***A* Project Report On**

SECURE HOME AUTOMATION USING RASPBERRY PI BY TELEGRAM APP

Submitted in partial fulfilment of the requirements for the award of degree
of
Bachelor of Technology
in
INFORMATION TECHNOLOGY
by

Student Name	Student ID
1. G.Harshitha	19K61A1215
2. N.Akanksha	19K61A1240
3. A.Harika	19K61A1201

Under the Esteemed supervision of

Mr.G.Nageswara Rao M.Tech.(Ph.D)

Associate Professor, Department of IT

Department of Information Technology

SASI AUTONOMOUS INSTITUTE OF TECHNOLOGY & ENGINEERING TADEPALLIGUDEM West Godavari District | NAAC ACCREDITED A | NBA NATIONAL BOARD OF ACCREDITATION

KADAKATLA, TADEPALLIGUDEM -534101,
WEST GODAVARI, ANDHRA PRADESH.

Academic Year : 2022-2023

SASI INSTITUTE OF TECHNOLOGY & ENGINEERING
AUTONOMOUS
TADEPALLIGUDEM
West Godavari District

NAAC ACCREDITED A

NBA
NATIONAL BOARD OF ACCREDITATION

Department of Information Technology

CERTIFICATE

This is to certify that the project work entitled **"SECURE HOME AUTOMATION USING RASPBERRY PI BY TELEGRAM APP"** *is being submitted by* **G.Harshitha (19K61A1215), N.Akanksha (19K61A1240), A.Harika (19K61A1201)** *in partial fulfilment for the award of the degree of* **BACHELOR OF TECHNOLOGY** *in* **Information Technology** *affiliated to Jawaharlal Nehru Technological University, Kakinada during the academic year 2022 to 2023 is a record of bonafide work carried out by them under my guidance and supervision. The results presented in this thesis have been verified and are found to be satisfactory. The results embodied in this thesis have not been submitted to any other University or Institute for the award of any other degree or diploma.*

Project Guide
Mr.G.Nageswara Rao
Associate Professor
Department of IT

Head of Department
Dr.K.Subhash Bhagavan
Associate Professor & HOD
Department of IT

External Examiner

SASI INSTITUTE OF TECHNOLOGY & ENGINEERING AUTONOMOUS
TADEPALLIGUDEM
West Godavari District

National Level Accreditation NAAC ACCREDITED A

NBA NATIONAL BOARD OF ACCREDITATION

Department of Information Technology

DECLARATION BY THE CANDIDATES

We,G.Harshitha (19K61A1215), N.Akanksha (19K61A1240), A.Harika (19K61A1201),here by declare the project report entitled **"SECURE HOME AUTOMATION USING RASPBERRY PI BY TELEGRAM APP"** under esteemed supervision of **Mr.G.Nageswara Rao**, is submitted in partial fulfilment of the requirements for the award of the degree of Bachelor of Technology in Information Technology. This is a record of work carried out by us and the results embodied in this project have not been reproduced or copied from any source. The results embodied in this project report have not been submitted to any other University or Institute for the award of any other degree or diploma.

G.Harshitha (19K61A1215)

N.Akanksha (19K61A1240)

A.Harika (19K61A1201)

ACKNOWLEDGEMENT

We pay obeisance to the dynamic Chairman of Sasi Educational Society, **Sri Burugupalli Venu Gopala Krishna**, for his inspiring presence, which has always been the principle driving force behind all over endeavors.

First of all, we would like to thank **Mr. Meka Narendra Krishna**, Vice-Chairman, Sasi Institute of Technology and Engineering, for his everlasting support.

We would like to thank **Dr. K Bhanu Prasad**, Director, Sasi Institute of Technology and Engineering, for his support.

We would like to thank **Dr. Mohammed Ismail** , Principal , Sasi Institute of Technology and Engineering, for his support.

We would like to thank **Dr. T J V Subrahmaneswara Rao**, Dean Students Affairs , Sasi Institute of Technology and Engineering, for his support.

We would like to thank **Dr. K Subhash Bhagavan**, Associate Professor and Head of the Department, Information Technology, Sasi Institute of Technology and Engineering for providing us with invaluable feedback on our work, which allowed us to constantly improve.

