

Group Project report

On

SMART RECEPTIONIST WITH SMART LOCK SYSTEM

Submitted

In the partial fulfilment of the requirements for Group Project (III-II)

In

ELECTRONICS & COMMUNICATION ENGINEERING

By

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Hyderabad and Approved by AICTE - New Delhi)**

DECLARATION AND ACKNOWLEDGEMENT

We hereby declare that the work described in the Group project, entitled “**SMART RECEPTIONIST WITH SMART LOCK SYSTEM**” which is being submitted by us for Group Project (III-II) in the Dept. of **Electronics & Communication Engineering, Sreenidhi Institute of Science & Technology** affiliated to Jawaharlal Nehru Technological University Hyderabad, Kukatpally, Hyderabad (Telangana) is the work on our own effort and has not been submitted elsewhere.

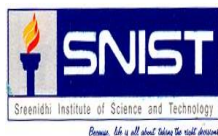
We are very thankful to **Mrs. B. PRIYANKA**, Project Co-ordinator, ECE Dept., Sreenidhi Institute of Science and Technology, Ghatkesar for providing an initiative to this mini project and giving valuable timely suggestions over the work.

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CERTIFICATE

This is to certify that the Project report entitled “**SMART RECEPTIONIST WITH SMART LOCK SYSTEM**” being submitted by **N. SAHITI, S. PAVANI, A. ANUSHA** bearing the Roll No’s. **19311A04X4, 19311A04X5, 19311A04Z7** for Group Project (III- II) in **Electronics and Communication Engineering** to **Jawaharlal Nehru Technological University**, is a record of bonafide work carried out by him/her during the academic year 2021-2022 under our guidance and evaluation.

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ABSTRACT:

Security and safety are becoming more and more popular day by day and it is getting improved and used for the ease in our life. Now days, technology has become an integrated part of people's lives therefore the security of one's home, office or organization must also not be left behind. Smart Receptionist with smart lock system is mainly designed and developed for security system and purposes. This smart security system is used to see a visitor when the main door of the home or office or organization is closed. The purpose of this system is to control the door lock using commands given by the telegram bot and Raspberry Pi.

In this system whenever a person comes near the door the PIR sensor detects the presence, sends alert to the user through telegram and enables the camera, video of the person is captured by the camera and then the smart lock system will send the 5 seconds video to Telegram. If the owner grants the permission to enter, then the system will open the door, and if the owner denies the permission to open the door, door will remain locked by the commands through telegram bot.

KEY WORDS: Raspberry pi, Telegram bot, PIR sensor, camera.

1. INTRODUCTION:

The system is developed to increase the security level which is called as "Smart Receptionist with Smart Lock System". The system is designed in such way so as to open the door using Raspberry pi 3. And give a access only to authorized person. This effective system provides access control to the door and security system which is based on a face recognition pattern.

The main objective of the paper is to see the visitor at the main door and to allow them inside the office if the person concerned is in the middle of meeting and if the known person is standing infront of the door. Raspberry Pi3 controls the whole function in the main door. Raspberry Pi3 model B has 4GB RAM Quad Core 1.2GHz CPU. It is a minimized version of active computer. It has a lot of interfacing units. The Pi Cam is used to take picture of the visitor and a video is sent to registered telegram account using Raspberry Pi3 with the help of Internet. The user can see the video of the visitor in their telegram and can control the Raspberry Pi3 using IOT. The Raspberry Pi3 receives command from IOT and controls the door lock. The pi cam and PIR sensor are connected to the Raspberry pi3 board where in turn Raspberry pi3 is connected to the (Owner`s) PC and telegram through Internet. The PIR sensor and Pi cam with Raspberry pi3 board are attached to the office door or main door of our house and output of PIR sensor act as the input to the camera module and pi camera records a video.

Cam data is stored in internal memory of Raspberry pi3.DC motor or servo motor is connected to the Raspberry pi3 board where it acts as the output device which controls the door lock according to the telegram commands given by the owner.

2. EXISTING TECHNOLOGY:

In order to maintain better security, the normal locks were replaced by the password based door locks which are massively used by everyone now-a-days. In the password based door lock system, the visitor has to enter the password in order to open the door. Compared to normal locks, it provides better security because there is a high chance of losing keys of the normal locks which can be avoided by using password based door locks and anyone who knows the password can easily enter into the house without waiting for the person who has keys with him(provided password is known only to the close ones of the owner).But the major disadvantage of password based door lock system is if the password is forgotten, there is no chance of opening the door which might get you into the trouble. In order to avoid such things, we propose “smart door receptionist with smart lock system” which does not require any password or any key to open the door.

2.1. Types of smart locks:

- 2.1.1. **Numerical Codes and Passwords:** Most common form of electronic lock uses a keypad to enter a numerical code or password for authentication. Such locks provide, an audible response to each press. Combination lengths are usually between 4 and 6 digits long.
- 2.1.2. **Security Tokens:** Another means of authenticating users that is in practice is to require them to scan or "swipe" a security token such as a smart card or similar, or to interact a token with the lock. For example, some locks can access stored credentials on a Personal Digital Assistant (PDA) or Smartphone, by using infrared, Bluetooth, or Near Field Communication (NFC) data transfer methods
- 2.1.3. **Biometrics:** Biometrics has become more and more prominent as a recognized means of positive identification. Some electronic locks take advantage of technologies such as fingerprint scanning, retinal scanning, iris scanning and voice print identification to authenticate users.

2.2. PROBLEMS EXISTING :

The basic problems arrived in smart locks are:

- Very expensive and hard to install.
- The features vary depending on system.
- The security token design of the door lock system is less impressive than smart technology.
- Alternate physical keys needed to enter in to the room.
- Need to monitor batteries regularly.
- The visitor cannot be viewed.
- Password lock can be easily hacked.
- The above problems are addressed in our paper.

3. PROPOSED TECHNOLOGY:

The proposed system, i.e. “**smart door receptionist with smart lock system**” provides high security compared to normal locks and Password based door locks. The system is developed to increase the security level which is called as "Smart Receptionist with Smart Lock System". The system is designed in such way so as to open the door using Raspberry pi 3. And give an access only to authorized person. This effective system provides access control to the door and security system which is based on a face recognition pattern. Telegram interfaces the user with the Raspberry pi. By giving commands like ‘/open’, ‘/closedoor’ , ‘/close’ to the telegram bot, the door either opens or closes accordingly.

