Find Out When Someone Takes Your Stuff ~ IoT Home Security

Explore our IoT-based Intruder Detection System, a smart home security solution that utilizes the power of IoT technology to safeguard your home. The project integrates the Bolt Wi-Fi module, LDR sensor, and buzzer to detect potential intrusions in real-time. With seamless internet connectivity, the system sends SMS alerts and activates a loud buzzer to deter intruders and alert nearby individuals. Discover how this efficient hardware setup, combined with our Python code implementation, offers an effective and reliable solution for enhancing home security. Protect your home and loved ones with our innovative IoT intruder detection system.

IoT-based intruder detection system *(Cover Image)*

“The Guardian of Possessions”

Once upon a time, in a quiet neighborhood, lived a young and tech-savvy individual named Alex. Alex was passionate about electronics and programming, and they loved building projects that could make a positive impact on people’s lives. Inspired by recent incidents of theft in the area, Alex decided to create an innovative IoT Home Security system called “Find Out When Someone Takes Your Stuff.”

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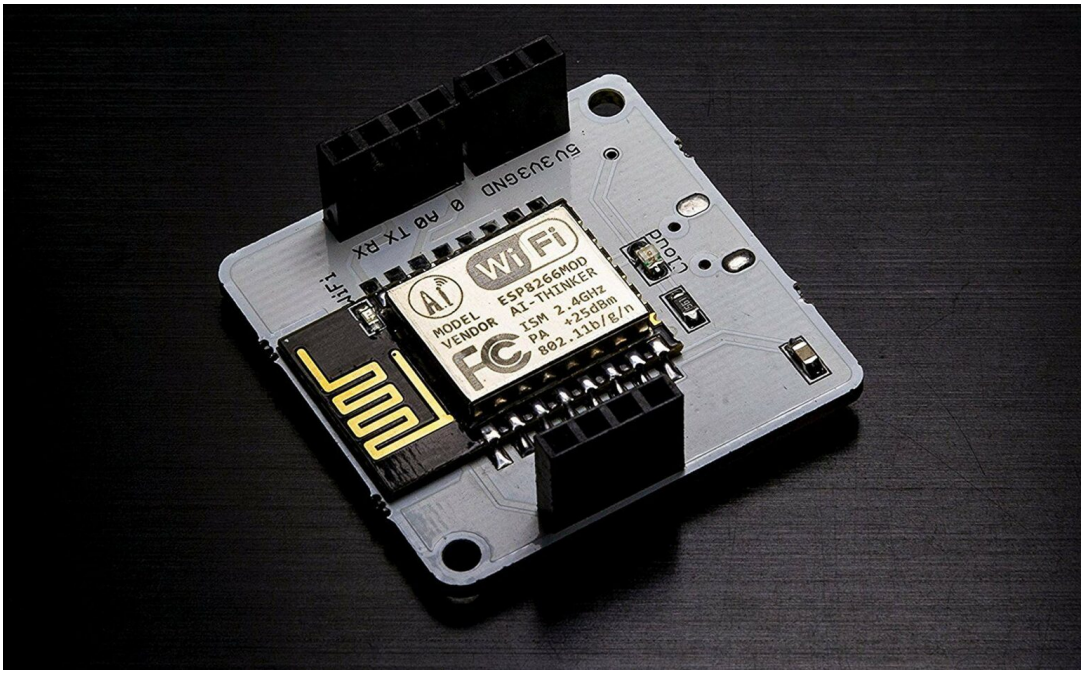
Things Used in This Project

Hardware Components

Bolt ESP8266 Module



Breadboard

Buzzer

LED (Light-Emitting Diode)

LDR (Light-Dependent Resistor)

Two 330-ohm Resistor

Jumper Wires

Software Apps and Online Services

Bolt Cloud

The Bolt IoT Platform is an accessible and user-friendly Internet of Things (IoT) platform designed for makers, hobbyists, and developers. It simplifies the process of creating IoT applications and prototypes by providing a hardware module, the Bolt Wi-Fi module, that connects to the Bolt Cloud backend. Through the cloud, users can remotely control and collect data from their IoT

devices, visualize the data in real-time using a web-based dashboard, and set up notifications and alerts based on specific events. Know more at https://cloud.boltiot.com/

Bolt IoT Android App

Bolt mobile app helps you set up and control your Bolt IoT devices from your Android phone. You can use the app to connect your devices to a Wi-Fi network, link them to your Bolt Cloud account, and monitor or control them remotely. You can also access the Bolt Cloud dashboard, where you can configure your devices, visualize the data, and deploy machine learning algorithms. To download the app visit https://play.google.com/store/apps/details?id=com.bolt.com.bolt&pli=1.