We are greatful to our project coordinator **Dr. S.Phani Kumar**, Associate Professor and thanks to all teaching and non teaching staff members those who contributed for the successful completion of our project work.

We would like to thank our Guide **Mr. G.Nageswara Rao**,Associate Professor, Sasi Institute of Technology and Engineering for his constant encouragement, monitoring and guidance throughout the submission of the project. He motivated us whenever we encountered an obstacle along the way.

We wish to thank my family and many other people whose names are not mentioned here but this does not mean that we have forgotten their help.

With gratitude,

G.Harshitha (19K61A1215)

N.Akanksha (19K61A1240)

A.Harika (19K61A1201)

INSTITUTE VISION AND MISSION

Institute Vision

Aspire to be a leading institute in professional education by creating technocrats to propel societal transformations through inventions and innovations

Institute Mission

1. To impart technology integrated active learning environment that nurtures the technical & amp; life skills.
2. To enhance scientific temper through active research leading to innovations & amp; sustainable environment.
3. To create responsible citizens with highest ethical standards.

DEPARTMENT VISION AND MISSION

Department Vision

To become recognized centre for excellence for quality Information Technology education and create professionals with ability to solve social needs.

Department Mission

1. Provide quality teaching learning environment oriented towards employ ability and career development.
2. Conduct training/events for overall development of stake holders with collaborations.
3. Impart value base education to serve the society with high integrity and good character.
4. Provide state of the art facilities to enable innovation, student centric learning.

PROGRAM OUTCOMES (POs)

Students in the Information Technology program should, at the time of their graduation, be in possession of :

PO1. Engineering knowledge : Apply the knowledge of mathematics, science,engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis : Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics natural sciences, and engineering sciences.

PO3. Design/development of solutions : Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to valid conclusions.

PO5. Modern tool usage : Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society : Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability : Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

PO8. Ethics : Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and Team Work : Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.

PO10. Communication : Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

PO11. Project Management and Finance : Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long Learning : Recognize the need for, and have the preparation and ability to engage in independent and life-long learning i the broadcast context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1. Application Development : Develop risk free innovative IT applications or industrial needs.

PSO2. Successful Career and Entrepreneurship : Explore technical knowledge in diverse areas of IT and experience an environment conductive in cultivating skills for successful career, entrepreneurship and higher studies.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1. Possesses strong knowledge about Information Technology applications and leadership qualities.

PEO2. Pursue successful career in Information Technology and allied industries, innovate and provide solutions for global needs.

PEO3. Have attitude towards life-long learning attitude and practice professional ethics.

PROJECT OUTCOMES (PROs)

PRO1. Identifying the problems by doing a thorough literature survey of the existing research related to Secure Home Automation Using Raspberry Pi By Telegram App.

PRO2. Analyze, design and develop a solution for Secure Home Automation Using Raspberry Pi by Telegram App to meet societal needs and industry standards for project management and finance.

PRO3. Develop employability and the ability to work in a team following the best ethical practices with a spirit for life-long learning and sharpening communication and presentation skills for authorized person through webcam.

PRO4. Make use of appropriate tools or techniques for sustainable development of a solution.

PRO5. Create interest to research different sources to check authorized or unauthorized person information automatically and authorizing the unauthorized through Telegram Notification.

PRO6.PRO6.Construct a platform that makes users to interact with proposed system.

EXPECTED OUTCOMES

1. **PROGRAM OUTCOMES(POs)**
    - **PO1 :** Engineering knowledge
    - **PO2 :** Problem analysis
    - **PO3 :** Design/development of solutions
    - **PO4 :** : Conduct investigations of complex problems
    - **PO5 :** Modern tool usage
    - **PO6 :** The engineer and society
    - **PO7 :** Environment and sustainability
    - **PO8 :** Ethics
    - **PO9 :** Individual and team work
    - **PO10 :** Communication
    - **PO11 :** Project management and finance
    - **PO12 :** Life-long learning
2. **PROGRAM SPECIFIC OUTCOMES(PSOs)**
    - **PSO1 :** Application Development
    - **PSO2 :** Successful Career and Entrepreneurship

SYNOPSIS OF THE PROJECT

Title of the project:

SECURE HOME AUTOMATION USING RASPBERRY PI BY TELEGRAM APP

Abstract

Automated secure entry is a basic need in today's Home Automation System. To accomplish this need, we are proposing secure home entry system using Internet of Things. This proposal is an attempt to construct a smart, innovative and secure entry by using the raspberry pi controller, camera and various other associated sensors. To enhance the home security system, the best possible way is to use facial recognition and has been implemented in our proposal. In existing system, notification is through E-mail or Twitter account. Due to popularity and flexibility of using current social network for all type of generation, we are proposing home security system using Telegram notification. The advantage of using Telegram App for this project is to send notification to the user as it provides an instant secure communication between the user and the home automation system.

