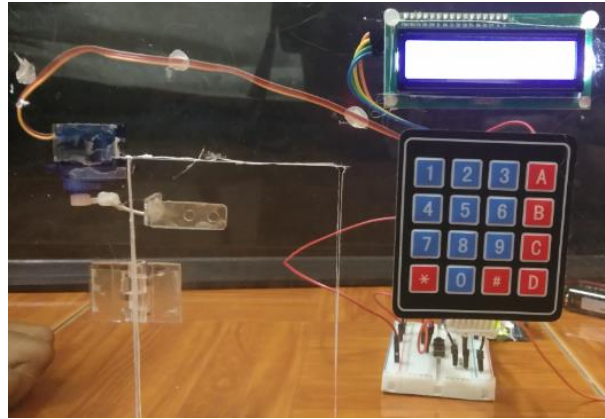
Figure 3: Prototype of door locking system

3.2 Results and Discussion

3.2.1 Stanby Mode

The program is loaded to give instructions and move the components involved such as LCD to convey the message and password that need to be entered. The LCD will display the steps that need to be taken by the user before the password is verified to match the saved password. Figure 4 shows the LCD in the standby mode and will displaying the user for "Enter the code". The 6-digit provided by the host will be entered on the keyboard to be compared with the predefined password.
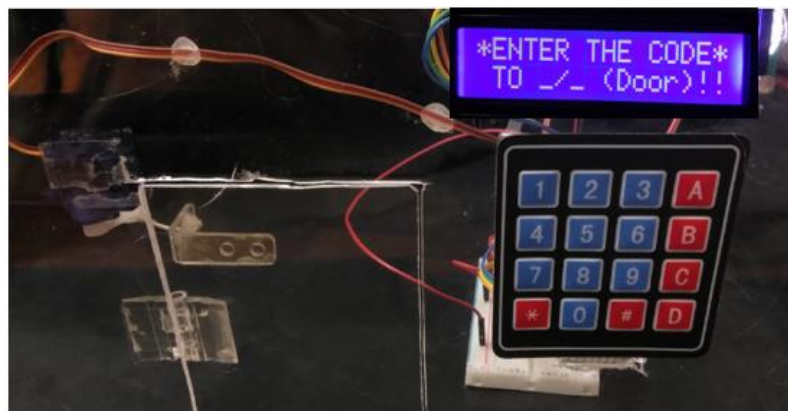

Figure 4: The system is in the standby mode

3.3.2 Access Authorisation

The password entered by the guest will be displayed on the LCD as shown in Figure 5. The servo motor serves to move the door open or close according to the program that has been set. Figure 6 shows condition when a guest enters a correct 6-digit password via the keypad, the LCD will display "Access Given, WELCOME". The servo motor will open the door after the password is confirmed to match the stored password and after 15 seconds of door opening. the door will automatically close. The servo motor will move the door to position 120° and will close the door again after 15 seconds. Among the advantages of servo motor is that the door is difficult to damage or leak because it has its own durability.

Figure 7 shows the display when entering the wrong password and does not match the saved password. Incorrect password will be entered will not open the door in any way. If the wrong password is entered more than three times, the door will remain closed and the bell will ring as notification of an

attempt to enter the homestay without permission. The bell interfaced on the device will emit a buzzing sound that will attract people around for further action such as contacting the homeowner owner or reporting directly to the police. Another advantages of Homestay door lock system is that the guests can still access the door by looking at the password given by the homeowner owner via a short message sent by the owner such as SMS or WhatsApp application if guests forget the password. That is one of the advantages of Homestay Door Lock System which is very simple and flexible for guests.

In addition, homestay owners can also change the password after guests check out to ensure that the homestay is protected from intruders. The owner can change the password every time a guest checks out for security and prevents any attempt of burglary. Password change gives the homestay system a high security level as illustrated in Figure 8.