4. BLOCK DIAGRAM:

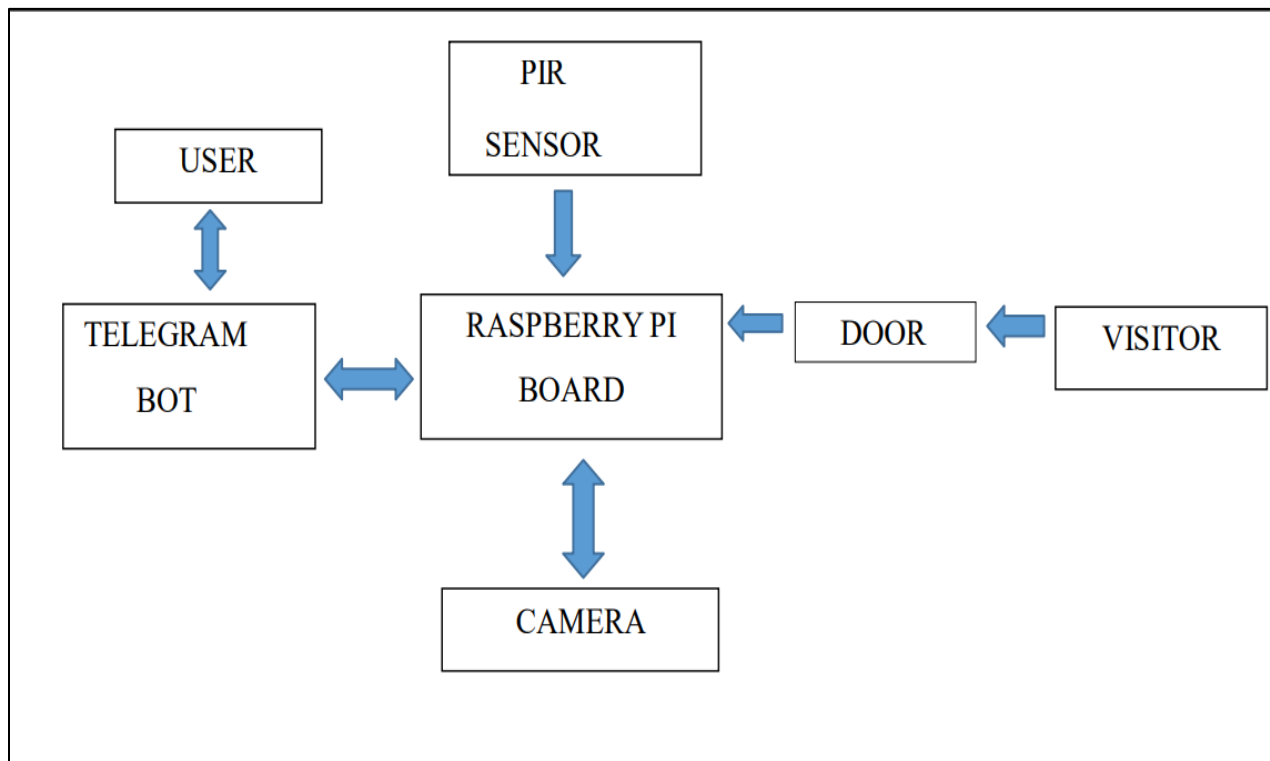


Fig 1: Block diagram of smart receptionist with smart lock system

5. SYSTEM REQUIREMENTS AND SPECIFICATIONS:

5.1. HARDWARE REQUIREMENTS:

1. Raspberry Pi Board
2. PIR sensor
3. PI Camera
4. Servo motor

5.2. SOFTWARE REQUIREMENTS:

1. Thonny python IDE
2. Telegram

5.1.1. RASPBERRY PI BOARD:

Raspberry Pi is a credit card sized pc which has 40 pins, among which 24 pins are General purpose input output (GPIO) pins which are used to control the outside world by being connected to electronic circuits like controlling of LED, recording humidity and temperature of surroundings, to store the photos captured by Pi camera etc. Raspberry Pi allows us to write the code in Python language to control the circuits.

Raspberry Pi 3 Model B was released in February 2016 with a 1.2 GHz 64-bit quad core ARM cortex-A53 processor, on-board 802.11n Wi-Fi , Bluetooth and USB boot capabilities. There are two kinds of Input and Output pin numbering for the Raspberry pi. One is the BCM and the other is BOARD. Basically these pin numberings are useful for writing python script for the Raspberry Pi.

GPIO BOARD– This type of pin numbering refers to the number of the pin in the plug, i.e. , the numbers printed on the board, for example, P1. The advantage of this type of numbering is, it will not change even though the version of board changes.

GPIO BCM– The BCM option refers to the pin by “Broadcom SOC Channel. They signify the Broadcom SOC channel designation. The BCM channel changes as the version number changes.



Fig 2: Raspberry Pi Board

5.1.2. PIR SENSOR:

Passive infrared (PIR) sensor is an electronic sensor that measures infrared light radiating from objects in its field of view. A PIR-based motion detector is used to sense movement of people, animals, or other objects. They are commonly used in burglar alarms and automatically activated lighting systems. It detects the motion of a person or anything that comes near to it and sends signal to which it's output is connected, saying that motion has been detected. It has three pins-Vcc (Power supply), OUT, GND.

