COMSATS University, Islamabad Pakistan

Arduino Based Remote Door Lock/Unlock Mechanism

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A project presented to

COMSATS University, Islamabad

In partial fulfillment

of the requirement for the degree of

Bachelors of Science in Computer Engineering (2019-2022)

By

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DECLARATION

We hereby declare that this software, neither whole nor as a part has been copied out from any source. It is further declared that we have developed this software and accompanied report entirely on the basis of our personal efforts. If any part of this project is proved to be copied out from any source or found to be reproduction of some other, we will stand by the consequences. No Portion of the work presented has been submitted of any application for any other degree or qualification of this or any other university or institute of learning.

Hamza Khan

Inamullah Khan

CERTIFICATE OF APPROVAL

It is to certify that the final year project of BS (CS) “Project title” was developed by **Hamza Khan (CIIT/FA19-BCE-075/ISB)** and **Inamullah Khan (CIIT/SP09-BCE-083/ISB)** under the supervision of “Ms Zahida Waliyat” that in her opinion; it is fully adequate, in scope and quality for the degree of Bachelors of Science in Computer Sciences / Software Engineering.

Supervisor

Executive Summary

The goals of this project were to build a modern, easy-to-use, smart door lock that allows for accessible unlocking and adds convenience, utility, and security to your home.allows users to open their door remotely via the accompanying Smart Lock remote. We start by evaluating the need for such a system by sending a survey and analyzing the results. We follow the Software Development Life Cycle to set the project objectives and implement the design. The paper presents a simple design and implementation of a remote control door. The system was made up of two major components, including an on-board logical unit, and a IR remote. It enables the user to control the door using a remote from approximately 10 meters away. The Arduino UNO is responsible for controlling a servo motor, and an actuator. Users can open the door by tapping the button on the remote from range in radius. The remote transmits a tone using an infrared light-emitting diode. This tone is decoded by a receiver since the receiver only switches when the tone is received. The system was broken down into simpler functional blocks namely; infra-red transmitter, infra-red sensor, signal amplifier, control logic, sampler, control stepper, output control logic, load and display unit.

Acknowledgement

All praise is to Almighty Allah who bestowed upon us a minute portion of His boundless knowledge by virtue of which we were able to accomplish this challenging task.

We are greatly indebted to our project supervisor Ms Zahida Waliyat. Without their personal supervision, advice and valuable guidance, completion of this project would have been doubtful. We are grateful to them for their encouragement and continual help during this work.

And we are also thankful to our parents and family who have been a constant source of encouragement for us and brought us with the values of honesty & hard work.

Hamza Khan

Inamullah Khan

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Introduction:

The main goal of this project was to design and build a door lock system that allows users to unlock a door via remote. This project is based on the Keyes IR Sensor, a remote controller, and Arduino Uno. Controlling a door wirelessly is a kind of project that every beginner loves to work on. Once you learn how to make a remote access door lock, then you can control anything wirelessly using any IR remote. A remote control door opener system is an access control system that allows only authorized persons to access a restricted area, this system is best suitable for co-operating offices and home security.

Problem and Solution:

The elderly, deaf, blind or handicapped people faces problem in opening and closing the door in their house as they have to walk to the door to do so. This project is designed to solve the problem faced by such people. Traditionally, a normal Lock and key are used to lock the door and gate. Our Arduino based door lock/unlock project, we can overcome this problem by replacing the traditional method with remote controlled. The remote control along with all the other components attached to the door lock allows the door to be locked/unlocked from a certain distance without the need to go closer to it. Our project makes the unauthorized access to houses, hotels, rooms, etc. more difficult therefore decreasing the risks of security. In order to unlock the door, the user just have to press a button on the remote unlike the traditional method where the individual has to walk to the door to unlock it. People who carry great amount of shopping, grocery, etc. to home can also benefit from this system as they can easily unlock the door while carrying all the items.

Methodology:

V- model means Verification and Validation model. Requirements begin the life cycle model just like the waterfall model. But, in this model before development is started, a system plan is created. The test plan focuses on meeting the functionality specified in the requirements gathering. The high-level design (HLD) phase focuses on system architecture and design. The low-level design (LLD) phase is where the actual components are designed. It defines the actual logic for each and every component of the system. Each step ensures that the developers are ready for the next one and the approach tries to minimize the development time by having predefined expectations for each step. By following this process, the developers ensure that their finished product actually meets and addresses the needs of their users.