Twilio SMS Messaging API

Twilio is a cloud communications platform as a service company based in San Francisco, California. Twilio allows software developers to programmatically make and receive phone calls and send and receive text messages using its web service APIs. Know more at https://www.twilio.com/en-us

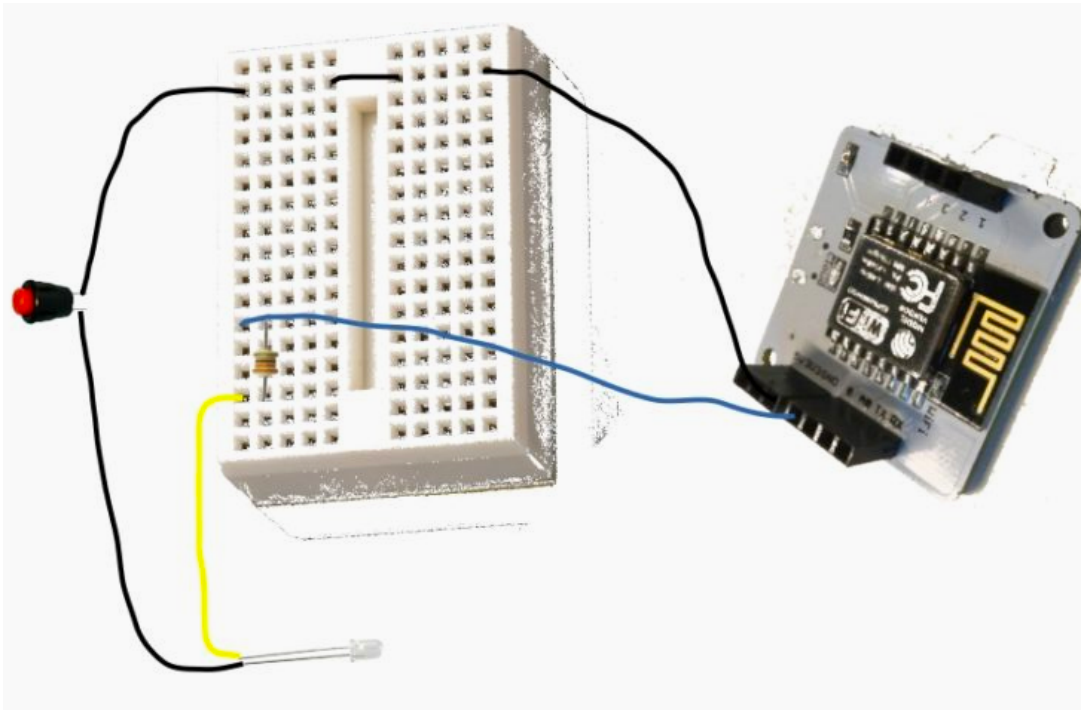
Description of Project

Alex's IoT Home Security System was designed to be an intelligent guardian, monitoring the safety of a home and its belongings. The project utilized a few sensors namely, connectivity modules, and a user-friendly interface to empower homeowners with real-time insights and peace of mind.