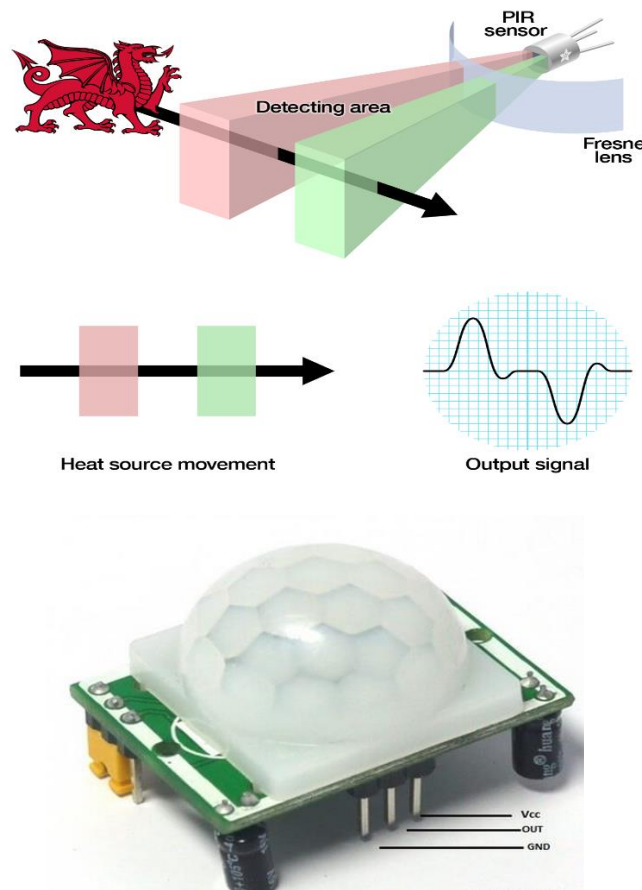


Fig 3: PIR sensor

5.1.3. PI CAMERA:

PI Camera is used to capture the photos and store them in the folder which is given by us in the code. To enable camera we have to write few commands in the terminal and we need to write “import picamera” at the top of the code. We can also change the resolution, flip the image, apply some effects using Pi Camera. We can also record a video using Pi Camera.

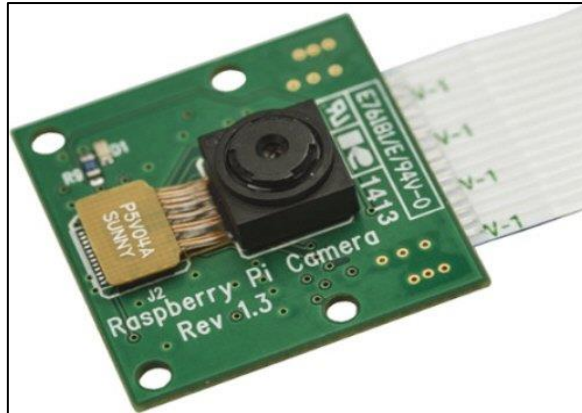


Fig 4: PI Camera

5.1.4. SERVO MOTOR:

A Servo motor is an electromechanical device that produces torque and velocity based on the supplied voltage. If motor is powered by DC supply then it is called as DC servo motor. If motor is powered by AC supply then it is called as AC servo motor. It has three pins-GND (Brown color), Vcc (Red color), PWM (Orange color).

Servos can be classified by means of their feedback control systems:

Type 0 servos: under steady-state conditions they produce a constant value of the output with a constant error signal;

Type 1 servos: under steady-state conditions they produce a constant value of the output with null error signal, but a constant rate of change of the reference implies a constant error in tracking the reference;

Type 2 servos: under steady-state conditions they produce a constant value of the output with null error signal. A constant rate of change of the reference implies a null error in tracking the reference. A constant rate of acceleration of the reference implies a constant error in tracking the reference.

The servo bandwidth indicates the capability of the servo to follow rapid changes in the commanded input.



Fig 5: Servo motor

5.2.1. THONNY PYTHON IDE:

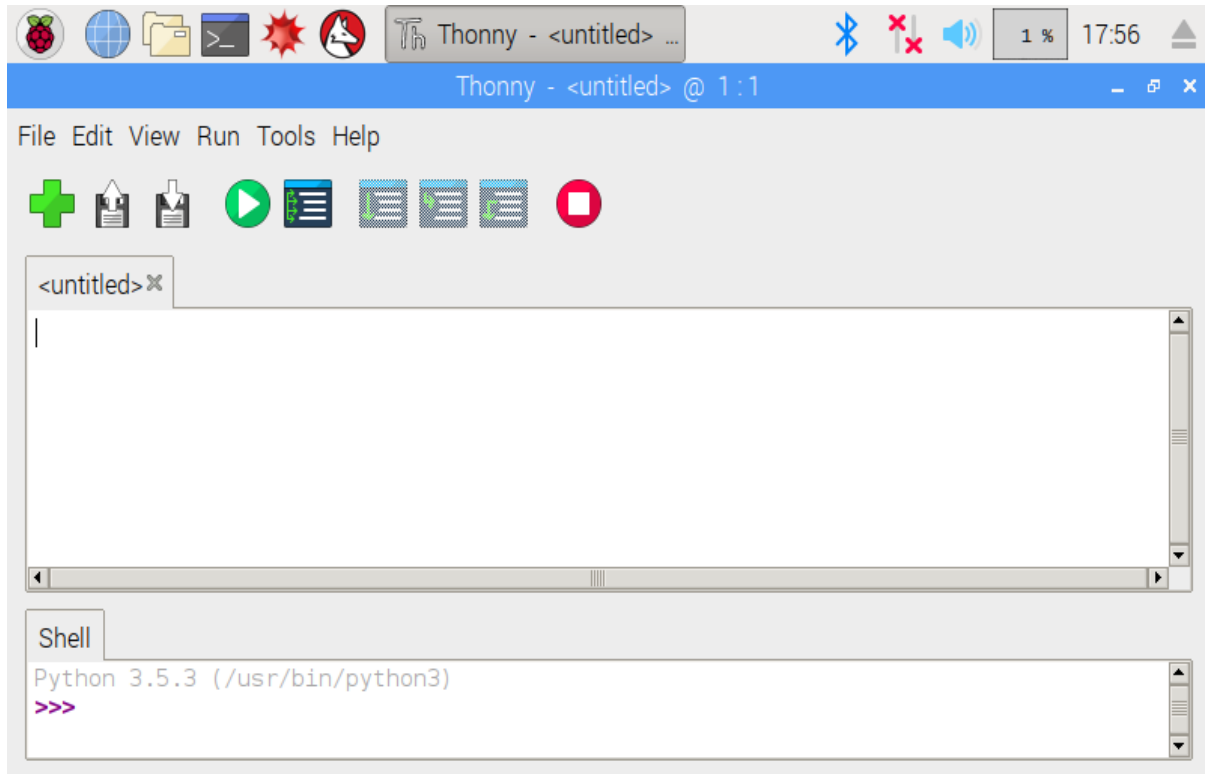


Fig 6: Thonny python IDE

Thonny IDE allows us to write the required code and the name of the file should be saved by using .py extension. Keywords should not be given as filename. After saving the program, click the run button and output will be shown in the shell at the bottom. If you have your Assistant View turned on, you will also notice that it will give you a helpful message to guide you in the right direction when you are debugging.

5.2.2. TELEGRAM:

Follow the below steps to create your own telegram bot:

STEP 1: Open telegram app and Enter @BotFather in the search tab and choose the bot which had a blue checkmark.