Requirements Phase:

Q: What is the most common nuisance of all the traditional door lock systems?
A: As a User, I want to lock/unlock the door remotely so that I don't have to move to lock/unlock the door.
.
Q: Does disable people have problems with locking and unlocking traditional doors?
A: Yes, in fact it will be a lot easier, if we can control other things with the remote as well.

The above answer indicated that smart locks are useful. They, as well, other remote control stuff are becoming a trends nowadays.
During analysis, developers aim to produce a model of the system that is correct, complete, consistent, and unambiguous. The system will unlock and lock the door with the help of remote. There will be two buttons on the remote, one for unlocking and another for locking the door. In case of pressing both button, the command will be ignored. There is a small electronic unit that is fixed at the door entry to control the door mechanism, when the pin is energized it will drive the motor in a clockwise direction for the door to close and anti-clockwise direction for the door to be open. It is developed for a system to enable users to use only a customized remote to open doors at restricted zones. The remote will have

specific for that door and the door cannot be unlocked with any other IR remote.
The remote for the specific door will not be able to work for other doors of same type for security purpose. There would not be any duplicate lock or remote for any door lock system. For remote to works the person should be in range and have the correct remote. Any obstacle that blocks the IR rays should not be in between or around. The standard lock design will be used along with electronic unit, inside the door. The lock and electronic unit will be separate modules. It , also, will be separate module as whole that can be fit into any door.

Hardware Specifications:

Main Controller:

The ATmega328 is a single-chip microcontroller created by Atmel in the megaAVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8-bit RISC processor core. Evaluation boards are available for the ATMEGA328, with the most practical option being the Arduino Uno. Programmed via a standard USB connector, the Uno integrates the ATMEGA328 onto a board with I/O headers to provide an easy-to-use platform for programming the ATMEGA328. The on-board microcontroller includes a bootloader for enabling programming over UART. Library support for the Arduino Uno is arguably one of the largest available.

Sensor System:

An infrared receiver, or IR receiver, is hardware that sends information from an infrared remote control to another device by receiving and decoding signals. In general, the receiver outputs a code to uniquely identify the infrared signal that it receives. This code is then used in order to convert signals from the remote control into a format that can be understood by the other device. It is the part of a device that receives infrared commands from a remote control.

Luckylight offers many of the most common types categorized by supply voltage, carrier frequency, transmission distance, packaging type and supply current. The most common sizes for carrier frequency are 36kHz, 38kHz and 40kHz. Luckylight also offers infrared receivers with carrier frequency up to 56kHz. The transmission distance can range from 8m to 30m.

Infrared receivers are used in a variety of applications including Air Conditioners, Fans, Heaters, TVs, DVDs, Set-top boxes, Computers and peripherals, Industrial automation, Remote control toys, Communications Equipment, Photographic Equipment, business machines, Automotive electronics, lighting and other fields.

Motion Control:

A **servo motor** is a type of motor that can rotate with great precision. Normally this type of motor consists of a control circuit that provides feedback on the current position of the motor shaft, this feedback allows the servo motors to rotate with great precision. If you want to rotate an object at some

specific angles or distance, then you use a servo motor. It is just made up of a simple motor which runs through a **servo mechanism**. Apart from these major classifications, there are many other types of servo motors based on the type of gear arrangement and operating characteristics. A servo motor usually comes with a gear arrangement that allows us to get a very high torque servo motor in small and lightweight packages. Due to these features, they are being used in many applications like toy car, RC helicopters and planes, Robotics, etc.

