

H.E.L.P (Home Easy-Lock Product)

Dr.T.K.Thivakaran, Farag Anjum Kureshi

Professor and Head, Information Technology, SRM IST, Chennai, India

Student, Information Technology, SRM IST, Chennai, India

ABSTRACT

This proposal effectively manages one of the aspect of helping old aged and handicapped people through technology in the country. Based on profile of elderly person in the country, it stated that there were 10.38 crore (8.6 per cent of the population) elderly persons in 2011 as compared to 7.66 crore (5.6 per cent) in 2001. It said 71 per cent of elderly population resides in villages while 29 per cent is in cities. The elderly population lives with their family in most cases or are isolated providing all the means to sustain themselves. Second are the disabled people in India; according to census 2011 they constitute of 2.21% of the total population and increasing.

The government has been trying hard to tackle the problem of taking care of these people using old age homes and also relief funds but is falling short due to inadequate and inconsistent management. Appropriate measures cannot be executed without reliable workers and accurate data. The govt. can use home automation in this area to keep the elderly and the handicapped safe and give them an easy lifestyle at home if not outside. So with this work, Arduino based working prototype can play a major role in solving this problem. It can help the appropriate people by providing real time solution of the problems at home and accordingly generate data when the product is used.

The paper explains a small, cost effective/cheap, efficient and easy home automation system based on Arduino Uno and Android App. The app supports Bluetooth enabled management of the automation and Arduino has a Bluetooth module attached to it, thus making conventional locks and keys obsolete. There is also a use of Servo motor which needs to be programmed and attached to the Arduino board. The working model has been tested to run in all conditions in a safe manner.

Keyword: - Bluetooth, Arduino, Android App, Servo Motor, Smart Lock, Affordable home automation etc.

1. INTRODUCTION

The Indian Home Automation Industry is at its blooming stage and is creating a lot of opportunities for companies and start-ups. Home Automation is basically the networking of appliances and devices that we use in our daily lives. We must have noticed fancy gadgets being displayed in movies and also as prototypes in Indian market but they come with a hefty price tag. Then Indian market majorly consists of middle class users who would not go out their monthly or yearly budget to buy these devices.

Now, due to the advancement of technology as a whole, wireless communication has also seen a lot of variations in connections such as GSM, WIFI, and Bluetooth etc. and with that comes a lot of complications. Each of the connections have their own unique applications and specifications. In this project we have chosen Bluetooth as our wireless module with a range of 2400Hz frequency.

The choice of using Bluetooth comes with the advantage of making the whole design simple and cost effective which can suit the need and the budget of the Indian market and also most of the smart phones come with built in Bluetooth hardware. The Bluetooth module will be attached to the Arduino which will be programmed to take input from the Bluetooth and pass it to the servo motor. Arduino Uno will be controlled by an Android app custom designed for the purpose of serving as a key to the lock we are providing. The app has a login page where username and password is a must deciding the real owner of the virtual key. With the advancement in smart phone technology, android smart phones are getting cheaper and cheaper for everyone to afford it. The app has two pages, one with a login page and the other which is used to lock or unlock the door bolt. The overall cost of the smart lock is less than Rs.1000. The idea of not carrying a key is also a promising idea.

1.1 Components and Total Cost:

The main components for the product are Arduino Uno Board (Rs.340), Bluetooth Module HC 05 (Rs.250), Servo Motor SG90 9g (Rs.180), a set of male female wires, a paper clip, a power source and an Android App. The total cost of the whole setup is Rs.770. Future upgrades in the app will see premium users with subscriptions.

1.2 System Overview

The system is fixed right beside the bolt on the door and is controlled using the Android app. It does not need the conventional circuiting consisting of switches and wires. The whole system can be powered via rechargeable battery thus not needing to worry about opening the door during power cuts. The Bluetooth wireless connection makes it possible to control the door lock from anywhere in the house and also at a certain range outside the house. Due to the lock being attached just to the Arduino board with servo motor and Bluetooth module, the app is the only way how the lock can be accessed, if tried manually, the function system may be disrupted. The power provided to the Arduino board must be within 2.5 to 5V. Thus in no circumstance will there be a fire outbreak. To use the smart lock all a user needs to do is open the app on their phone, login using their Username and Password, then connect the Bluetooth device and once paired they can use the lock-unlock buttons. The android app will search for the Bluetooth connection and pair with the device, once done it will show "connected". To disconnect just turn off the Bluetooth option on the smart phone. The battery must be changed/charged from time to time. The portability of the phone and the range of the Bluetooth helps handicapped, hospitalized and old people to access the door without having to move around.