Assembling the Hardware Components for IoT Intruder Detection

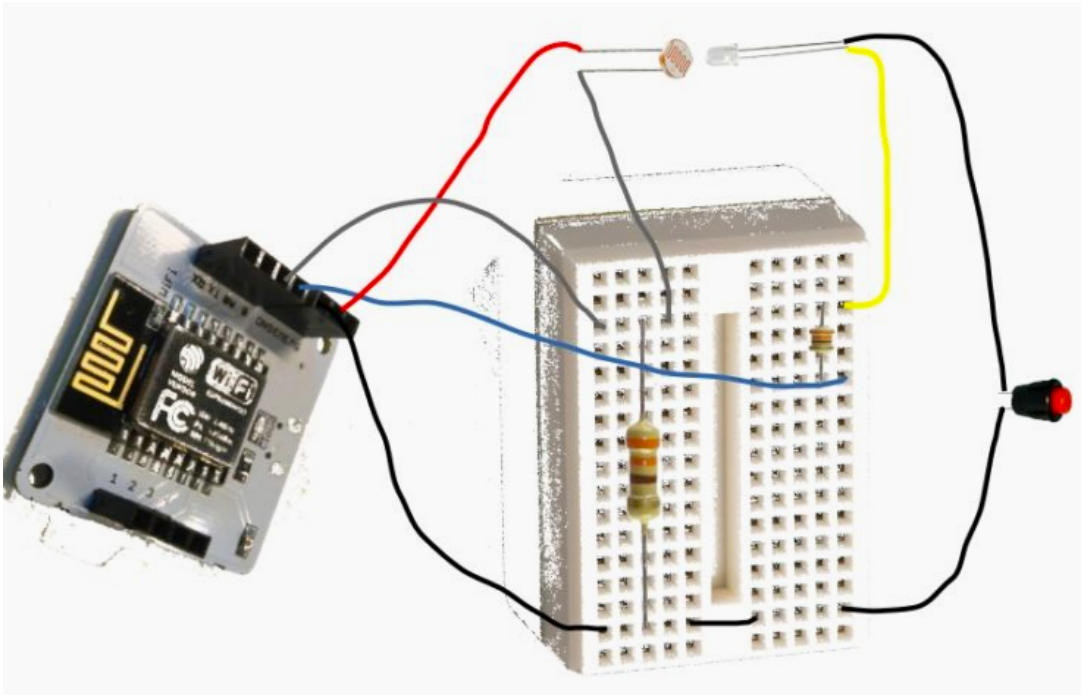
Step 1: Making LED Connection to Manipulate LDR Resistance

- Connect one end of 330-ohm resistor to a GPIO pin, 0 of Bolt Module.
- Another end of it to positive arm of LED.
- And extend its negative arm with a wire.
- The extended wire will connect the GND pin of Bolt Module when door is closed



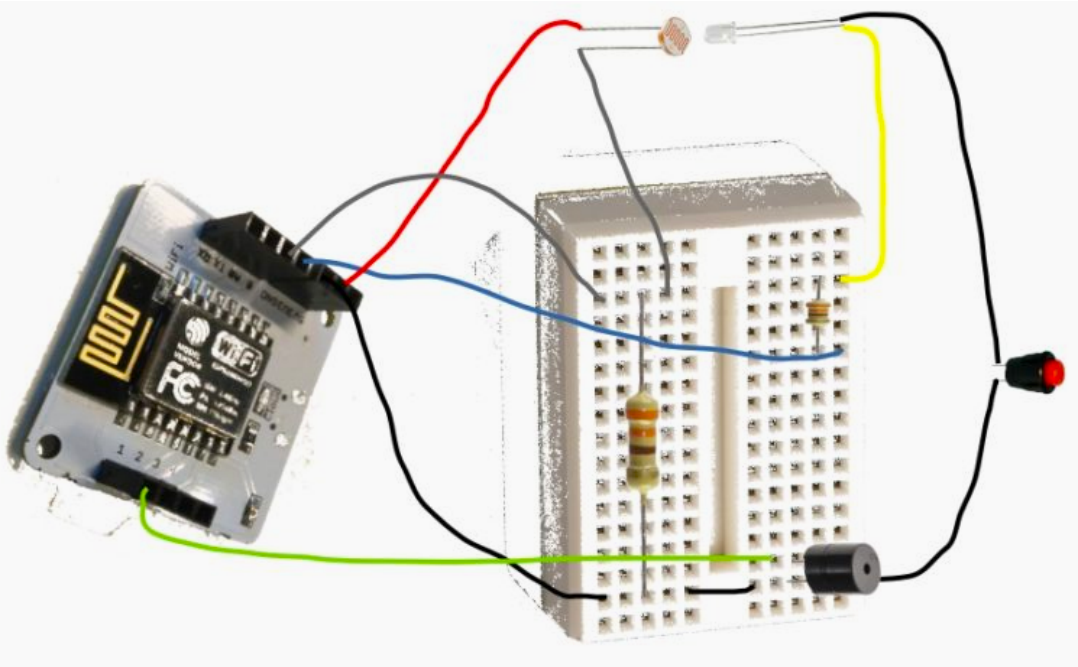
Step 2: Making LDR Connection to Notify Homeowner of Suspicious Event

- Connect one arm of LDR to the 3.3-volt supply pin of the microcontroller.
- And its another arm to analog pin, A0.
- Connect a 330-ohm resistor to the same A0 pin and its remaining end to GND pin of the bolt Wi-Fi module.