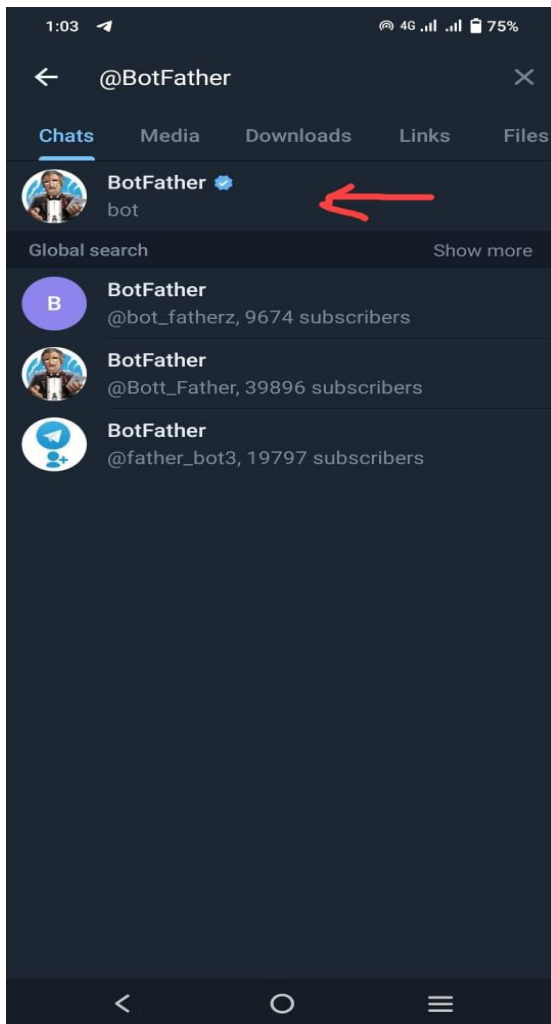


Fig 6: searching of BotFather

STEP 2: Click “Restart” button to activate the bot.

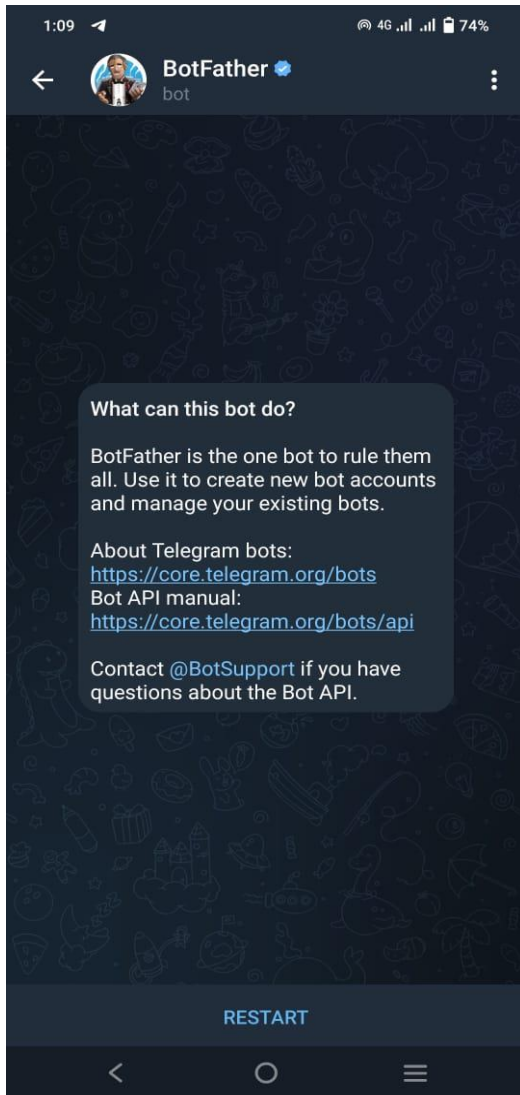


Fig 7: Activation of botfather

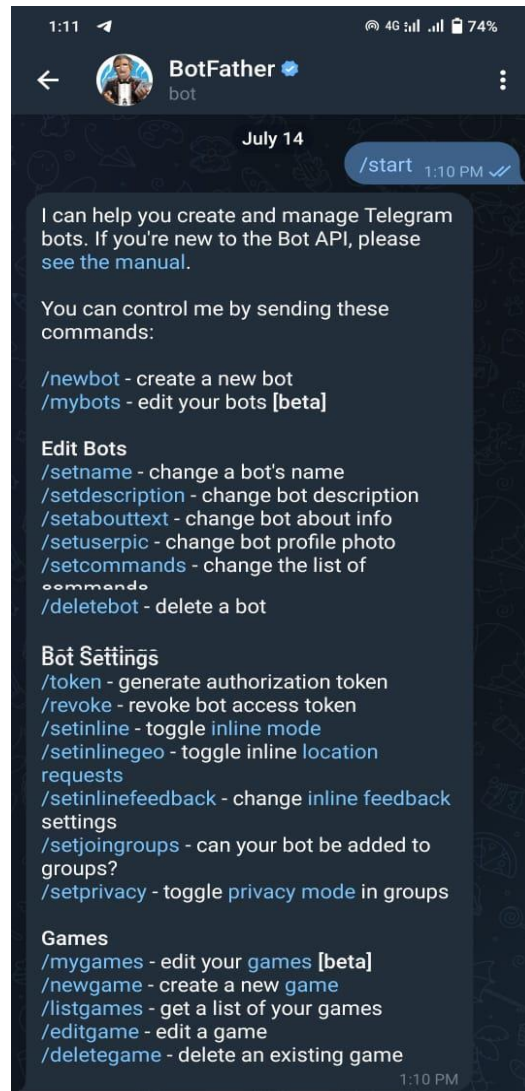


Fig 8: list of commands displayed by botfather

STEP 3: Send `/newbot` to create a new Telegram bot. Later enter the name for the bot. Now you have to give unique username to your Telegram bot. The username must end with Bot or _bot or bot. e.g. tetris_bot or tetrisbot or tetrisBot.