Design Models:

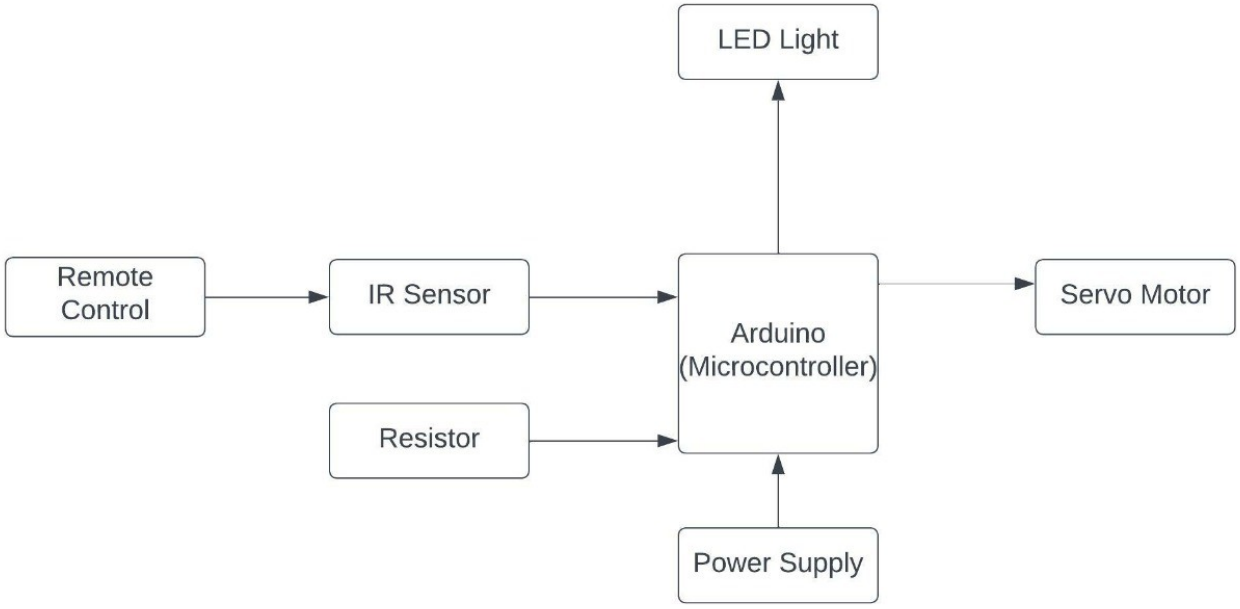

Fig: Design Model

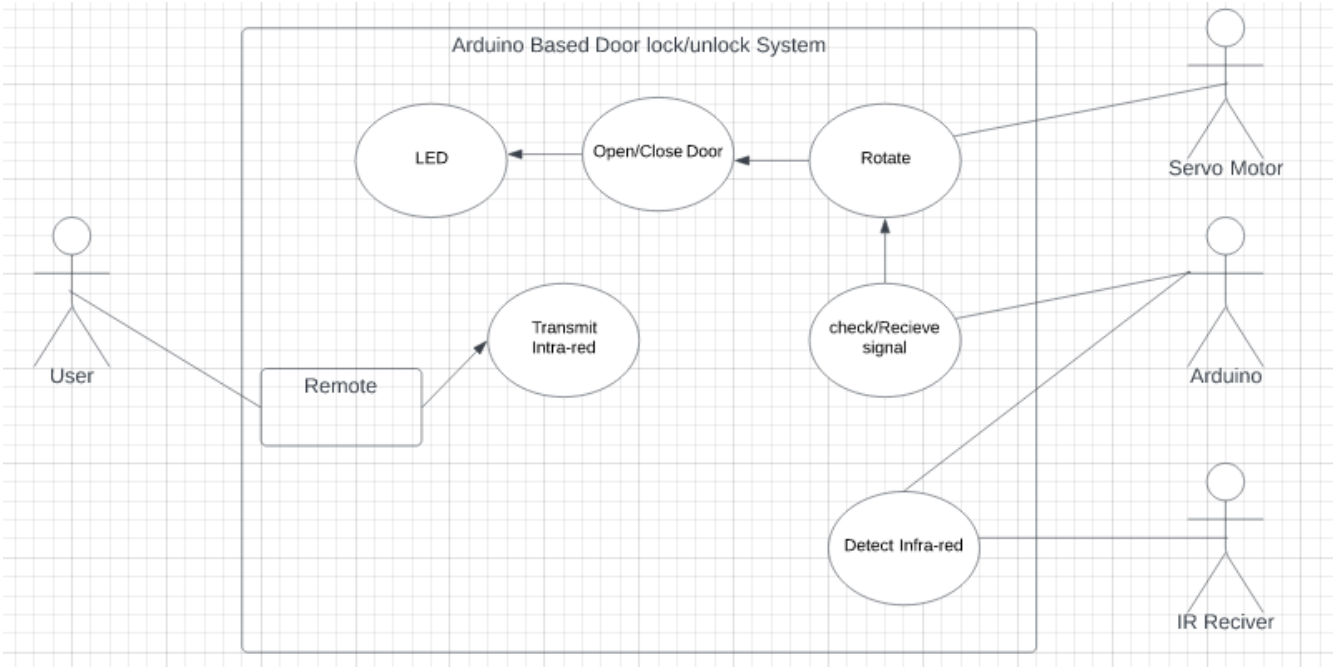

Fig: Use Case Diagram

Hardware Interface:

	Pinout	**Function**
IR Reciver	5V	Connected to 5v of Arduino
	11	Connected to DAT pin of IR sensor. It takes the output signal generated from the sensor.
	GND	Connected to Gnd
Servo Motor	5V	Connected to 5v of Arduino
	9	Connected to PWM pin of the servo motor. Sends signal to the motor when unlocking the door.
	GND	Connected to Gnd
LED	13	Sends output signal to the LED on detecting the signal from IR sensor.
	GND	Connected to Gnd
Arduino	GND	Provides common ground pole to all the components.
	5V	Provides 5V to IR sensor and the servo motor

Implementation:

The Arduino is interfaced to the IR receiver and servo motor along with LED. Now the Arduino start sensing through the IR receiver and checks for any infrared signals. If it receives any then according to the received signal it closes or, opens the door. If the signal is not the required one then it is simply ignored. When the received signal is appropriate, the Arduino sends signal to the Servo motor to rotate

