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INDORE (M.P.)**



A Minor Project Report On

CONTACT-LESS DOORBELL WITH SMS NOTIFICATION

In Partial Fulfillment of the Degree of

BACHELOR OF TECHNOLOGY

In

ELECTRONICS & COMMUNICATION ENGINEERING

Submitted by-

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CERTIFICATE

This is certified that the Project entitled “**CONTACT-LESS DOORBELL WITH SMS NOTIFICATION**” is the record of bonafide work done by **ARPIT LAD (18010BTIOT04117)** under my guidance for the partial Fulfillment of the requirements for the award of the degree of **Bachelor of Technology in Electronics & Communication (IoT)**. To the best of my knowledge, this project is an original work done by the students in order to learn the fundamentals of engineering and design.

Date:-

(Internal Examiner)
Examiner)

Date:-

(External

ACKNOWLEDGEMENT

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ARPIT LAD (18010BTIOT04117)

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ABSTRACT

In today's world Internet of Things (IoT) plays an important role in automation at everyplace for everybody. This project refers to automation in home doorbell using IoT. Here we are using Infra-Red (IR) sensor for object detection. If someone arrives at your home, and comes in front of it object will be detected by the IR sensor and it will ring the bell so that owner will come to know that someone is at doorstep. In addition, if owner somehow didn't heard the bell then they will get an SMS notification using Twilio messaging services using Application Programming Interface (API) over Wi-Fi so that the owner will be alerted.

1. INTRODUCTION

1.1. BACKGROUND

In the current scenario, pandemic situation is going on and even though we cannot stop our visits to certain homes by emergency. As we arrive in front of a house, we generally look for the doorbell. But the doorbell button can cause the spread of virus. If a certain infected person touches the doorbell the virus stays on that button for some time and during that time if a non-infected person touches that doorbell then the virus will infect that person. By using contact-less doorbell we can reduce the risk of virus.

1.2. MOTIVATION

In the current situation, COVID-19 is spreading and we all are taking preventing measures to stop the spread of virus. Even though we cannot stop our visits to shopping malls, airports, our relatives house, shops, etc. Due to advancement in technology, certain things have developed.

For example: Whenever we visit shopping malls, airports touch-less doors are made to reduce the contact of persons with door, smart Hand Sanitizer dispenser is made so that people can take sanitizer just by placing their hands in front of the sensor which is contact-less.

By observing these things, I thought I should make a doorbell which would reduce the contact just by placing sensor with my doorbell and whenever any visitor will come in front of it, object will be detected and it will ring the bell plus there can be a feature that can notify owner visually via SMS. This is how I get motivated for making this project.

1.3. PROBLEM STATEMENT

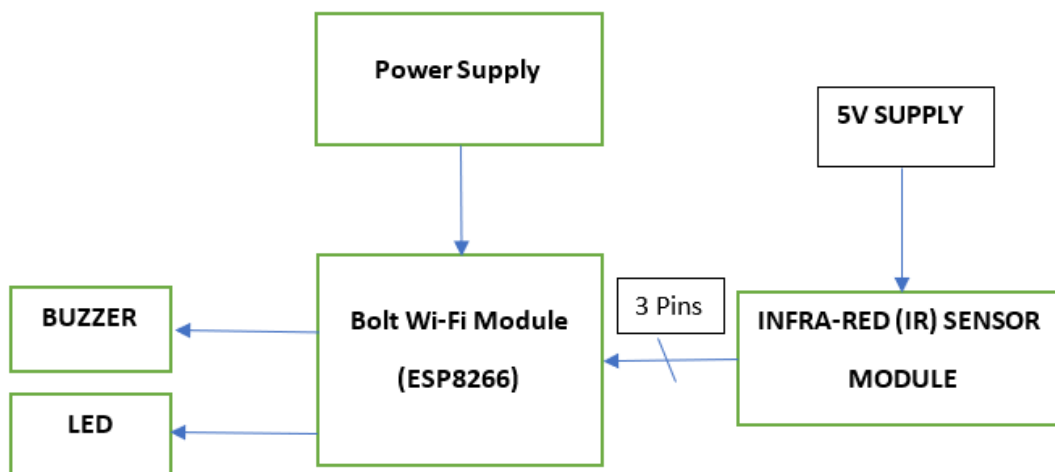
In the current scenario, covid-19 is going on and all of us are taking care of our hygiene. For important work we cannot stop our visits to some houses and when we reach, we generally look for doorbell which can cause the virus to spread. To reduce the effect of virus we should replace existing doorbell with contact-less doorbell. Otherwise, it will spread virus from person to person.