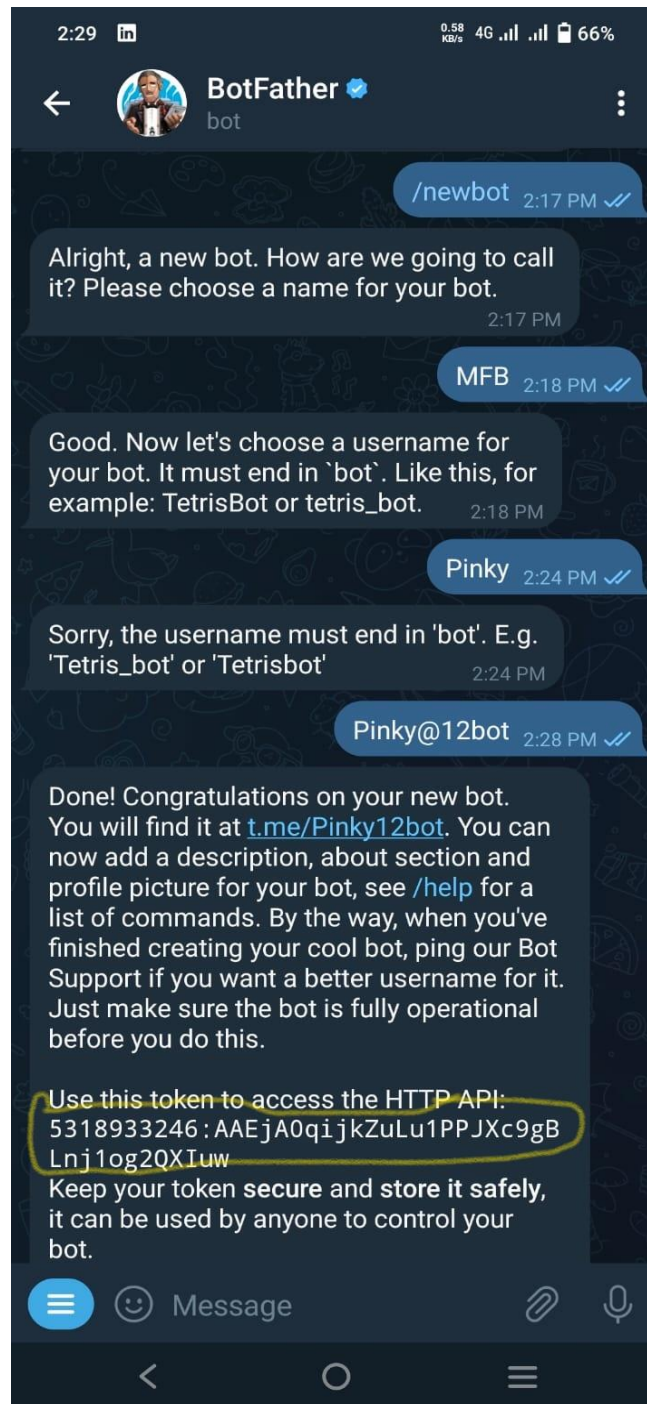


Fig 9: generating token for our bot

STEP 4: Copy the token of your bot which will be used for further purpose.

STEP 5: Click on bot link as follows and later click on “START” button to activate your bot.