Objectives of the study:

The aim of this project is to allow Authorized persons into home and capture Image of Unauthorized person, sending through Telegram.

This system uses OpenCV is a Python open-source library, which is used for computer vision in Artificial intelligence, Machine Learning, face recognition Computer vision allows the computer to perform the same kind of tasks as humans with the same efficiency. In the object classification, we train a model on a dataset of particular objects, and the model classifies new objects as belonging to one or more of your training categories.In the object identification, our model will identify a particular instance of an object

The objective is to Machines are facilitated with seeing everything, convert the vision into numbers and store in the memory. Here the question arises how computer convert images into numbers. So the answer is that the pixel value is used to convert images into numbers. A pixel is the smallest unit of a digital image or graphics that can be displayed and represented on a digital display device.

The rational of the study:

- Surveying base papers
- Analysis on existing system
- Problem identification in existing system
- Requirements gathered for the proposed system
- Develop the proposed system

Detailed methodology used for carrying out the study:

- Hardware requirements, software requirements, and user requirements are necessary for the proposed system's implementation design. The suggested system's control flow is depicted in the Hardware Components:
- Raspberry Pi
- USB Camera
- Sd card
- Servo Motor(door)
- IR sensor
- Telegram app
- Power supply

The expected contribution from the study:

- The main objective of this project is to allow Authorized persons into home and capture Image of Unauthorized person, sending through Telegram
- By using the proposed system we have security.
- This system provides message to the user about unauthorized person.

Examples of NLP are:

1. Motion detect
2. Camera capture photo
3. Authorized person
4. Door open
5. Unauthorized person detect in front of door
6. Camera capture photo send photo through telegram app by user

Below bar graph represents the time allocated for the completion of project.

Places/Labs/Equipment and tools required and planning of arrangements:

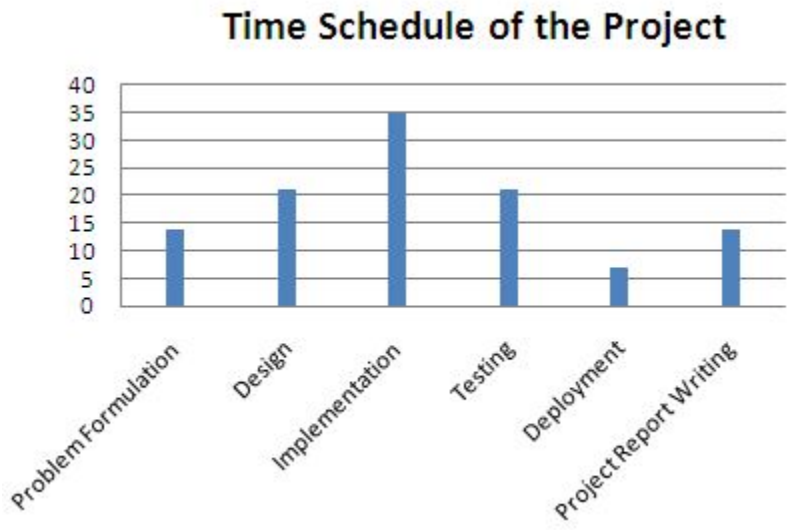
HARDWARE REQUIREMENTS:

- IR Sensor
- Raspberry Pi
- USB Camera
- SD card
- Servo Motor(door)
- Telegram app
- Power supply

SOFTWARE REQUIREMENTS:

- Open cv Python language
- IDLE Software

Problems envisaged in carrying out the project, if any : Nill



Synopsis Prepared by	**Synopsis Guided by**
G.Harshita(19K61A1215)	**Mr.G.Nageswara Rao**
N.Akanksha(19K61A1240)	Associate Professor
A.Harika(19K61A1201)	Department of IT
Signature:	Signature:
Signature:	
Signature:	

