

# Automatic Garage Door and Smart Lighting System

*Sree Rama Murthy Maturi*<sup>1\*</sup>, *Madhurya Lahari Bodicherla*<sup>2</sup>, and *Sreya Paidiseti*<sup>2</sup>

<sup>1</sup>Department of AIMLE, GRIET, Hyderabad, Telangana, India

<sup>2</sup>UG Student, Department of CSBS, GRIET, Hyderabad, Telangana, India

**Abstract.** The inconvenience of manually opening your garage door, driving your car out, and then closing the door while you are in a rush is what our application aims to solve. By interacting with an IoT network, smart garage doors may control your garage door using the power of your smartphone. Additionally, it does away with the trouble of physically locking the door. This will also provide intelligent notifications for enhanced monitoring, are some of the system's remarks. The goal of this project is to design and build a low-cost system that monitors garage doors and transmits their status to a receiver unit located in a convenient location inside the user's home. This allows the user to monitor their garage doors from the comfort of their own home, rather than having to go outside and inspect the garage. The receiver unit includes a screen for displaying system information as well as LEDs for viewing the status of the garage door from a distance. The system has enough range to place the receiver anywhere in the house while providing accurate garage door status. By designing and building this, we hope to increase home security.

## 1 Introduction

The internet of Things (IoT) is all about the networking of their physical objects and their architecture. IoT is based on the advanced levels that can be useful for future use, as of now IoT is being used in the applications of “machine learning” & “artificial intelligence”. The applications of IoT is represented in the following section.

1. Smart city IoT application is designed to provide improved and better-living conditions. With the growth in technology and population, IoT will play a major role in managing the city and population. Many services such as energy-saving lights, weather reporting systems, and streetlights will be embedded with IoT solutions for sustainable and cost-effective reasons.
2. Home automation has seen rapid growth in recent times. Consumers have been provided with services like lightning control for their homes, voice-based controlling, smart air quality adjustment, AI experience, and smart locks with the IoT enabled in homes.
3. The biggest reason people are attracted to smart home technology is because of security features. For example, with the help of a simple IoT device, the lights of the house can

---

\* Corresponding author: [sreerama1613@grietcollege.com](mailto:sreerama1613@grietcollege.com)

- be monitored when on vacation; this function will keep the intruders away. Webcams can be installed with the help of this application to monitor the home; the major advantage here is one can control the connected devices remotely using a web interface or just simple mobile applications.
4. Business Analytics: IoT devices embedded in machines generate a large amount of data that is being used by BI (Business Intelligence tools) such as Power BI to generate useful insights and predict future outcomes. With the help of business analytics tools, the data generated from IoT are used to study customer behaviour to increase customer satisfaction rates and provide a better customer experience. In the near future, BI tools will be embedded within things such as wearable health monitoring systems, which can make instant decisions based on the current data. Data recorded from the user's behaviour and everyday habits will give better opportunities for the caretakers and hospitals to tackle any sickness in advance.
  5. Advantages: The Internet of things facilitates several advantages in day-to-day life in the business sector. Some of its benefits are given below:
  6. Efficient resource utilization: If we know the functionality and the way that each device works, we definitely increase the efficient resource utilization as well as monitor natural resources.
  7. Minimize human effort: As the devices of IoT interact and communicate with each other and do a lot of tasks for us, then they minimize the human effort.
  8. Save time: As it reduces the human effort then it definitely saves time. Time is the primary factor which can save through the IoT platform.
  9. Enhance Data Collection.
  10. Improve security: Now, if we have a system where all these things are interconnected then we can make the system more secure and efficient.