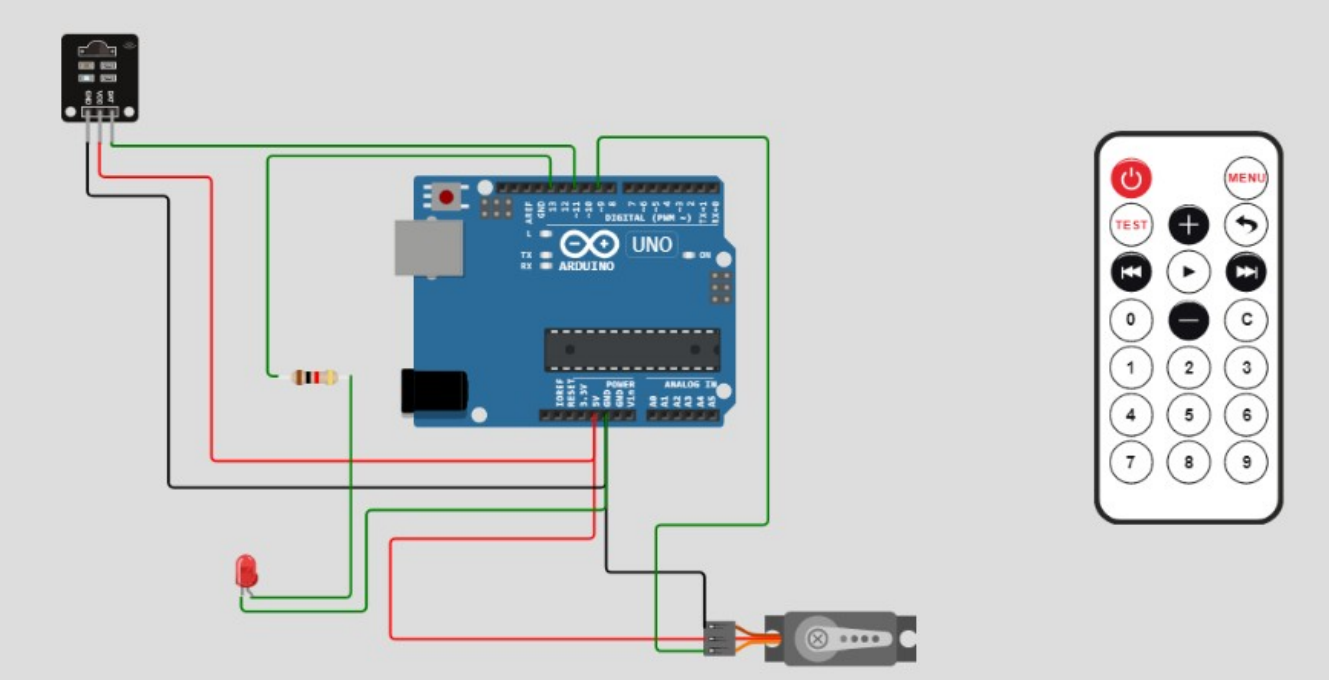

Fig: Circuit for the system

it and ,open or close the door. When the open button is pressed on IR remote the motor moves clockwise, while on close button it moves counter-clockwise. The IR remote button transmits specific bits through infra-red which are captured by IR receiver. Changing the code for which the door works we can create different remotes or codes for different doors. Thus, making it more secure. The Led is an indicator as to whether the door is close or open.

Testing:

Testing Case 1: Normal Open/Close-ing Door

Objective: Ensure porper lock/unlock-ing door.

No.	Test case/Test script	Attribute and value	Expected result	Result
1	Check which button clicked(Assume Closed button)	IR button Pressed	If door open and then closed the door. If door closed then ignore.	Pass
2	Check which button clicked(Assume open button)	IR button Pressed	If door closed then open the door. If door open then ignore.	Pass