Abstract

Automated secure entry is a basic need in today's Home Automation System. To accomplish this need, we are proposing secure home entry system using Internet of Things. This proposal is an attempt to construct a smart, innovative and secure entry by using the raspberry pi controller, camera and various other associated sensors. To enhance the home security system, the best possible way is to use facial recognition and has been implemented in our proposal. In existing system, notification is through E-mail or Twitter account. Due to popularity and flexibility of using current social network for all type of generation, we are proposing home security system using Telegram notification. The advantage of using Telegram App for this project is to send notification to the user as it provides an instant secure communication between the user and the home automation system.

Contents

List of Tables

List of Figures

Chapter 1

INTRODUCTION

The main objective of this project is to allow Authorized persons into home and capture Image of Unauthorized person and control home application by on and off commands sending through Telegram..

1.1 Introduction

The project aims at designing an advanced home automation system using normal web server and Wi-Fi technology. The devices can be switched ON/OFF and sensors can be read using a Personal Computer (PC) through Wi-Fi.

Automation is the most frequently spelled term in the field of electronics The hunger for automation brought many revolutions in the existing technologies These had greater importance than any other technologies due to its user-friendly nature These can be used as a replacement of the existing switches in home which produces sparks and also results in fire accidents in few situations Considering the advantages of Wi-Fi an advanced automation system was developed to control the appliances in the house.

Wi-Fi (Short for Wireless Fidelity) is a wireless technology that uses radio frequency to transmit data through the air. Wi-Fi has initial speeds of 1mbps to 2mbps. Wi-Fi transmits data in the frequency band of 2.4 GHz. It implements the concept of frequency division multiplexing technology. Range of Wi-Fi technology is 40-300 feet.

The controlling device for the automation in the project is a Raspberry pi. The data sent from PC over Wi-Fi will be received by Wi-Fi module connected to Raspberry pi. Raspberry pi reads the data and decides the switching action of electrical devices connected to it through Relays.

1.2 Problem Formulation

The problem is to develop a face recognition-based door opening system that can identify authorized individuals and automatically unlock the door for them while denying access to unauthorized individuals. This involves designing a system that can recognize faces captured by a camera mounted on the door and compare them to a database of authorized individuals. The system should be able to recognize faces even if the individual is wearing a mask or glasses and should work in different lighting conditions while being fast, reliable, and accurate.

The output of the system is a decision on whether the individual in front of the camera is authorized or not. If authorized, the system should unlock the door, and if not, it should remain locked. The system assumes that the individuals in the database have already been authorized to access the door and has access to a reliable and up-to-date database. It is also connected to the door's locking mechanism and can control its lock/unlock status.

1.3 Motivation

The motivation for a face recognition door opening system is to improve security and convenience for access control while eliminating the limitations of traditional methods. Face recognition technology has advanced significantly, making it more reliable and accessible. The COVID-19 pandemic has accelerated the adoption of touchless technologies, and face recognition systems offer a safer and more hygienic approach to access control. This project has the potential to enhance security, convenience, and hygiene in various settings.

1.4 Proposed System

The proposed face recognition door opening system uses a camera, microcontroller, and a database of authorized individuals to authenticate access. It leverages deep learning-based algorithms that can recognize faces in challenging conditions, and the microcontroller controls the locking mechanism. The system maintains an updated database and can store access logs and generate alerts in case of unauthorized attempts. It offers fast, secure, and convenient access control while enhancing hygiene and safety.

1.5 Scope of the Project

The project aims to design, develop and implement a face recognition door opening system prototype that can authenticate authorized individuals and unlock the door for them while denying

access to unauthorized individuals. It includes researching algorithms, designing the system architecture, integrating hardware and software components, testing the system, and implementing access logs and alerts. The project scope does not include installation or legal/ethical considerations.