2. SYSTEM DESIGN AND IMPLEMENTATION

2.1.PROJECT OVERVIEW

In this project, contact-less doorbell is made using Bolt Wi-fi module. This is a touchless way in which we will ring the doorbell of the house. Here Infra-Red (IR) sensor is placed which detects the visitor as an object. A buzzer is placed for alerting the owner and an LED is placed for indication that object is detected. So, whenever any visitor will come in front of the sensor it will ring the bell. An additional service is also available that it can notify owner visually via SMS service with the help of an Twilio API (Application Programming Interface).

2.2. BLOCK DIAGRAM



2.3. WORKING PRINCIPLE

An IR sensor consists of an IR LED and IR Photodiode; together they are called as Photo-Coupler or Opto-Coupler. The visitor has to come in front of the infra-red sensor. The infra-red sensor transmits an infra-red signal, this infra-red signal bounces from the surface of the visitor and the signal is received at the infra-red receiver. Based on the intensity of the reception by the IR receiver, the output of the sensor is defined

or in other words, we can say that visitor is detected. Then, it will then send an SMS to the owner of the house along with buzzer notification. LED is used for the visitor that object is detected.

2.3.1. HARDWARE DETAILS

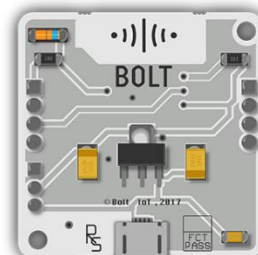
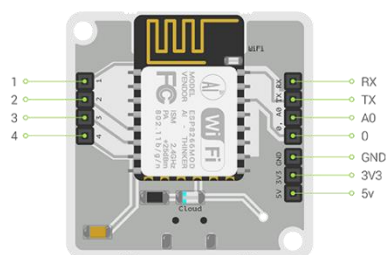
The hardware components used in this project are:

1. Bolt Wi-Fi Module (ESP8266)
2. Infra-Red (IR) Sensor
3. LED
4. Buzzer
5. USB A to Micro USB cable
6. Male header
7. PCB

COMPONENT DETAILS

1. BOLT Wi-Fi MODULE

BOLT is an Internet of Things platform. Bolt IoT platform gives you the capability to control your devices and collect data from IoT devices safely and securely no matter where you are.



BOLT works with:

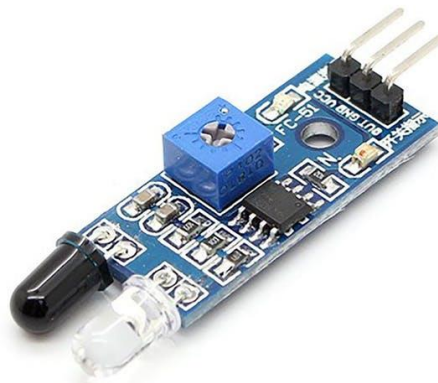
Bolt works with SMS, E-Mail, iOS and Android Notifications, Facebook, Twitter, Instagram and hundreds of other services.