2. HARDWARE DESIGN

Fig 1 show cases the connection of the components with the Arduino Uno. In this segment we will deal in detail about the hardware demonstrating the wiring and the setup of the smart lock system. For the microcontroller part, an Arduino Uno has been selected as it is based on ATmega328P. The board has 14 digital pins and 6 analog pins. It supports type B USB cable and can be powered by USB cable or external 9V battery. It is programmed using Arduino IDE. A Bluetooth HC 05 module is selected to connect with the Uno board since it is cheap, easily available and has a wide range. The other major part is Servo motor that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback.

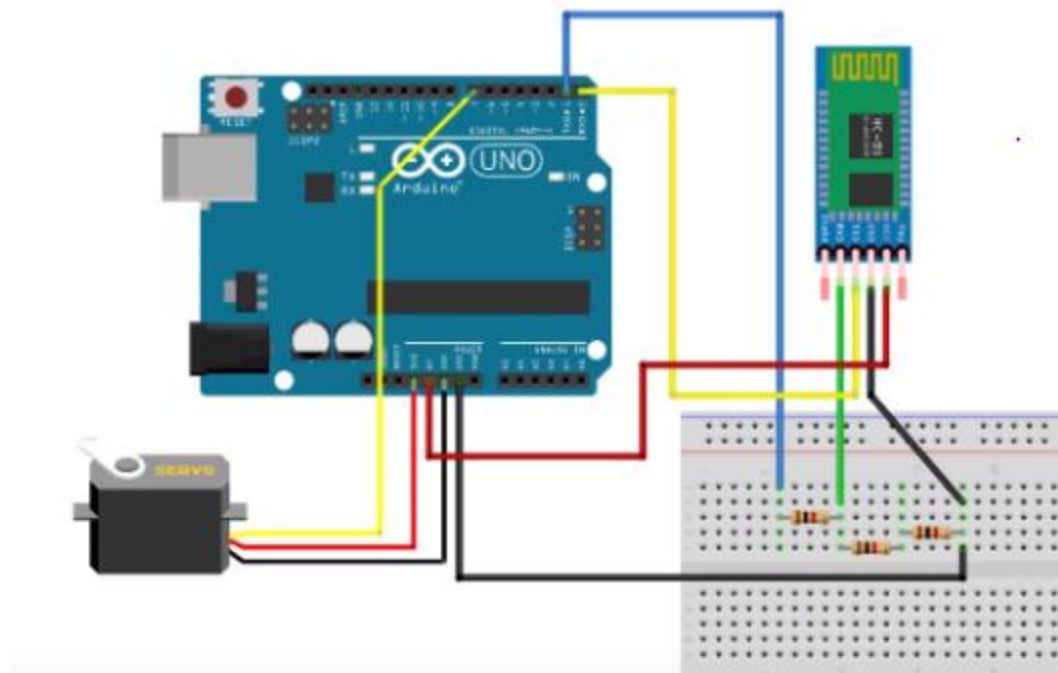


Fig -1: Circuit Design

Fig. 1 shows the use of bread board and resistors with the given circuit which can be excluded and is not a necessity.

2.1 Bluetooth HC 05 Module

Bluetooth HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module which can be used in a master or slave configuration having serial connection. By default the module is slave. The role of the module can be configured by AT Commands. The module works under 3.3 to 5V input/output. It auto connects to last device when powered. Uses pin code to pair with devices, thus maintaining uniqueness. The hardwired connection established can be seen in fig 2.

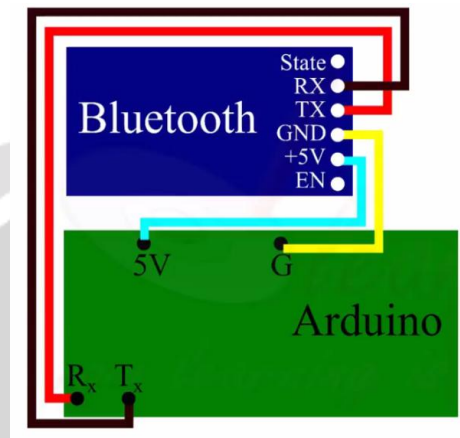


Fig -2: Bluetooth Connection

2.2 Servo 9g SG90

The Servo Motor has three wire connections. The brown wire goes to the ground pin in Arduino board. To control the input of the current, a red wire is attached to pin of 3V onto the board. At last the connection is wired to any of the command receiving pins, by default it is pin 9. It can also be changed to 10, 11 etc.