The scope of a project to create a smart door with face recognition would typically include the following components:

1. **Hardware:** This would involve selecting and installing the necessary hardware components, such as a camera for facial recognition, a microcontroller for controlling the door's actions, and any necessary wiring.
2. **Facial recognition software:** This would involve selecting or developing facial recognition software to recognize authorized faces and control access to the door.
3. **User interface:** This would involve creating an interface for users to interact with the smart door, such as a touchscreen or a mobile app.
4. **Security:** This would involve implementing security features to prevent unauthorized access, such as encryption of data, secure communication protocols, and protection against hacking attempts.
5. **Integration with other systems:** Depending on the specific use case, the smart door may need to integrate with other systems, such as a home automation system or a security monitoring system.
6. **Testing and validation:** Once the hardware and software components are in place, extensive testing and validation would be necessary to ensure the system works as intended and meets safety and security standards.

   Overall, the scope of the project would be to create a secure and reliable smart door system that can accurately recognize authorized users and control access to the door in a convenient and user-friendly way.

Chapter 2

LITERATURE SURVEY

2.1 Reference Papers

In the context of a project, a literature survey plays a crucial role in establishing the project's scientific validity and informing its design and implementation. By examining and synthesizing previous research and literature relevant to the project's objectives and methodology, the survey provides a theoretical framework and establishes the project's context. This enables the project team to identify and build on existing knowledge, avoid duplication of efforts, and address any gaps or shortcomings in the existing research. Furthermore, a literature survey can help to refine the research question or project objectives, identify potential challenges or limitations, and establish criteria for measuring success.

A literature survey typically involves a systematic search for relevant literature using appropriate keywords and search terms, followed by a critical evaluation of the quality and relevance of the identified literature. The survey should be comprehensive and objective, and the findings should be documented and referenced to ensure transparency and accuracy. By leveraging the insights gained from a literature survey, project teams can improve the quality and effectiveness of their research or development efforts, ensure the project's relevance and impact, and contribute to the advancement of knowledge in the field.

Literature Review

Dey, Roy, and Das [1] Technology alters peoples daily routines, An android app is created to assist old individuals who are unable to aid themselves, and this created system is used by people who live alone. This systems implementation makes use of WIFI and an easy-to-use web server, both of which have the potential for future growth when combined with improved sensors to boost sensor precision (like up to street Nights)

Sunehra and Ramana [2] Users can access household equipment at any time by connecting to the network and controlling them as necessary. This system also offers security as it sends an email notice to the user when it detects an intruder or person The system is operated via a web page and a telegram bot.

Kadali, Prasad, Kudav, *et al.*[3] Home automation system that combines many technologies, such as the Internet of Things. The primary benefit of this system is that it offers users both text and voice communication options. A chat bot application will be used for the users text input, and a voice assistant will be used for the users voice input.

Biswas and Mynuddin [4] Three levels of security have been guaranteed. Use of NFC tags with a PIR motion sensor and a password. The door wont open if one of them isnt there. A lock is attached to the shaft of the servomotor that will be used to unlock the door. When the incorrect password is entered, the LCD shows error text.

Kodali, Jain, Bose, *et al.* [5] By managing and interacting with remote control of home appliances, the IOT offers a comfortable way of living to people. Two Node MCUs are present in the proposed system. The Node MCU (Node micro controller unit) is an open-source device that combines hardware and software to create a far less expensive system based on the ESP8266 chip.

Dash and Choudekar [6] While an automated home can be referred to or classified as a smart home, a wireless home automation system employing the internet of things employs computers or mobile devices to operate features automatically through the internet from anywhere in the globe.

Nakrani, Panchal, Thakkar, *et al.* [7] These systems often include a detecting and actuation layer made up of passive infrared sensors, also referred to as motion sensors, and web cameras for security.

Reddy, Cheerla, Inthiyaz, *et al.* [8] In this system, devices including lighting, fans, and camera access are employed. Any internet-capable device, such as a smart phone or laptop, may be used to control home appliances thanks to an Android application and a Telegram bot. Additionally, the proposed system offers home security by using a camera that can send photos via a Telegram bot message when no one is home.

Satapathy, Bastia, and Mohanty [9] To serve as a connectivity module to show the systems

effectiveness and viability. It enables the user to remotely manage a variety of appliances, including lights, fans, and televisions, as well as make decisions based on sensor feedback on various environmental factors.