Figure 5: Guest key in the password on keypad

Figure 6: Access granted if password is matched and the door will unlock automatically

Figure 7: Displayed message when guest key in incorrect password and thus denied access by the system
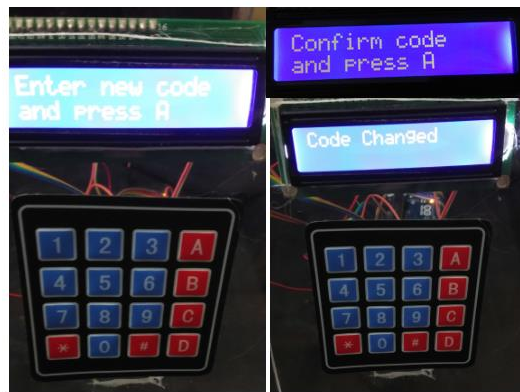

Figure 8: Displayed message when password is being reset and changed to new password

3.3.2 Real-time Data Retrieval

The final part of this door locking system is the real-time data retrieval through apps integrated with the physical system.This system is utilising the ThingSpeak app, which is an open IoT platform that will analyze and visualize data using the HTTP protocol over the Internet. ThingSpeak channel and it will generate the channel ID and API key automatically. Homestay owners can access the ThingSpeak app to see a visualization of the data of guests checking in and out. Data that provided by this system are time of check-in, check-out time and frequency of guests renting in a month. An example of date-frequency when the guests is entering the homestay, which is illustrated in Figure 9.
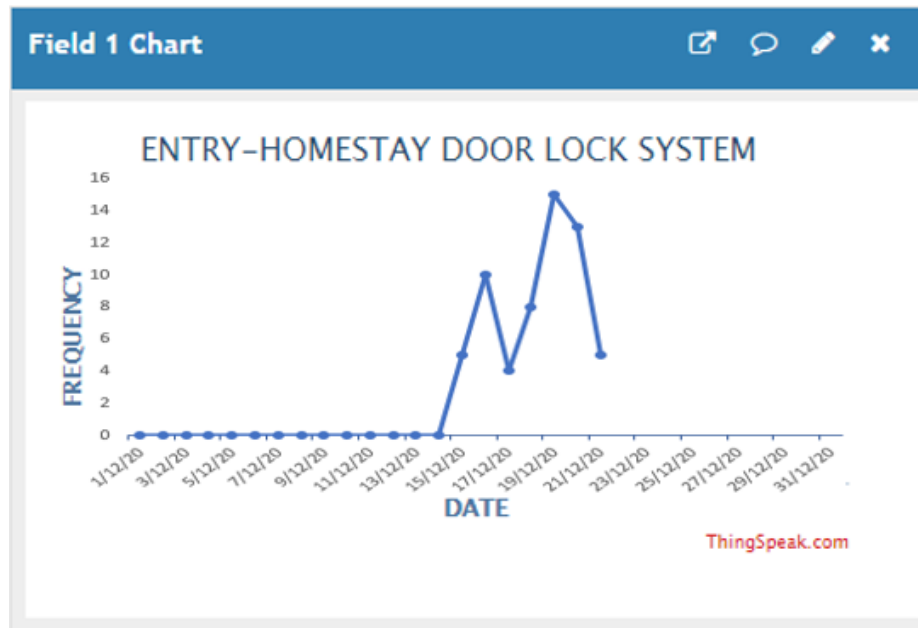
Figure 9: An example of authorised access for a selected period

4. Conclusion

Overall, the proposed door locking system was able to allow access for the authorised users and vice versa automatically. In addition, the system is also capable of retrieving the accessing data of users or geust of homestay in real time. Those data is presented in a useful format for the host. However, there is an obvious limitation of this sytem, which is the identity of guest cannot be made instantly through the locking sytem. Having said that, the developed system provides a flexible and yet a secured system for a homestay both to the host and guest.

Acknowledgement

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