## **2 Proposed method**

### **2.1 Garage parking assistant**

Garage parking sensors using addressable RGB LEDs to provide feedback to vehicle drivers as they approach and reach stop position are presented. Here the construction is around a piece of 1/2" diameter by 20-7/16" long acrylic half-round material that it had on hand and intended to use as a lens that also holds dovetail parts together. It also includes a model of a lens that can be printed in sections using clear filament and is easily obtained online for roughly 0.66 per foot. Prepare a WS2812b LED strip (a 1 meter long strip with 30 independently controllable RGB Smart Pixel LEDs). Cut the strip into two (2) 15 LED segments, then at the start of each segment, solder leads onto the segment. Arrows on the strip point "AWAY" from the location of the leads. Assemble each length of rail. LED strip leads should be fed into the casing from either side and taped in place. Keep in mind that LED strips will cease at approximately 1/2 "from each end of an outside rail to lock all dovetails into position, slide Lens into each end of the case all the way. There must be four printed lenses for each side if using them. They are meant to connect the dovetail regions.

A backer board should be used to mount the assembly with end caps. Fix the assembly with teeny pan head or flat-head screws. Connect the electronics. Keep in mind where the capacitor is. To stop supply-related voltage spikes, a capacitor is required. In order to prevent voltage back feed in the case that the USB is inserted without the power supply turned on, a resistor is used on the signal wire (pin 7) for the LEDs and a diode is used on the Arduino (V+). Without the diode, Arduino will attempt to power LEDs, which will draw too much current from the on-board voltage regulator. Heat shrink tubing is used to cover the soldered resistor and diode that are placed in line with the wiring. To feed wires from the power source, the case needs to be drilled from the outside near the bottom under the Arduino. Since the size will depend on the type of wire used.

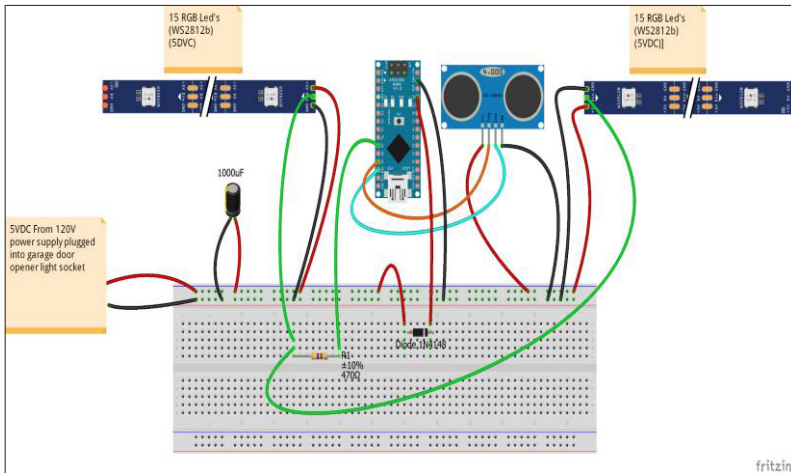


**Fig. 1.** Connection to IoT system.

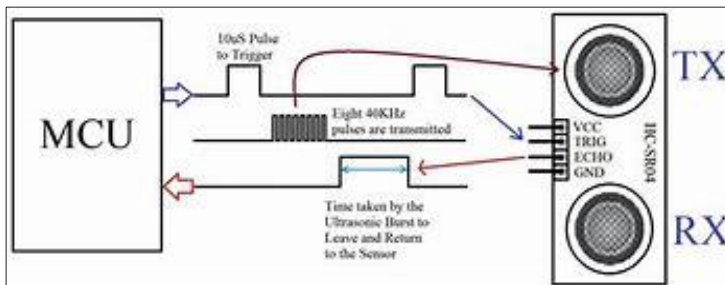
Complete the wire connections to the Arduino and secure it with a 2.5mm screw. The holddown ends project into the case's square holes. To make installation simpler, I removed the outermost pins on Arduino (which were not in use). Ultrasonic detector (HC-SR02) can be fastened to a cover using 2.5mm screws. Complete soldering of sensor connections. NOTE: When installing, make sure wires point toward the center of the sensor to prevent interference with the sidewall. Use the code below to programme an Arduino. Before compiling your software, add "Fast LED" and "Quick Stats" to your IDE libraries. Note: Modify the parameters for "start distance" (the point at which the sensor first detects the approach of a vehicle) and "stop distance" (final park spot of vehicle). Start and stop parameters must fall between the 3 cm to 400 cm range of the sensor. Install a lamp socket adapter with an outlet on the garage door opener. Run your 5VDC power supply's line to the light bar unit and plug it into that. Only from the time the door opens until the door light expires will the light bar be on. As a result, the light bar won't be on constantly.