General Specifications

Parameters	Details
Connectivity and Processing Module	ESP8266 with custom firmware
MCU	32-bit RISC CPU: Tensilica Xtensa LX106
Power	5V/1A DC via Micro-USB port or 5V and GND pins
Operating Voltage	3.3V
CPU Clock Frequency	80 MHz
MCU Internal Memory	64 KB of instruction RAM; 96KB of data RAM
MCU External Memory	4 MB Flash memory [QSPI]
GPIO pins	5 Digital pins [3.3V logic]
ADC	1 pin 10 bit ADC [0-1V input]
PWM	All 5 Digital pins capable of PWM [Software PWM]
Dimensions	35mm x 35mm
Boot Time	Less then 1 second

2. INFRA-RED (IR) SENSOR

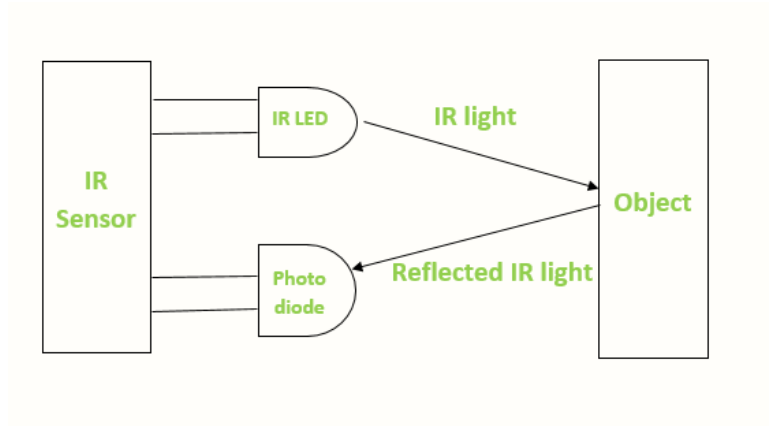
An infra-red sensor is an electronic device, that emits the light in order to sense some object of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, but infrared sensor can detect these radiations.



The emitter is simply an IR LED and the detector is simply an IR Photodiode. Photodiode is sensitive to IR light of the same wavelength which is emitted by the IR LED. When IR light falls on the photodiode, the resistances and the

output voltages will change in proportion to the magnitude of the IR light received.

There are five basic elements used in typical infrared detection systems: an infrared source, a transmission medium, optical component, infrared detectors or receivers and signal processing. Infrared lasers and Infrared LED's specific wavelength is used as infrared sources.



PIN CONFIGURATION

PIN NUMBER	PIN NAME	DESCRIPTION
1	VCC	Input voltage is +5V for typical applications.
2	High/Low Output	The signal pin gives out the sequence based on the IR signal detected.
3	Ground	Connected to ground of circuit.

FEATURES

- 5V DC Operating voltage
- I/O pins are 5V and 3.3V compliant
- Range: Up to 20 cm
- Adjustable sensing range
- Built-in Ambient Light Sensor
- 20mA supply current

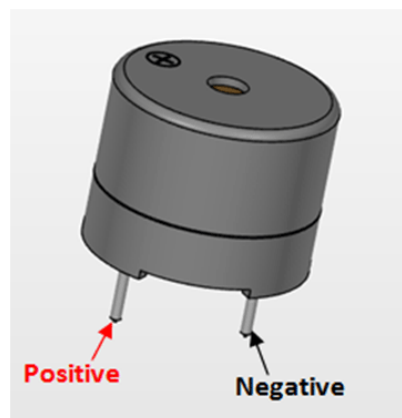
3. LED

A Light Emitting Diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor.



4. BUZZER

A buzzer is a small yet efficient component to add sound features to our project. It is very small and compact 2-pin structure hence can be easily used on breadboard, PCBs which makes this a widely used component in most electronic applications. The one shown here is a simple buzzer which when powered will make a continuous Beeeeeepppp.... sound.



This buzzer can

be used by simply

powering it using a DC power supply ranging from 4V to 9V. A simple 9V battery can also be used, but it is recommended to use a regulated +5V or +6V DC supply. The buzzer is normally associated with a switching circuit to turn ON or turn OFF the buzzer at required time and require interval.