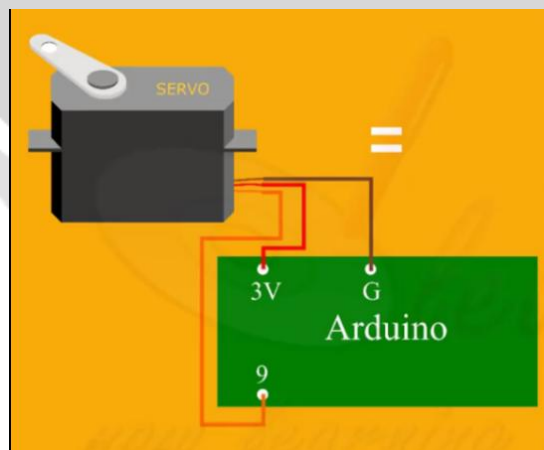


Fig -3: Servo Motor Connection

3. SOFTWARE DESIGN

Software design section will explain about the design flow of the software and the app. Since the whole idea behind this smart lock is not carrying an extra key and not walking up to the door to open it. We have an app which opens the door. The app is designed using MIT App Inventor which helps to design easy quick apps and gives a boost to

ideas like these. Fig -4 starts with opening the app in the smart phone and going to the login page. The login page will ask for user name and password. Upon entering the correct details, the next screen will let the user pick the Bluetooth connection and once connection is established, locking and unlocking the door is done.

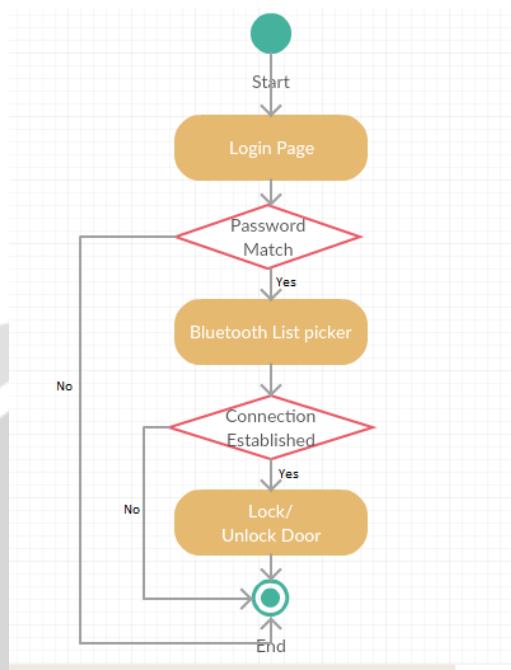


Fig -4: Software Activity Diagram

3.1 Android App

Fig. 5 shows two images of app screens for the users. The app has been designed in Android version 2.3 (Gingerbread) so that higher android version are compatible with the app. The app has been tested on Moto G2 android version 6.0 (Marshmallow). The less number of screens will avoid complexity among all users specially old people and also give the app a better response time.

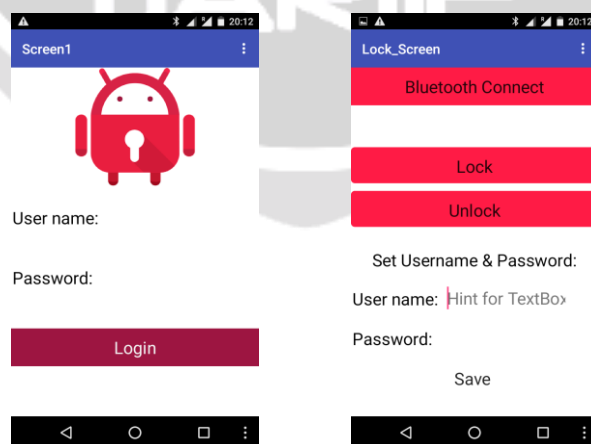


Fig -5: App screens

Once the user logs in using the username and password, the “Bluetooth connect” will help you choose the Bluetooth connection form the list of options and once connected, it will notify the user in the label. Then the user can use the

two buttons to lock and unlock the door accordingly. There is an option to reset the username and password in the second screen and click save. Once saved, the save button turns green.

4. CONCLUSION

In conclusion, the smart lock is cheap system designed to make the lives of old and handicapped people easier. The remote control feature using the android app and Bluetooth connection makes it convenient for the users not to leave their current work and attend the gate. In order for the lock to be used at all times, it is powered by both a battery and also a continuous current flow of the house. The smart lock is directly installed beside the door bolt which makes it an easy installation system.

The GUI of the app makes sure that only the user can operate the door lock via password lock/unlock and the color change of the buttons indicate which button is active and which button is not. This will help the elderly to remember if the door is locked or unlocked. For future work, a small camera will be installed outside the gate which can send live footage to the app thus for the elderly to determine if to open the door or not. A speech recognition feature can also be installed which will let the user not use their hands but voice to control the door lock.

5. REFERENCES

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