## 2.2 HC-SR04 pinout

- VCC: gives the HC-SR04 ultrasonic sensor power. It can be connected to your Arduino's 5V output.
- TRIG: To start ultrasonic sound pulses, a pin is used. The sensor starts an ultrasonic burst by holding this pin HIGH for 10 s.
- GND: The ground pin is it. Attach it to the Arduino's ground.
- ECHO: When an ultrasonic burst is broadcast, the pin goes high. It stays high until the sensor gets an echo, at which point it becomes low. The distance can be determined by counting the number of seconds the Echo pin remains up.



**Fig. 2.** Wiring diagram.



**Fig. 3.** HC-SR04 pinout.

The majority of modern homes have garages where people may park their cars or keep their goods. When we are rushing, we frequently forget to lock the door. In the modern world, this puts homeowners in danger from theft and vandalism of their possessions. A home burglar can always enter the house easily through an open garage. The idea behind our technology is to keep the garage door closed at all times to protect the home and its contents. In our technologically advanced society, new innovations are being developed constantly. These new developments in IoT communications-based initiatives result from a continually expanding network that works to share and acquire knowledge.

## 2.3 Modules

### 2.3.1 Smart door and parking assistant

A vehicle entrance detail is gathered at this position using an ultrasonic sensor. An alert is sent to the owner's phone when a car is spotted close to the garage door. The owner inspects, then opens the carport entrance. This smart garage system has security features in addition to being a system for garages. A notification is delivered to the owner's phone when a new car is found, informing them that a stranger may be present.

### 2.3.2 Mobile application and smart lightning

Users were informed via the application's notifications whether the garage door was open or closed. The app functions as a remote to operate the garage door. Brilliant lighting will likewise be introduced in the carport. The lights turn on and off by themselves.

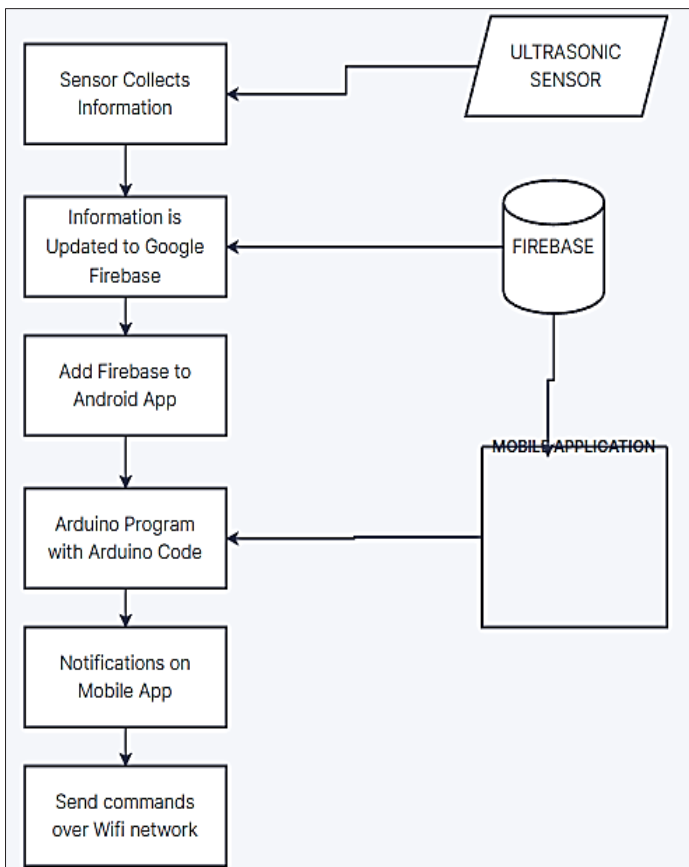
### 2.3.3 Unique features

- 1) Works as a security system as well
- 2) Can grant access to Guest cars as well
- 3) Price point