BUZZER PIN CONFIGURATION

PIN NUMBER	PIN NAME	DESCRIPTION
1	Positive	Identified by (+) symbol or longer terminal lead. Can be powered by 5V DC.
2	Negative	Identified by short terminal lead. Typically connected to the ground of the circuit.

SPECIFICATIONS

- Rated Voltage: 5V
- Operating Voltage: 4-8V DC
- Rated Current: <30mA
- Sound Type: Continuous Beep
- Resonant Frequency: ~2300Hz

2.3.2. SOFTWARE DETAILS

1. BOLT CLOUD
2. TWILIO MESSAGING SERVICE
3. PYTHON v3
4. DIP TRACE

1. BOLT CLOUD

Bolt cloud is a server which lets you communicate with your BOLT Wi-Fi module over the internet. It offers features like receiving and storing the data collected by BOLT modules, storing the data, analysis it via data visualization and machine learning as well as it lets you program your bolt modules.

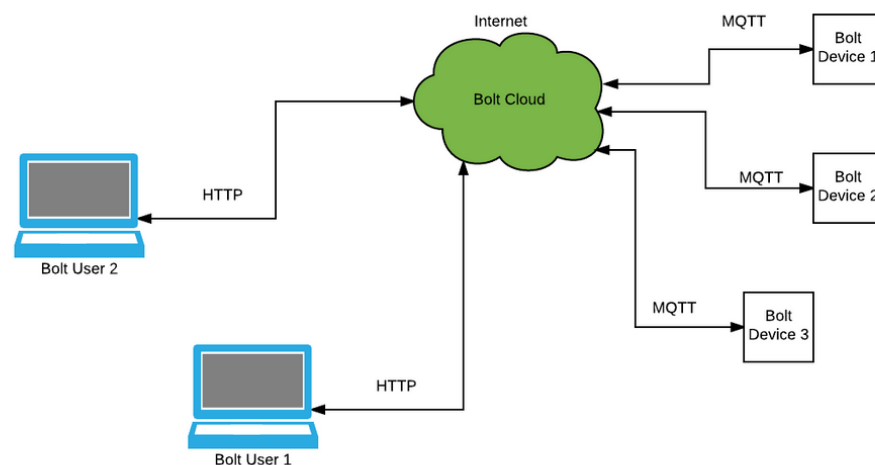


Communication of Bolt devices with Bolt cloud

The communication of Bolt devices with Bolt cloud happens over the MQTT communication protocol. MQTT stands for Message Queue Telemetry Transport.

Most IoT devices and sensors contain limited processing capabilities and constrained internet bandwidth. Due to these limitations, they send data over the internet only when required and the data sent is very slow in terms of bandwidth usage. Hence using protocols such as HTTPs, HTTP does not become feasible where the overhead data is more than actual data itself. MQTT contains very low overhead and hence becomes ideal for IoT communication.

MQTT is a pub-sub messaging protocol. Pub refers to publishing and sub refers to subscribing. There is a central entity in our case it is Bolt cloud. All the Bolt devices connect to the Bolt cloud and send data to various channels by publishing the data on their unique channels. The Bolt devices also subscribe to channels so they can receive commands coming from Bolt users.



2. TWILIO MESSAGING SERVICE

Twilio is a third-party SMS functionality provider. It is a cloud communications platform as a service (PaaS) company. Twilio allows software developers to programmatically make and receive phone calls and also send and receive text messages using its web service APIs.



3. PYTHON v3

Python is a general-purpose language with its wide variety of applications. In addition to IoT systems python has wide range of applications from web development, data science and mathematical computing to desktop Graphical User Interface (GUI). It is a true general-purpose language. Python is designed to be highly readable and it uses English keywords frequently. Popular websites like YouTube and Instagram use python.



WHY PYTHON?