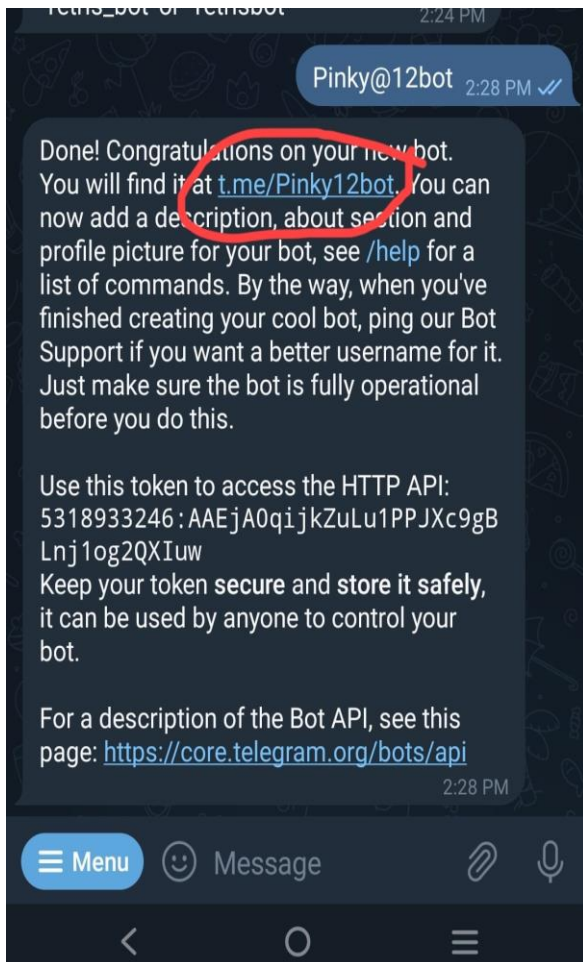


Fig 10: Open the created bot

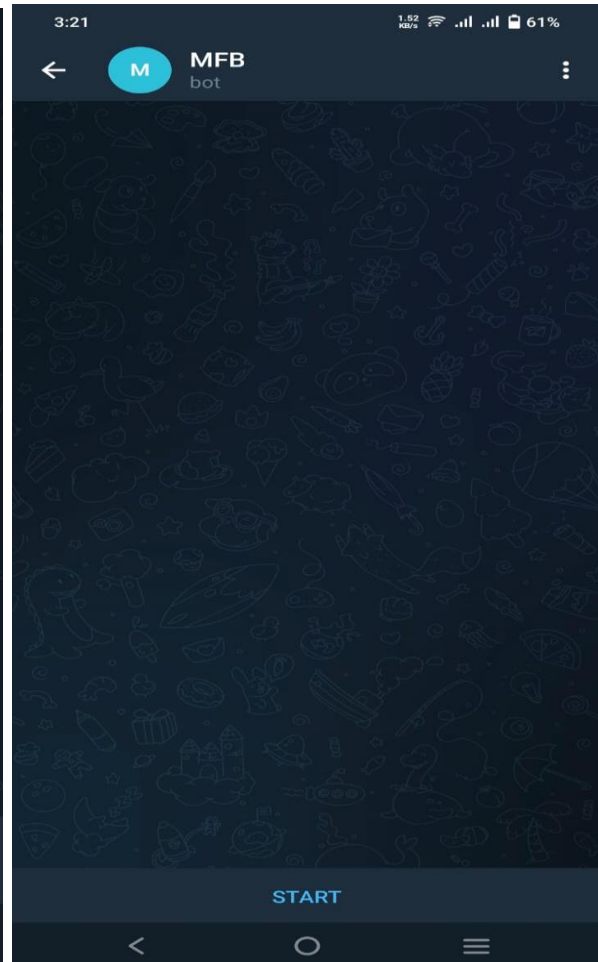


Fig 11: Activation of created bot

6. CODE:

// import all the required modules

```
import telepot
```

```
from picamera import PiCamera
```

```
import RPi.GPIO as GPIO
```

```
from time import sleep
```

```
import datetime
```

```
from telepot.loop import MessageLoop
```

```
from subprocess import call
```

```
from gpiozero import AngularServo
```

```
PIR = 4  // indicates pir data pin connected to GPIO 4
```

```
camera = PiCamera()
```

```
camera.resolution = (640, 480)
```

```
camera.framerate = 25
```

```
GPIO.setwarnings(False)
```

```
GPIO.setmode(GPIO.BCM)
```

```
GPIO.setup(PIR, GPIO.IN)
```

```
motion = 0
```

```

motionNew = 0

// handles all the commands sent from the telegram bot

def handle(msg):

    global telegramText

    global chat_id

    chat_id = msg['chat']['id']

    telegramText = msg['text']

    print('Message received from ' + str(chat_id))

    if telegramText == '/start':

        bot.sendMessage(chat_id, 'Security camera is activated.')

        while True:

            main()

            break

    elif telegramText == '/open':

        s=AngularServo(2,min_angle=-180,max_angle=180)

        s.min()

        bot.sendMessage(chat_id, 'door opened')

    elif telegramText == '/closedoor':

        s = AngularServo(2, min_angle=-180, max_angle=180)

```

```

s.max()

bot.sendMessage(chat_id, 'door closed')

elif telegramText == '/close':

    bot.sendMessage(chat_id, 'access denied')


bot = telepot.Bot('5510595588:AAHqcfljinHQMsBmj1lqqSMgssP9F-v5MUA')#
enter your bot token here

bot.message_loop(handle) // calls the handle() until the program execution stops


def sendNotification(motion): // used send alerts to owner through telegram

    global chat_id

    if motion == 1:

        filename = "/home/pi/Videos/" + (time.strftime("%y%b%d_%H%M%S"))

        camera.start_recording(filename + ".h264")

        sleep(5)

        camera.stop_recording()

        command = filename + '.h264'

        print(command)

        call([command], shell=True)

        bot.sendVideo(chat_id, video=open(command,'rb'))

```

```

        bot.sendMessage(chat_id,'The motion sensor is triggered!')

// used to find the state of PIR sensor

def main():

    global chat_id

    global motion

    global motionNew

    if GPIO.input(PIR) == 1:

        motion = 1

        if motionNew != motion:

            motionNew = motion

            sendNotification(motion)

    elif GPIO.input(PIR) == 0:

        print("motion is not detected")

        motion = 0

        if motionNew != motion:

            motionNew = motion

while 1:

    time.sleep(10)

```

We had written the python code in Thonny software and run the code after saving the file with .py extension.

Later we use the following commands through our telegram bot as and when required.

- /start – to activate the bot
- /open – to open the door
- /closedoor – to close the door
- /close – the door remains closed

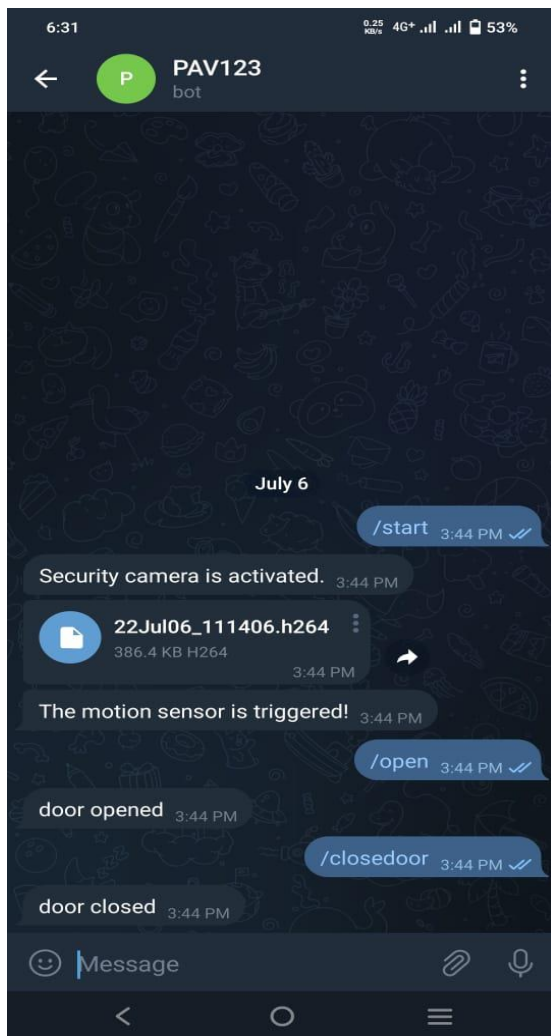


Fig 12: Operating telegram bot

We have given the commands through Telegram bot as shown in the above picture.

7. WORKING:

Step-1: Whenever there is a motion (the person arrives in front of the door), the PIR sensor senses and activates the camera module.

Step-2: The Pi Cam captures the video of the visitor and sends to the owner's telegram.

Step-3: Based on the owner's decision, the corresponding command is given in the telegram ('/open', '/close', '/access denied') to raspberry pi.

Step-4: According to the command received by the raspberry pi, the dc motor works and the door opens or closes.

Step-5: If we need to get the visitor in to our office, we give a command '/open' to open the door lock connected with the servo motor. The servo motor rotates clockwise to open the door. After 10sec, the door closes by rotating servo motor in anti-clockwise direction after the visitor enters into the home or office.

Step-6: If the '/access denied' command is passed then the door remains closed.