### 2.3.4 Sensors

The Ultrasonic Sensor HC-SR04 is a distance-measuring sensor. It sends out an ultrasound at 40 000 Hz (40kHz) that moves through the air and bounces back to the module if it encounters anything in its path. The distance can be calculated with this.

## 2.4 Architecture diagram



**Fig. 4.** Architecture diagram.

### 3 Result and discussions

#### 3.1 Module 1: Collection of data using sensors

The HC-SR04 Ultrasonic Distance Sensor is a sensor that uses sonar to determine how far away an object is. It is perfect for any robotics project that calls for you to steer clear of objects because it can do so by determining how close they are. The HC-SR04 ultrasonic sensor has four pins: the Vcc pin, the Trigger pin, the Echo pin, and the Ground pin. This sensor measures the exact distance between the sensor and the target. This sensor's main field of interest is sound waves.

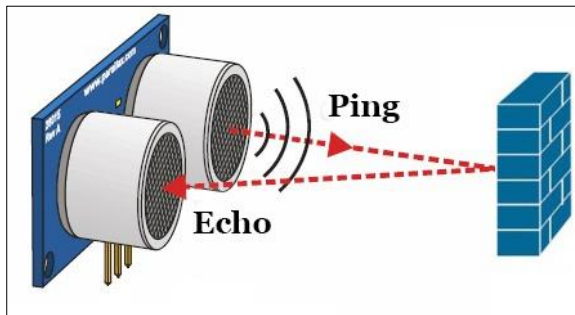


Fig. 5. Implementation of module-1.

#### 3.2 Module 2: information updation in Google Firebase and Kodular

Google uses Firebase as their mobile development platform. helps you develop apps and grow your user base. used by those who create client-side applications. utilized to build a brand-new mobile app, add functionality to an existing app, and expand the user base. It gives us the chance to learn about ourselves through the development of apps.