- Python works on different platforms (Windows, Mac, Linux, Raspberry Pi, etc.)
- Python has a simple syntax similar to English language.
- Python has syntax that allows developers to write programs with fewer lines than some other programming languages.
- Python runs on an interpreter system, meaning that code can be executed as soon as it is written. This means that prototyping can be very quick.
- Python can be treated in a procedural way, an object-oriented way or a functional way.

4. DIP TRACE

Dip Trace is an EDA/CAD software application for creating schematic diagrams and printed circuit boards. The developers provide a multi-lingual interface and tutorials. Dip Trace has 4 modules: schematic capture editor, PCB layout editor with built-in shape-based auto router and 3D-preview & export, component editor, and pattern editor.

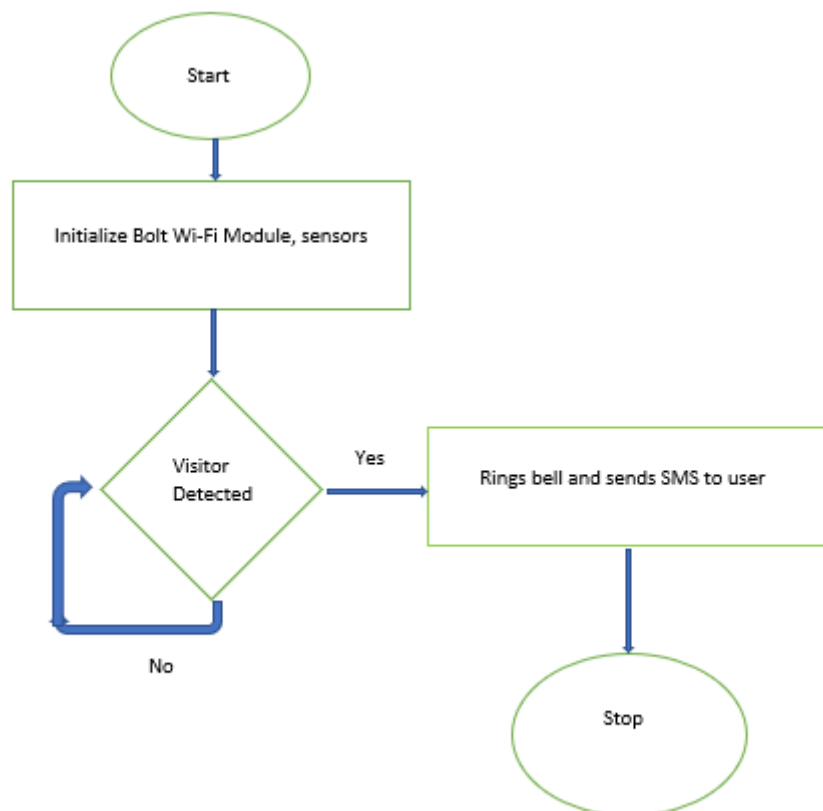


BASIC FEATURES

- Simple user interface.
- Multi-sheet and hierarchical schematics
- High speed and differential signal routing
- Smart manual routing modes
- Wide import/export capabilities
- High speed shape-based auto router
- Advanced verifications with real time DRC
- Real time 3D PCB preview
- Export of PCB to STEP 3D file format