3	Other than Open/Close button pressed	IR button Pressed	Ignore	Pass

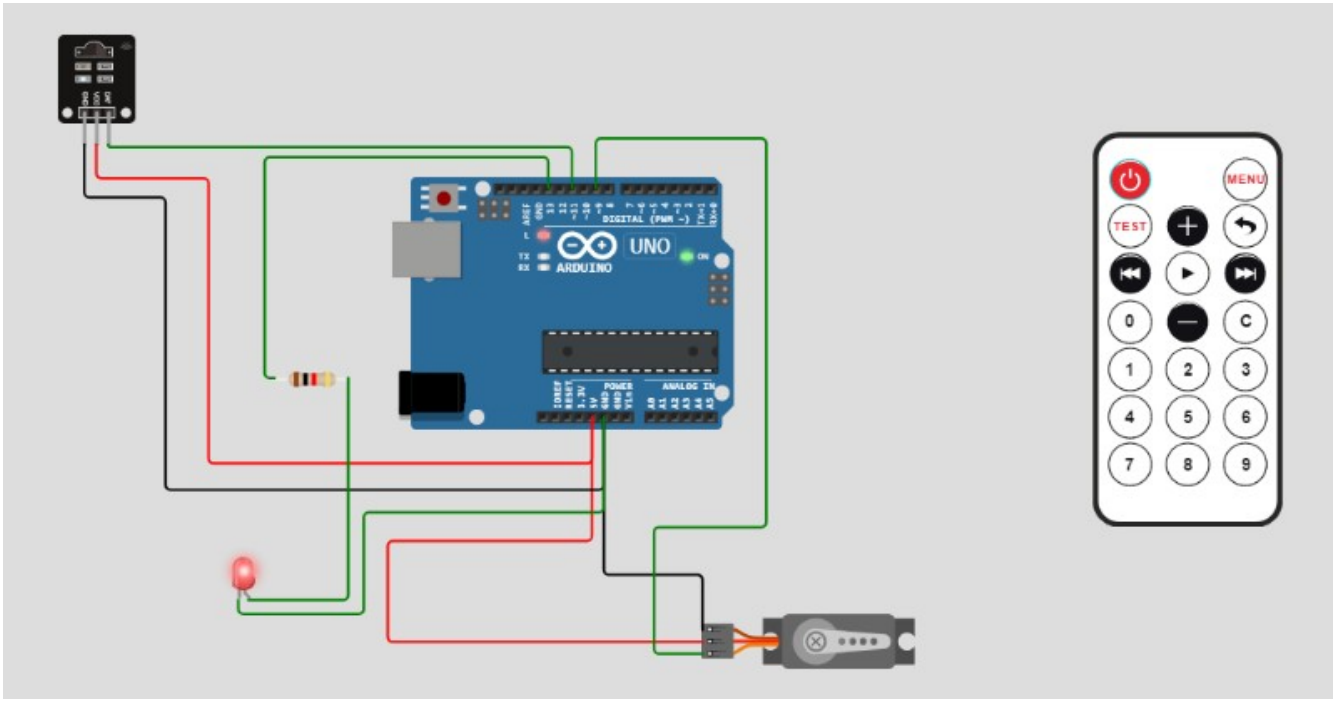

Fig : Closed Door State

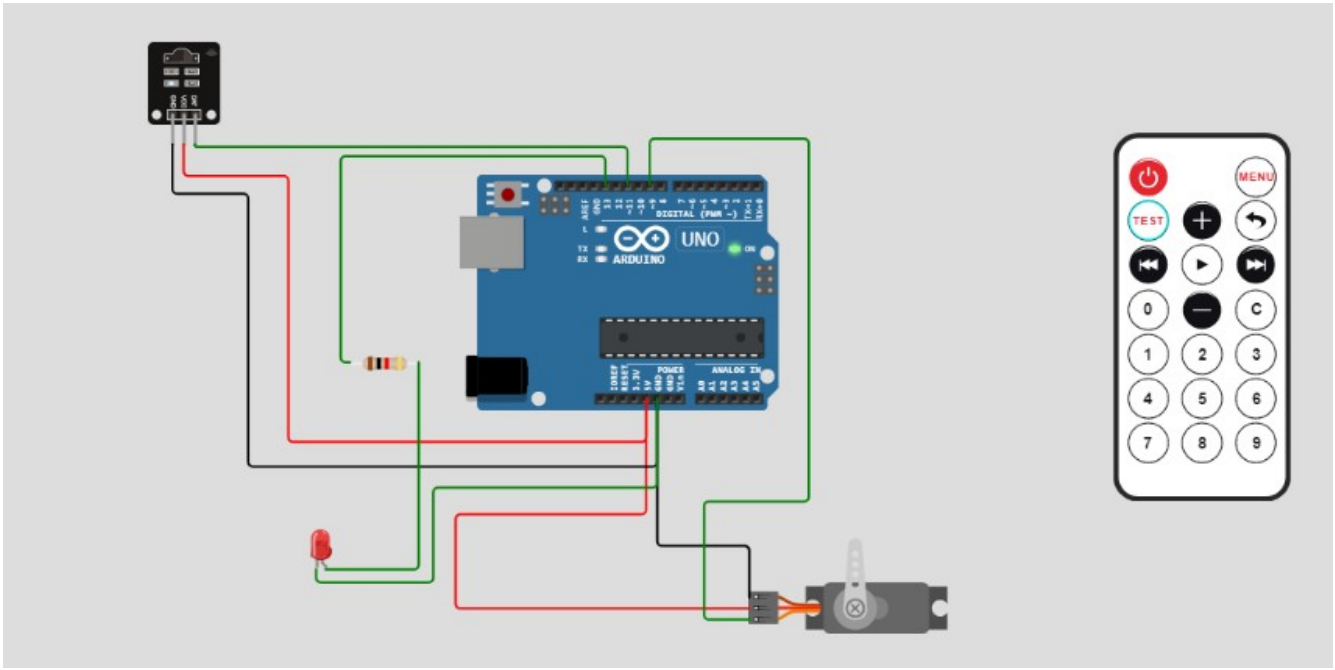

Fig : Open Door State

Testing Case 2: Pressing both button Simultaneously

Objective: Ensure door work correctly with simultaneous clicking of button.

No.	Test case/Test script	Attribute and value	Expected result	Result
1	Check which button clicked First(Assume Closed button)	IR button Pressed	If door open and then closed the door. If door closed then ignore.	Pass
2	Check which button clicked First(Assume open button)	IR button Pressed	If door closed then open the door. If door open then ignore.	Pass

Conclusion:

In this designed project, we made IR sensor based Electronic door locks systems using Arduino microcontroller. In this system we lock the unlock the door using remote control. This project makes the unauthorized access to houses, hotels, rooms, etc. more difficult thereby, decreasing the security risks.

This project helps the disabled or elderly people in locking/unlocking the door again and again without the need to physically approach the door. This helps to easily control the door lock from anywhere inside the house using a remote control. In future, the main purpose will be on replacing the remote controlled system with the concept of Internet of Things (IoT) so that the door can be controlled from any part of the world. The other field of focus will be on the idea of home automation in which controlling of home appliances and windows will be added on the same device. This system can also be modified to automobiles. Therefore, we can conclude a good future for this prototype.

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