7.1. CIRCUIT:

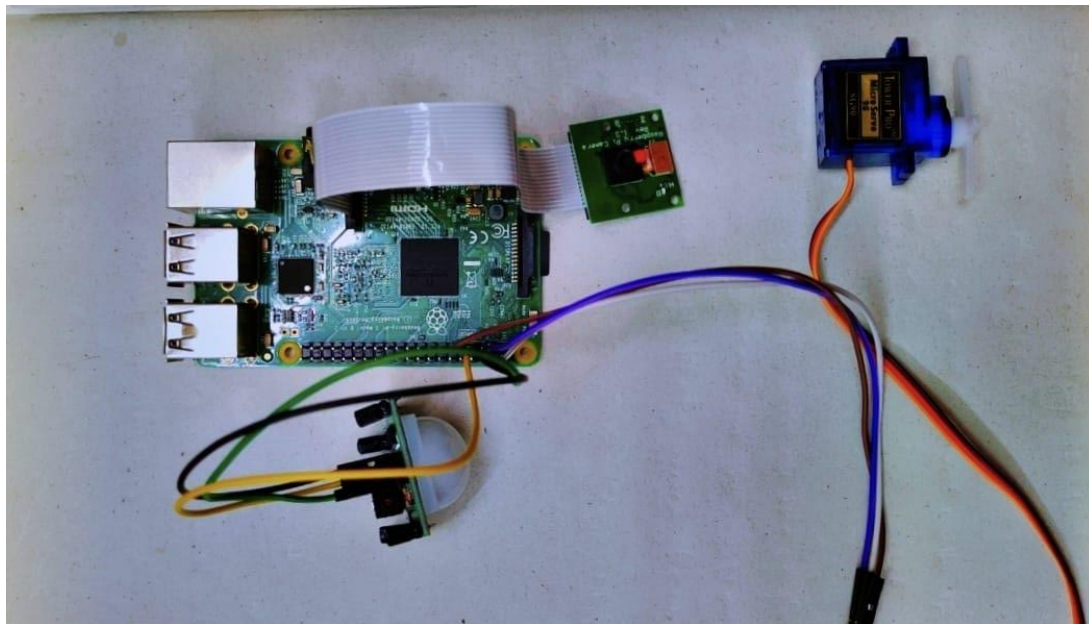


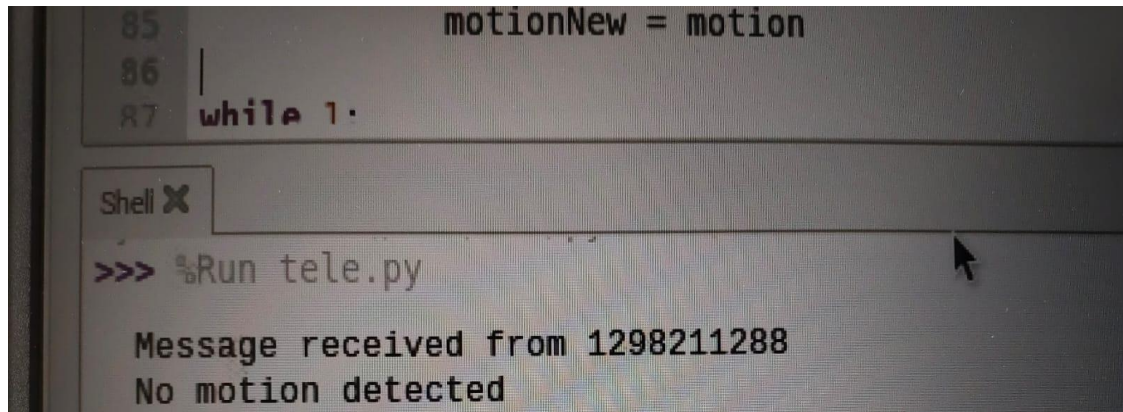
Fig 13: Circuit implementation

7.1.2. CIRCUIT CONNECTIONS:

- Out pin of PIR sensor is connected to GPIO 2 pin raspberry pi
- Signal pin of Servo motor is connected to GPIO2 pin of raspberry pi.
- VCC and GND pins of Servo, PIR are connected to Power pins of raspberry pi.

8. IMPLEMENTATION AND RESULT:

The command prompt displayed as below:

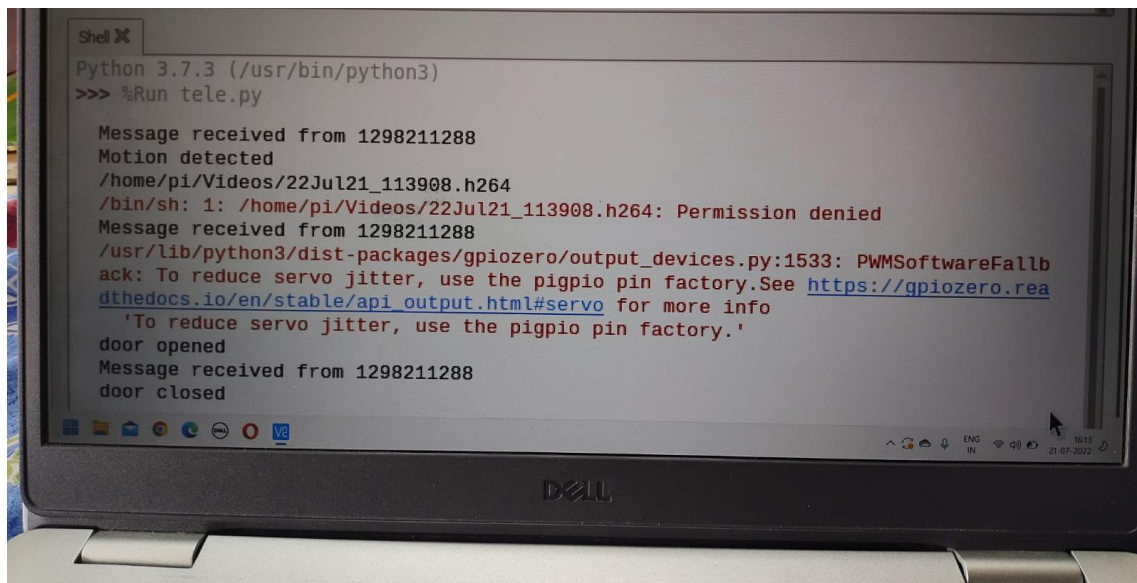


```
85 motionNew = motion
86 |
87 while 1:

Shell X
>>> %Run tele.py

Message received from 1298211288
No motion detected
```

Fig 14: when no motion detected



```
Shell X
Python 3.7.3 (/usr/bin/python3)
>>> %Run tele.py

Message received from 1298211288
Motion detected
/home/pi/Videos/22Jul21_113908.h264
/bin/sh: 1: /home/pi/Videos/22Jul21_113908.h264: Permission denied
Message received from 1298211288
/usr/lib/python3/dist-packages/gpiozero/output_devices.py:1533: PWMSoftwareFallback: To reduce servo jitter, use the pigpio pin factory. See https://gpiozero.readthedocs.io/en/stable/api_output.html#servo for more info
'To reduce servo jitter, use the pigpio pin factory.'
door opened
Message received from 1298211288
door closed
```

