

Smart Door Lock System

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Abstract—Home automation can impact our life on a daily basis in a positive way by making our life easier and secure. A computerized, intelligent system of electronic devices, designed to monitor and control. A growing number of systems have always been a helping hand for handicaps. In this paper, we propose a smart door lock system for homes. How life can get easier by just a simple click on our smart phone? The key aim of this system is to enhance our life by providing safe and secure system and also gives ability to people with disabilities. Technically, our proposed system is a remote access control door system wherein an image of a person standing at the front door gets captured by a camera installed at the door and this image is sent to a mobile application which is accessed by the user present inside the house. The user receives the image on a mobile application via Bluetooth and thus can lock/unlock the door accordingly. This product supports keyless entry which adds a big measure to security by providing a sense of protection and is more convenient.

Index Terms—Door Lock, Camera, Mobile Application, Bluetooth, keyless entry

I. INTRODUCTION

Home automation is an apparent field that has attracted the commercial markets. Although wired home systems were popular during the early developments of home automation systems but now the scenario has changed and wired system is replaced by the wireless communication. Smart door lock is a circuitry designed to control and monitor doorway. Our smart door lock system operates over Bluetooth network. Bluetooth module plays an essential role in our product as it provides the path for communications. It can communicate over a range of 100 meters. Camera module which is trendy nowadays is used to capture pictures of the person standing

outside the door [1]. The captured photo is sent to the user's smart phone via Bluetooth. Our product implements a memoryless system i.e. it doesn't store the images. It also compatible with society, offices, exits, hotels, etc. Smart door lock makes our lifestyle more comfortable and our home smart. It changes user experience by holding digital keys. Now our own mobile phones are digital key to take a door step inside our house. A family may have N members which makes difficult for each member to carry a set of keys along with them. This issue will be solved using smart locks as it can possess N number of installations in different mobiles. Each one of us wants to cherish our families and provide an ease life to them. Using smart lock, they can easily access the door without any efforts.

II. WORKING

In this circuit, we have taken Atmega328p as the backbone of our system. We have used bluetooth module and 5V solenoid latch which are connected to the output port of Atmega for controlling action. The Bluetooth Module is mainly used for sending photos and commands of locking/unlocking. Hence, acting as a communication bridge between microcontroller i.e. Atmega328p and the mobile. The doorway is monitored by camera module OV7670. This module is activated when the doorbell is pressed and the photo clicked by the camera is displayed on the application created by us. This application will first authenticate the user's credentials and then give the option of unlocking/locking the door. For security purposes every time the person presses unlock, a passcode is asked

which is a set value for each lock and given during installation to owner only. If the user grants the access then the door(solenoidal latch) is unlocked and if the user denies access then the door remains locked.

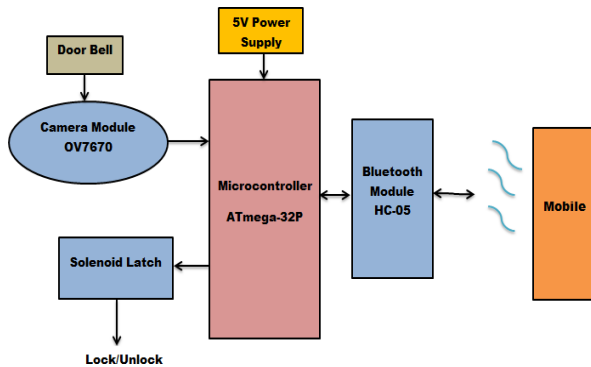


Fig. 1. Block Diagram

The working of smart door lock can be divided into three parts:

- **Control module:** Android Mobile
- **Communication module:** Bluetooth Module HC-05
- **I/O module:** Camera Module (OV7670) as input and Solenoid latch as output

A. Control Module

In our system, the control actions are carried out by a mobile application. Here the user takes the decision for locking and unlocking the door. Also, the microcontroller IC ATmega processes all the control actions. It unlocks the latch only when the user sends the right passcode after pressing unlock.