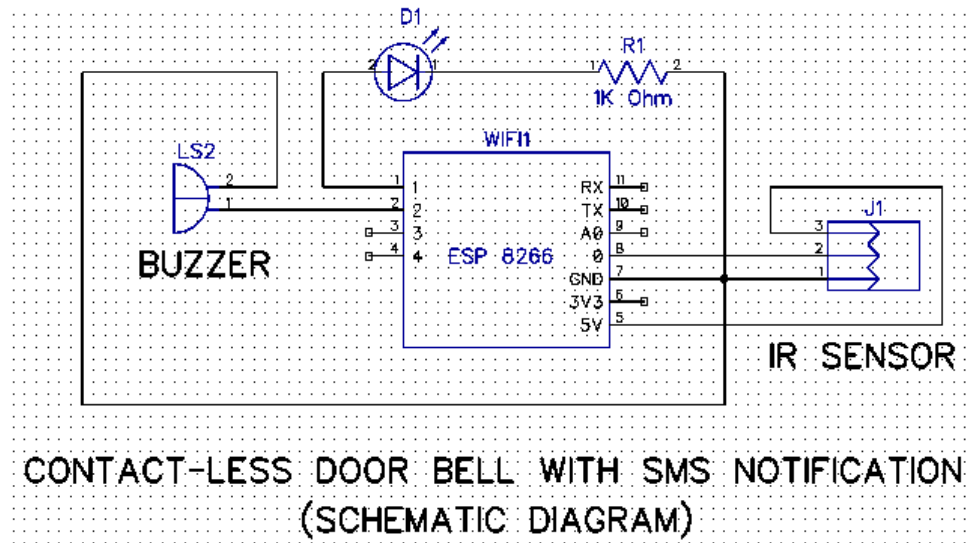
2.4. FLOWCHART



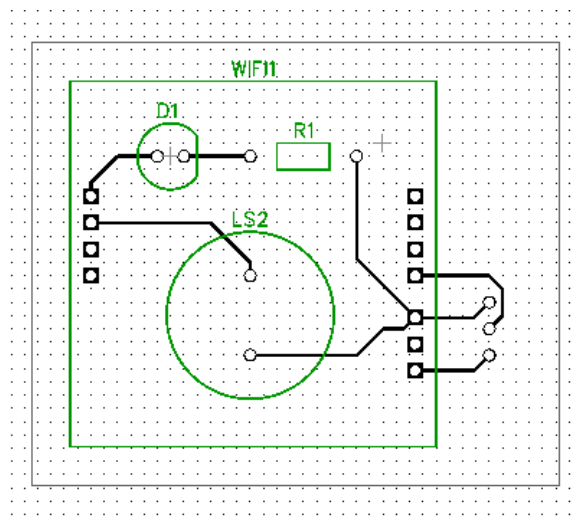
Firstly, we will initialize the Bolt wi-fi module, IR sensor, buzzer and LED. Here, we are using IR sensor for detecting object. If the visitor

will come in front to the sensor, object will be detected by the sensor. Buzzer will be used as a doorbell ring so, when object is detected it will ring the bell and LED is placed for detection of object, so LED will also glow when object is detected. After this it will send an SMS to the owner of the house so that he can be alerted.

2.5. CIRCUIT DIAGRAM



2.6. PCB LAYOUT



3. RESULTS AND DISCUSSION

3.1. SIMULATION RESULTS

After simulation, following output is obtained:

```
The current sensor value is: 1  
No Visitor detected  
The current sensor value is: 0  
Someone is at door. Please Open.  
Status of SMS at Twilio is: queued
```

3.2. RESULTS ANALYSIS

After simulation, we found that whenever any visitor will come in front of the sensor then object/visitor will be detected by the sensor and it will ring the doorbell with SMS notification plus it will also show results in your python screen.

3.3. ESTIMATING AND COSTING ANALYSIS

The costing for this project is estimated around Rs. 1500 for purchasing all the components.

3.4. APPLICATION AND CHALLENGES

This project can be used at various places like:

- Bank Lockers
- Home doorbell
- Security services in different societies

Challenges I faced during this project are:

- It can't distinguish between human, animal or any other objects and will triggered by any object's presence in front of it. This can lead to false alarms.
- If the Bolt's API servers are down it will won't function.