Fig 15: when motion detected

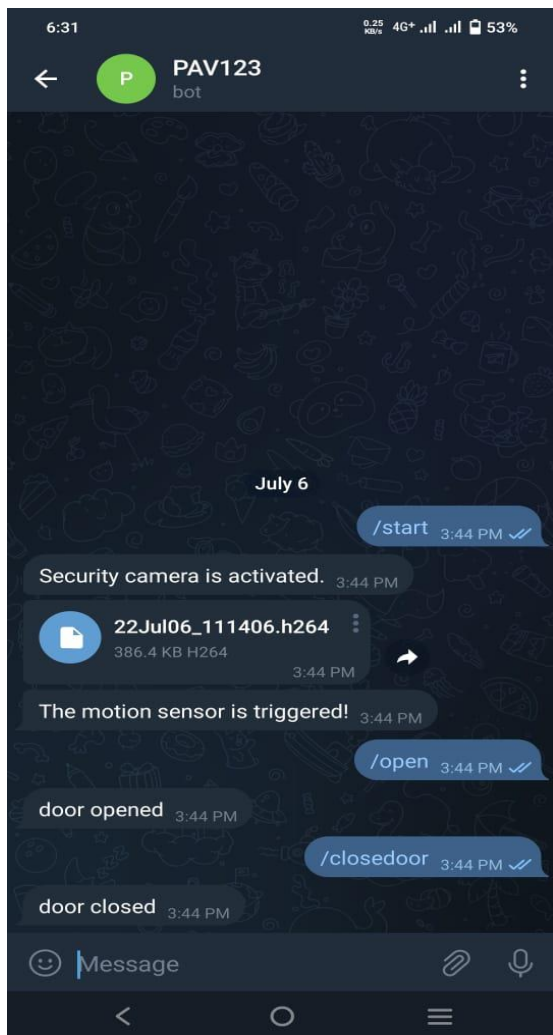


Fig 16: Telegram bot chat

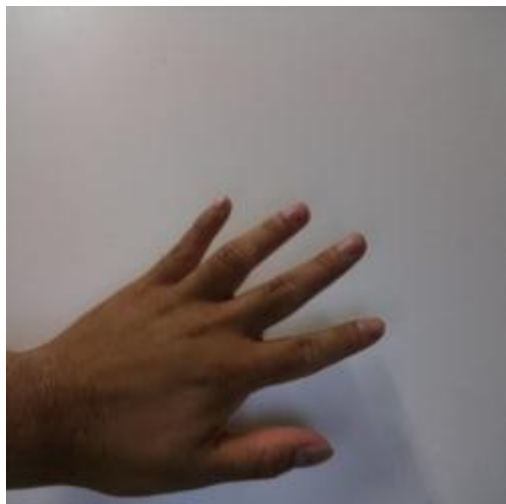


Fig 17: Image captured by camera

9. ADVANTAGES AND DISADVANTAGES:

9.1. ADVANTAGES:

- **Automation of entrance and exit**

The visitor don't need any keys or need not remember any passwords and need not inform the owner about his arrival. Simply he should stand near the door and based on the owner's reply, the door will unlock and locks when he gets in.

- **Manage your home or Investment Property from Across the Country**

The owner of the home can provide access to the visitor from anywhere, right from his home to anywhere in the country.

- **No need to remember any passwords to unlock the door**

If the door unlocks based on the password given, then there is a high chance of forgetting the passwords and also there is a chance of hacking the door locks. The proposed model does not require any passcodes to remember.

- **No need to wait for the longer hours until the owner of the home comes**

Generally there will be only one key and that will be there with the owner. If any of the person (might be a family member) comes to the home, he/she should wait until the person with key comes to the home. The proposed model provides peace to the owner without worrying about the persons visiting the home.

- **Remote control**

The owner of the home can easily provide access to the visitor simply by providing '/open' and '/close' commands through telegram via phone.

- **Enhanced security and safety**

The proposed model provides better security and safety, because the owner gets to know the person who is visiting the house.

- **Auto-locking**

Most of the times, we just forgot to lock the door in the hurry, and then come back again to confirm whether the door is locked or left like that. By the proposed model, we can simply verify through the phone and lock the door by providing ‘/close’ command.

- **Sending Alerts**

As soon as the PIR sensor senses the motion, the video is recorded and sent to the owner through telegram which helps the owner to know who is at the front of the door.

- **Free from the Worry of Losing Keys**

You don't have to bother about forgetting your key at your office or losing it.

- **Prevent Burglars from Breaking in**

We can easily know the burglars trying to enter into the home through the recorded video, with that information the owner can take necessary action to save his home and property.

9.2. DISADVANTAGES:

- **Expensive:**

The proposed model consists of raspberry pi which is little bit expensive.

- **No information to visitor:**

If the owner wants the visitor to not to enter the house, the door remains closed and visitor don't get the information that he is not allowed to enter the house which leads to confusion to the visitor

- **Wi-Fi Outages:**

As raspberry pi works on wi-fi, If there is an outage of wi-fi, the raspberry pi cannot send the alerts to the owner.

- **Battery issues:**

As the commands are given through the phone, If the phone's battery is down or if the phone is lost, then the owner cannot receive the alerts.

10. CONCLUSION:

The system developed is a great way of ensuring security. It goals at creating minimal human intervention and it has been achieved. It combines two modern technologies face recognition and IoT. It is low cost and power efficient system. All the components are easily available and of affordable cost.

It is portable and easily upgradable. It can be used as a part of home automation, bank security,at conference halls in offices etc. The best part of SMART applications is that "it can give alerts without human involvement".

This paper is a prototype for one of the security applications called "Smart receptionist with smart lock system" based on raspberry pi and Internet of Things. This paper provides a prototype for the above project.

11. REFERENCES:

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2. <https://projects.raspberrypi.org/en/projects/parent-detector/1>
3. <https://www.engineersgarage.com/raspberry-pi-based-smart-home-security-system>
4. <https://docs.microsoft.com/en-us/azure/bot-service/bot-service-channel-connect-telegram?view=azure-bot-service-4.0>
5. <https://roboticsbackend.com/raspberry-pi-camera-picamera-python-library>