B. Communication module

Bluetooth module is used as a serial communication mode which is programmed with 9600 baud rate [2]. It operates on 2.4 GHz ISM band frequency with a speed of 2.1 Mbps. HC-05 module consumes 3.3V power supply which is supplied by ATmega. The TX (3) pin of ATmega is connected to RX pin of HC-05, whereas RX (2) pin of ATmega is connected to TX pin of HC-05 as shown in Fig. 2

C. I/O Module

Camera module plays the role of input to the microcontroller, whereas doorbells trigger the OV7670

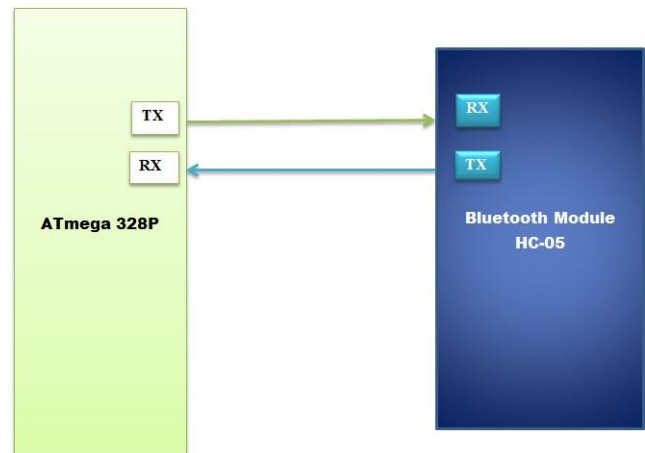


Fig. 2. HC-05 Interfacing with ATmega328P

module to take a snapshot and send it to the user's phone [3]. The 5V solenoid latch behaves as a door lock to our system. When the high signal is received at pin 13 of ATmega the door is unlocked. During active low signal the door is locked. Hence solenoid latch works as output module to our system. Figure.2 shows the interfacing of camera module OV7670 with ATmega328P.

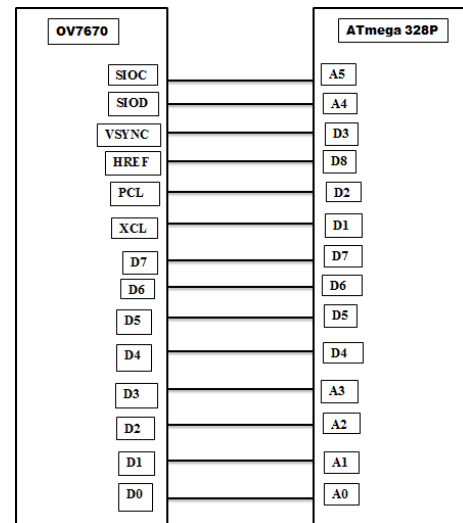


Fig. 3. OV7670 Interfacing with ATmega328P

The process flow for the systems is shown in Fig.4

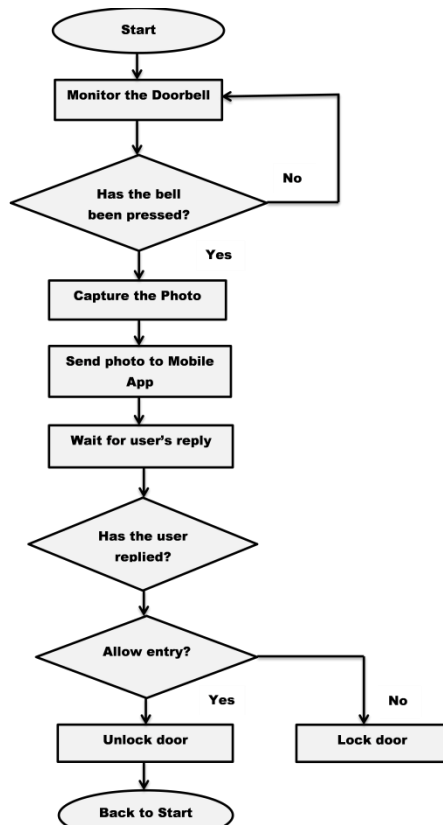


Fig. 4. Flowchart

III. METHODOLOGY

Bluetooth protocol is used for security purposes as it provides authentication and encryption. Also, it is easy to interface with Atmega328P as it uses SSP (Serial Port Protocol). It communicates at data mode Baud rate 9600, Serial communication (USART) and is TTL compatible. HC-05 follows IEEE 802.15.1 standardized protocol. The main functions of the Android app are granting access and viewing live feed through the application. Once the system has set the lock to the bluetooth device, the next step is authentication procedure by the system. The owner uses this Android application by using his username and password. So the system verifies the word which is usually the unique identity of the that has been set for each lock. Live feed is nothing but an image which can be sent within a fraction of seconds. The circuit design was constructed using

eagle software. The implementation of PCB layout had also been done in eagle software.