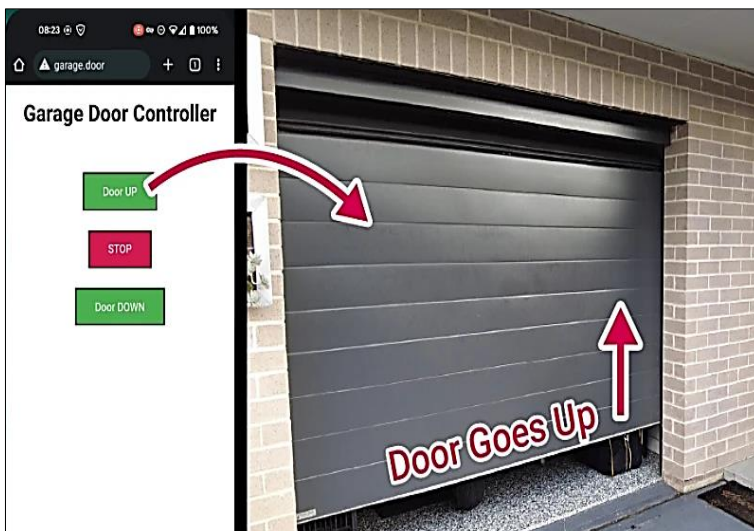
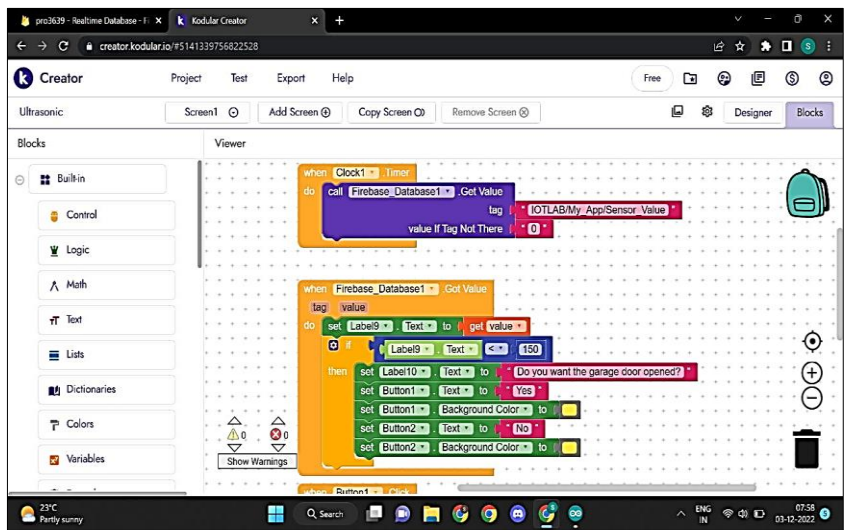
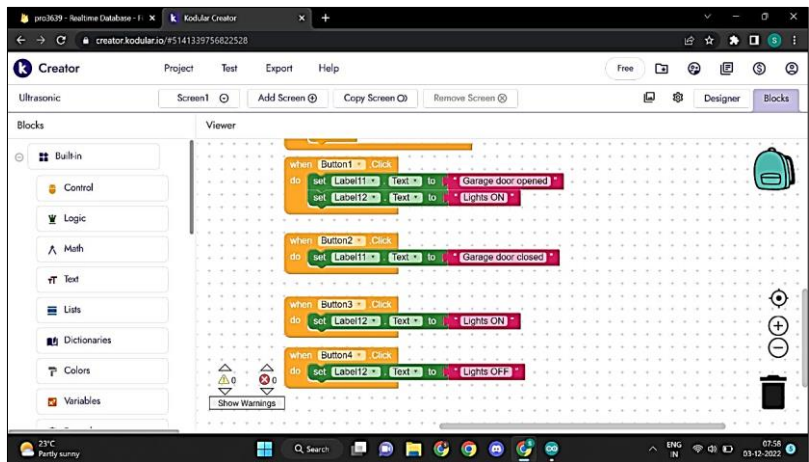


Fig. 6. Implementation of module 2.



**Fig. 7.** Kodular implementation 1.

It has statements and conditions that enable the ultrasonic sensor to determine whether anything is blocking the garage door. If it is clear, the door opens and shuts normally; if something is in the 20 cm-range defined, the door can open but not close. using the Arduino analogue pin standard code, they were designated as analogue pins. Digital pins serve to define the ultrasonic sensor. The motor driver receives digital signals as well. The code flow and the need for each component to function independently are taken into account when creating each algorithm. Each of the "if" phrases was followed by a conditional statement. The "if" statements were followed by one another, and if the condition did not apply, it moved on to the next sentence without checking the others. If none of the statements applied, it instructed the engine to remain off. then returns to the "while" loop.



**Fig. 8.** Kodular implementation 2.

Immediately after the garage door is opened, we give the command to turn on the lights. This also works on conditional statements where the lights are turned on and off only when you get to see the movement in the garage door. Once the vehicle leaves the garage the lights are automatically turned off.



Fig. 9. Working of Kodular application.