4. CONCLUSION AND FUTURE SCOPE

I have successfully completed the contact-less doorbell with SMS notification system model prototype and this project presents the implementation of contact-less doorbell as it is touchless process it is very hygienic, during these times when the whole world is suffering from COVID -19, it becomes very useful. By doing this project practically I gained the knowledge about working of contact-less doorbell system and with this future study and research, I hope to develop the system into a more advanced version. While realizing that this certainly requires tons of work and learning, like the programming, knowledge of sensors and making shields. Hence, I believe that incorporation of all components in contact-less doorbell system will maximize the safety and it will ring the bell with sending SMS notification to the owner.

FUTURE SCOPE

The future scope is to design and develop a control system based on contact-less doorbell. The contact-less doorbell with IR sensor would alert the owner of the house just by ringing the doorbell of the house with SMS functionality when the visitor is within the sensing range zone. The new function we can add here is just interfacing it with camera. So, whenever someone arrives at the doorstep it will capture the face and verifies its database which already has registered faces. Therefore, the safety system of the doorbell will be developed and may have more market demands.

It can be further used for security purposes in societies, bank lockers, etc. So, I feel it is a better idea in the current COVID-19 situation with moderate cost.

REFERENCES

- <https://docs.bolttiot.com/docs/bolt-wifi-module>
- <https://robu.in/ir-sensor-working/>
- <https://en.wikipedia.org/wiki/DipTrace>
- https://www.w3schools.com/python/python_intro.asp

APPENDIX

CONFIGURATION FILE (conf)

```
SSID = "ACdc6b58626b77b1f42e8214571b685ad3"
AUTH_TOKEN = "0b633f2d077563db995d49c38a7a82ed"
FROM_NUMBER = "+12015716954"
TO_NUMBER = "+918103224986"
API_KEY = "13b779b1-1952-4abe-bcab-ffe3cc56c8d0"
DEVICE_ID = "BOLT13167422"
```

PYTHON CODE

```
import conf #importing the conf file which has all the identifications
from bolttiot import Sms, Bolt #importing SMS and Bolt module for notifying and
accessing the bolt data and functionality
import json, time #imports Json for handling all operations on Json objects and time to
access the time related functionality

mybolt = Bolt(conf.API_KEY, conf.DEVICE_ID) #initializing the bolt module with
device id and API key
sms = Sms(conf.SSID, conf.AUTH_TOKEN, conf.TO_NUMBER, conf.FOR_NUMBER)
#initialize SMS module with Twilio API credentials

def get_sensor_value_from_pin(pin): #defining the function
    try:
        response = mybolt.digitalRead(pin) #reading the digital value connected to the
specified pin of bolt module
        data = json.loads(response) #converting the given text in JSON format
        sensor_value = int(data["value"]) #assigning the sensor value
        if sensor_value == 1:
            return sensor_value #returns sensor value
        return 0
    except Exception as e:
        print("Something went wrong while returning the sensor value")
        print(e)
        return -999
```

while True:

 sensor_value = get_sensor_value_from_pin("0") #reading the digital value connected to the "0" pin of bolt module

 print("The current sensor value is:", sensor_value) #prints current sensor value

 if sensor_value == -999:

 print("Something went wrong....")

 time.sleep(5)

 continue

 if sensor_value == 0:

 mybolt.digitalWrite("1", "HIGH") #updating the pin values to notify the user with beep sound

 mybolt.digitalWrite("2", "HIGH") #updating the pin values to notify the user with LED light

 print("Someone is at door. Please Open.")

 response = sms.send_sms("Someone is at door. Please Open 😊") #making the call Twilio to notify the user with SMS

 print("Status of SMS at Twilio is: " +str(response.status)) # print the status of Twilio to the console

 time.sleep(5) #wait the control for 5 seconds

 mybolt.digitalWrite("1", "LOW") #updating the pin values to Low to turn off the buzzer

 mybolt.digitalWrite("2", "LOW") #updating the pin values to Low to turn off the LED

 time.sleep(5) #wait the control for 5 seconds

 elif sensor_value == 1:

 print("No visitor detected")

 time.sleep(5) #repeating the operation for every 5 seconds