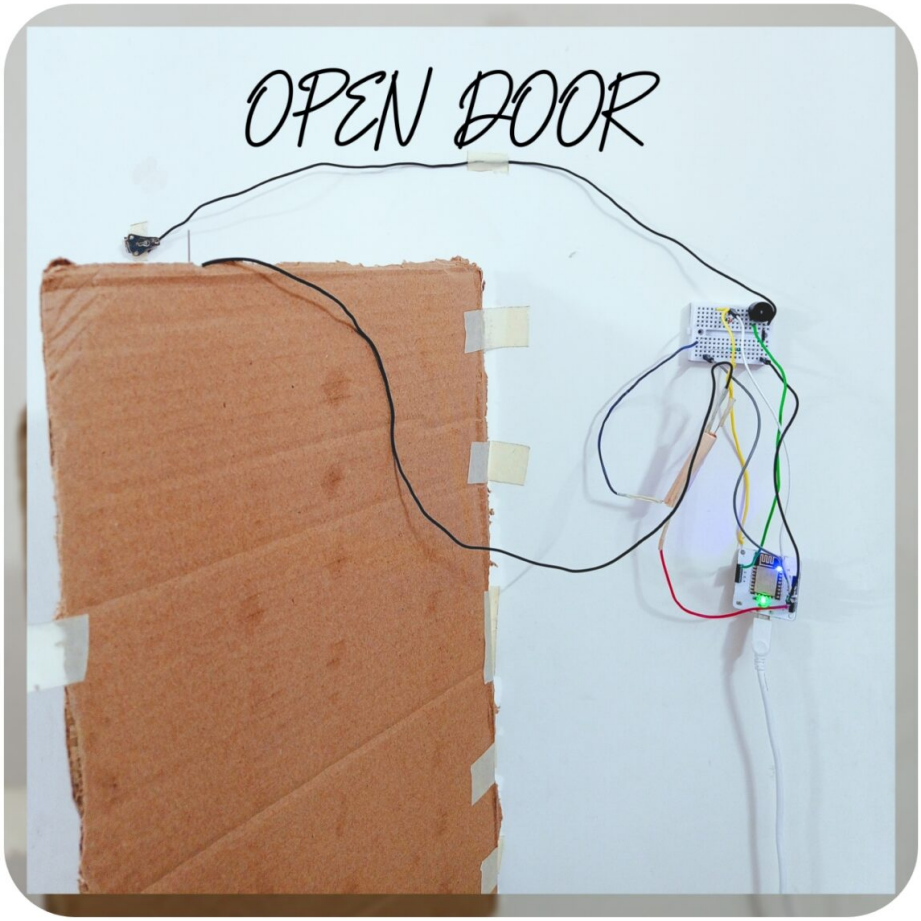
Step 3: Making Buzzer Connection to Deter Intruders

- Connect the positive pin of the buzzer to GPIO pin 1 of module.
- And its negative pin to GND.



Note: Make sure to cover the LDR from external light. This could be achieved by covering LED and LDR with some opaque things.

Complete Hardware Setup


OPEN DOOR


CLOSED DOOR

Implementing Intruder Detection System with IoT: Python Code Integration

The Python code is designed to detect potential intruders by monitoring sudden changes in light intensity using an LDR sensor. When an intrusion is detected, it alerts the house owner via SMS and activates a buzzer to draw attention to the situation.

I have divided the complete code in **few parts** for explaining purpose:

Part 1: Importing Libraries and Initializing Bolt Device

In this part of the code, the necessary libraries are imported, and the Bolt IoT device is initialized using the provided *device ID and API key*. This allows the code to communicate with the Bolt Cloud and interact with the connected hardware components.