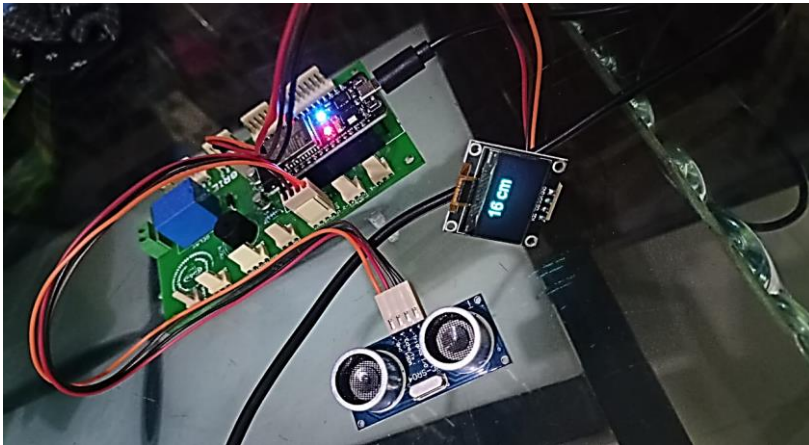
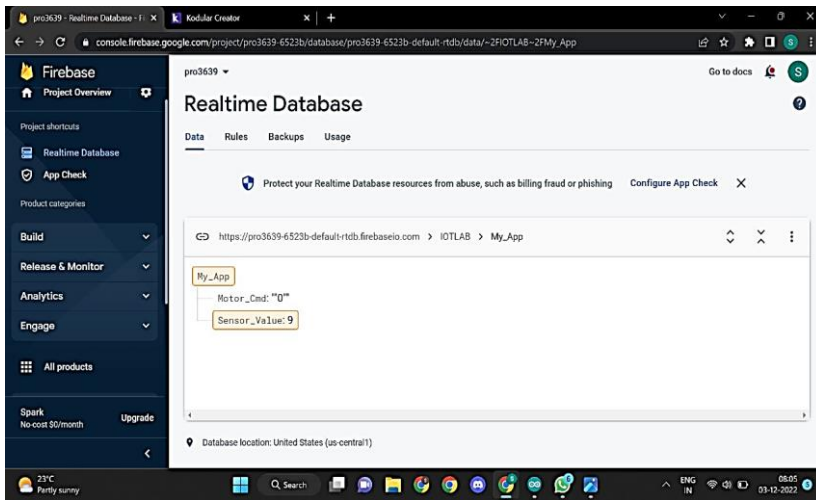


Fig. 10. Working of hardware.

## 4 Conclusion

Home automation has seen rapid growth in recent times. The biggest reason people are attracted to smart home technology is because of security features. With the help of business analytics tools, the data generated from IoT are used to study customer behavior to increase customer satisfaction rates and provide a better customer experience. Data recorded from the user's behavior and everyday habits will give better opportunities for the caretakers and hospitals to tackle any sickness in advance. Advantages : The Internet of things facilitates several advantages in day-to-day life in the business sector. Save time: As it reduces the human effort then it definitely saves time. As the IoT systems are interconnected and communicate over networks.





**Fig. 11.** Implementation and working of Firebase.

The majority of modern homes have garages where people may park their cars or keep their goods. When we are rushing, we frequently forget to lock the door. In the modern world, this puts homeowners in danger from theft and vandalism of their possessions. A home burglar can always enter the house easily through an open garage. The idea behind our technology is to keep the garage door closed at all times to protect the home and its contents. In our technologically advanced society, new innovations are being developed constantly. These new developments in IoT communications-based initiatives result from a continually expanding network that works to share and acquire knowledge.

## References

1. How IoT Works, Medium, 05-Jun-2018. <https://medium.com/@patelharshali136/>
2. Why is IoT taking over the Automation Industry, <https://www.hauper.com/blog/why-iot-is-taking-over-the-automation-industry/>
3. Major Disadvantages of IoT You Must Beware, <https://cyfuture.com/blog/3-major-disadvantages-of-iot-you-must-beware-of/>
4. ESP32 Pinout Reference - Last Minute Engineers, <https://lastminuteengineers.com/esp32-pinout-reference/>