IV. RESULT

The circuit implemented works on 9600, bits per second, along with 8 data bits and 1 stop bit. SMPS is used to power PCB circuit, 5V DC supply. Testing was done to examine connectivity between mobile application and Bluetooth module HC-05. Further the performance of unlocking/locking of door was tested by the movement of solenoid latch which draws 5V from microcontroller. The user can lock/unlock door if the distance between the mobile application and door is within 100m. Analysis was done for both indoor and outdoor cases.

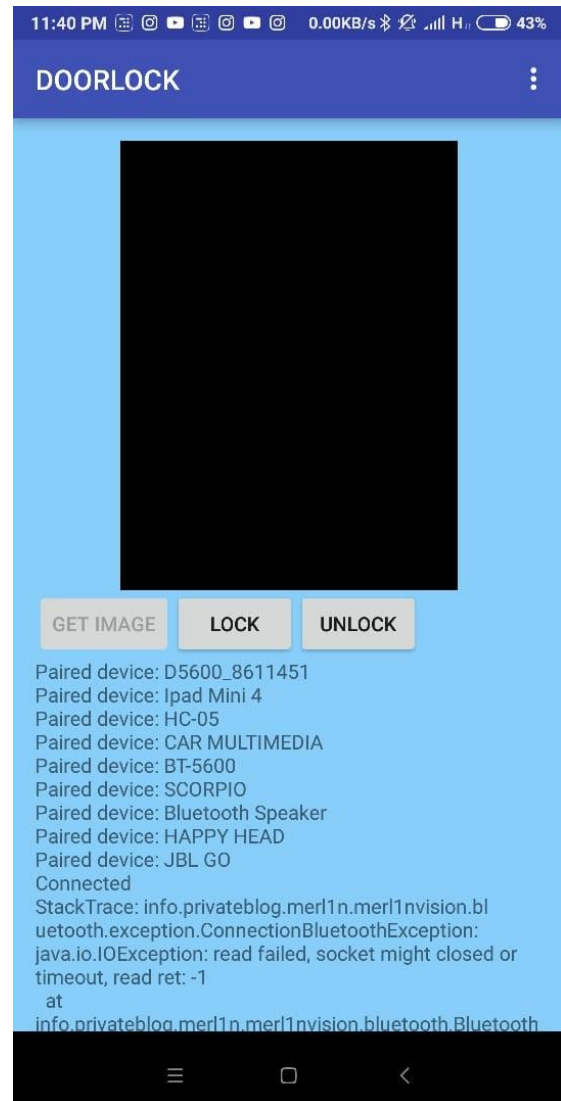


Fig. 5. Mobile App Testing

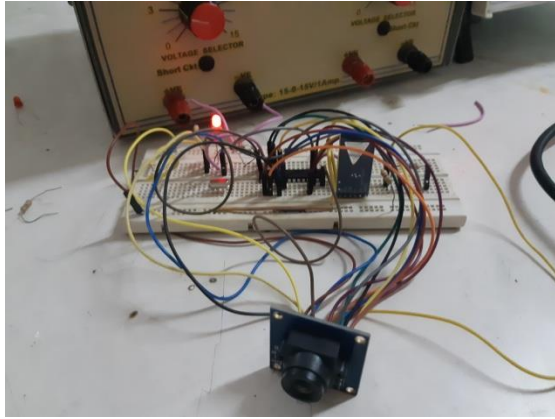


Fig. 6. Breadboard Testing


V. CONCLUSION

Thus we have created a Smart Digital Lock System with the help of various codes and technologies of android, using Bluetooth application etc. for the detection of person in front of door and automated opening of locks. This paper describes home automated system which we have created which allows the users to remotely access the door and lock or unlock it. Our demonstrated system has the capacity for monitoring and controlling door lock. It is user friendly product, flexible, compatible, simple and cheap. The product makes life convenient for all, especially for the elderly and disabled people [5].

VI. ACKNOWLEDGMENT

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