Part 2: Sending SMS Alerts with Twilio

This section defines a function to send SMS alerts using the Twilio API. When a sudden change in light intensity (indicating potential intrusion) is detected, the code sends an alert message to the house owner's phone number using Twilio's service. This way, the owner can be notified of possible intruders in real-time. To be able to receive the SMS make sure to include the *Twilio account SID and authentication token, Twilio phone number and your phone number in the code.*

Part 3: Checking Device and LED Status

Two functions are defined here. The first function checks if the Bolt device is online, ensuring the system is operational. The second function checks the status of an LED connected to the Bolt device. *The LED serves as an* ***indicator for the script's execution status*** *and is used to validate that the code is functioning as intended.*

Part 4: Detecting Sudden Change in Light Intensity

This part of the code is responsible for detecting a sudden drop in voltage across the Light-Dependent Resistor (LDR) sensor, which indicates a potential intrusion. When a sudden change is detected, the code proceeds to alert the house owner through SMS and triggers the buzzer for 20 seconds to alert nearby people.

Part 5: Buzzer Activation

In this section, a function is defined to control the buzzer. When activated, the buzzer is turned on for 20 seconds, creating a loud sound to draw attention to the possible intrusion.

Part 6: Main Loop for Continuous Monitoring

The main loop continuously monitors the LED status to ensure the script's execution is initiated correctly. If the LED is on (indicating the script is running), it checks for sudden light intensity changes. If a sudden change is detected, it proceeds to send SMS alerts and activate the buzzer. The loop also checks the Bolt device status to ensure it is online and operational.

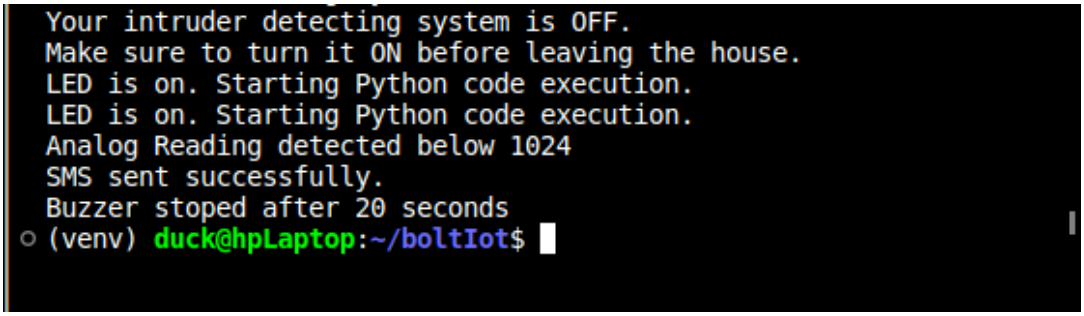
Complete Code

To access the complete Python code for the project, please click on the GitHub link provided below:

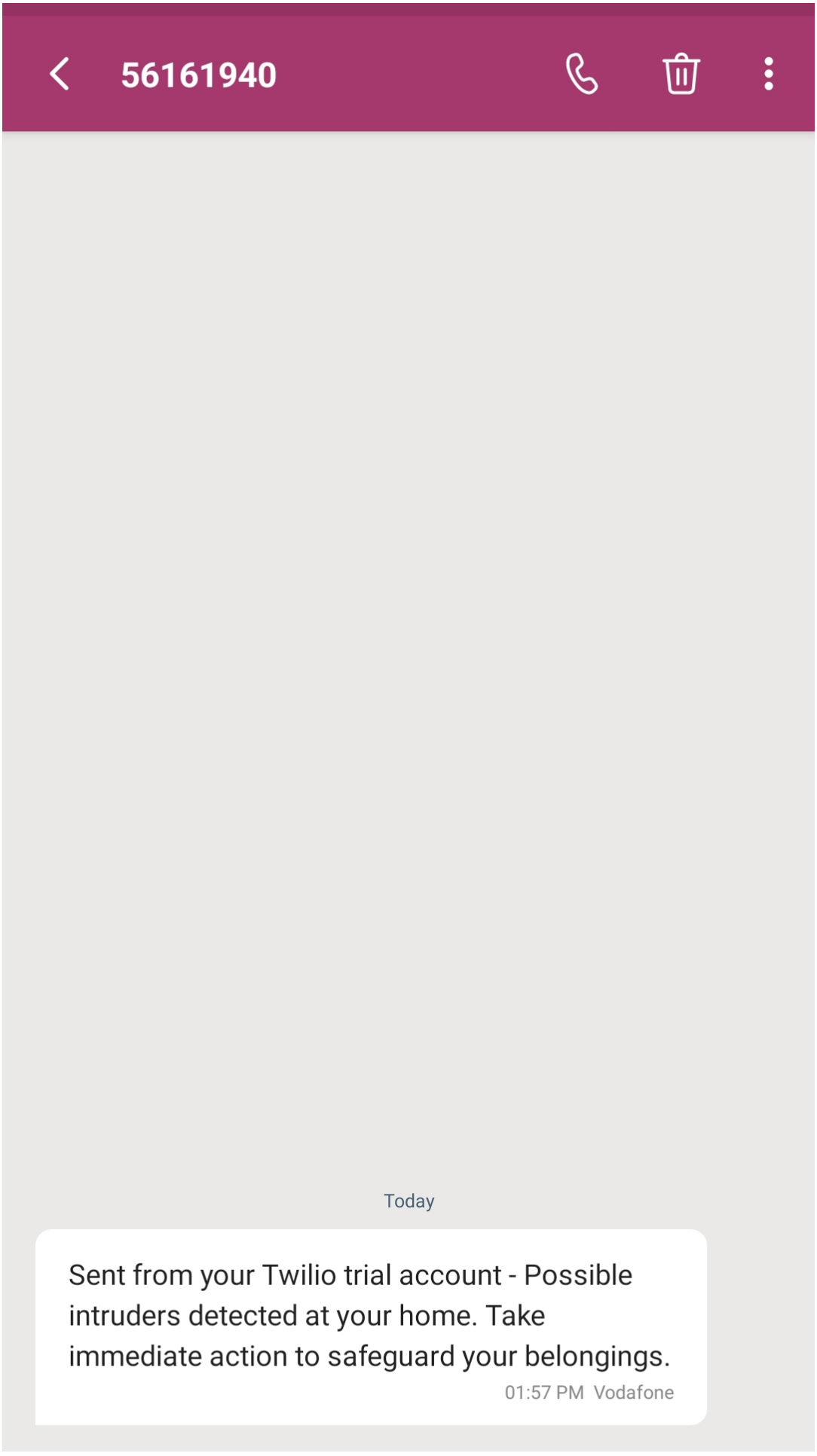
https://github.com/tah-seen/IoT-based-intruder-detection-system

In the Python code available at the provided GitHub repository, you will find the implementation of an IoT-based Intruder Detection System. The code utilizes the Bolt IoT Platform to establish communication with the connected hardware components and enable real-time monitoring and alerting.

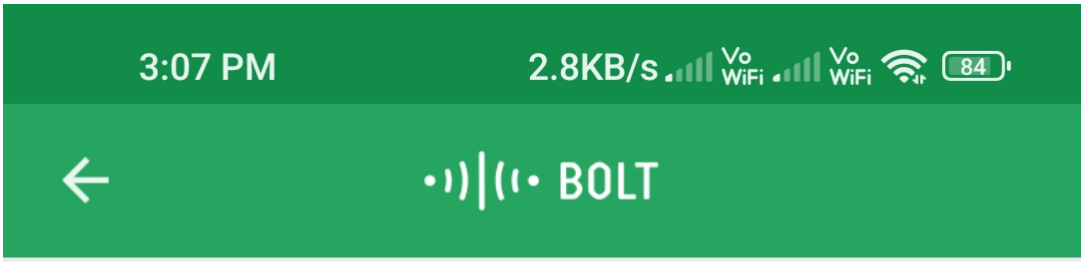
Code Output



Python output



Message via Twilio



Intruder Detection System

ON

OFF

It Basically turn on the LED, serving as an indicator for the script's execution status

How it Works

As the door opened, the door sensor triggered an event. This event broke the LED circuit placed strategically near the door, causing an interruption in the flow of electricity. Simultaneously, an LDR placed next to the LED circuit detected this change, as the voltage across the LDR changed abruptly due to the break in the circuit.

Alerting the Homeowner: Once the LDR detected the high voltage surge, indicating a possible intrusion, it instantly sent a signal to the Bolt ESP8266 Module. The module, acting as the smart brain, immediately activates a notification system. This includes sending an SMS notification to the homeowner using Twilio's API service and activating a buzzer to deter intruders and alert nearby individuals.

Demonstration

Conclusion

Alex's ingenious IoT Home Security system revolutionized the concept of home protection. As word spread, other neighborhoods sought his assistance, and soon, his creation became the **guardian of possessions** for countless homes.