Rao, Vinod, Priyanka, *et al.* [10] The study is primarily focused on IOT-based home automation utilising a wireless raspberry PI system. IOT enables us to control basic home appliances automatically via the internet from anywhere in the world using PCs or mobile devices.

Hema and Yadav [11] These days, everything moves at supersonic speeds, and digital media allows for data to be exchanged at the speed of light. Therefore, utilising Internet protocols, information must come in at the same rate.

Desai and Pawar [12] The IoT is at its height in the modern world. As the world becomes smarter, home automation is starting to take off. One of the newest technologies in home automation is smart door control. This study seeks to expand the door automation method utilising a Raspberry Pi and an Android device.

kh Shakthi and Abishiek et. al [13] A smart home is a networked association of automation and management for extraordinary living. Home security is crucial in this regard, becoming a crucial aspect of our lives.

Reeta [14] The facial recognition technology works by first taking a picture with a camera. The snippet of code recognises an individuals characteristics. Using a Raspberry Pi, the captured image is compared to the database of photos after being detected. The faces are then compared to see if they match or not. After that, if an intruder tries to enter the premises, the SIM300 GSM module transmits a security alert to the designated person.

Pallavi *et al.* [15] Our project aims to create devices that are simple to operate, including home applications and other devices. Using an application on a cell phone with an Android, iOS, or Windows operating system installed, we may operate fans, air conditioners, lights, and other appliances.

Amri and Setiawan [16] Email was the basis on which the smart home was formed. This research examined a home security system that identifies facial patterns to allow access. Cameras and a BeagleBone are used in this system. Email was used by the system to interact with users.

Anvekar and Banakar [17] The database contains pictures of people who have been granted

approval. The camera records the face of the person who rings the doorbell when they approach the door and compares it to previously recorded photographs in the database. The door unlocks if the image is a match with the one being captured at the moment. If it fails, the user receives the captured face.

Kumar and Mittal [18] The system includes a backup in case there is a power outage issue. The power backup devices are switched in place of the main supply, and they continue to power the security system.

Demir, Şimşek, Gür, *et al.* [19] The goal of their future study is to create an anonymous secure framework (ASF) for smart homes. The ASF model focuses on session key progression and routine key renewal to get rid of any faults brought on by a compromised key. Although this model offers unlinkability and anonymity,it is missing the property of anonymous identification.

Taiwo and Ezugwu [20] The smart home is now an established area of interest and research that contributes to comfort in modern homes. With the Internet being an essential part of broad communication in modern life, IoT has allowed homes to go beyond building to interactive abodes. In many spheres of human life, the IoT has grown exponentially, including monitoring ecological factors, controlling the home and its appliances.

Table 2.1: Literature Study

R. No.	TITLE	Year	METHODOLOGY	LIMITATIONS
[1]	“Secure home entry using raspberry pi with notificat ion via telegram” N. Hema and J. Yada	2021	Arduino, Relay, Led, Fan, Node MCU is used for automation	Security, privacy, and design ing, developing the system is very complex
2	“Webpage And Telegram Bot Controlled Home Aut omation System using raspberrypi3” D. Suneha and G.V Ramana	2020	Three 2-channel relays, two fans and 2 light ,elec tromagnetic door lock, The PIR Sensor , GPIO pins	SMTP server updation can be delayed as usage Of Raspberry Pi makes it more complex as detection of Introdution Send mail. (It can be enchanced further)
[3]	“Home Automation Using Chat bot And Voice Assis tant ”B.Kadali,N.prasad, p.Kudav and Manoj	2020	Raspberry Pi NLP unit: natural language pro cessing Spoken-to-text conversion will be applied to the Voice Assistant module’s speech input. processing, hence pro viding a text input to the NLP module, The entire processing of the acquired input happens in this unit.	The system can be further made inclusive of extensions such as attaching of email services as an alternate form of message delivery, in situ ations of utmost importance. The number of devices that can be connected to the sys tem can not be expanded to a larger range.
[4]	“Design And Implementa tion Of Smart Home Secur ity System” P. Biswas and M.Mynuddi	2020	PIR sensor, pin, servo motor ,buzzer ,VDD ,VSS ,power supply crystal osci llator set of authorized person data microcontr oller sends signal to servo motor	Developing the system is very complex which leads to not reachong all the features.

[5]	“Iot Based Smart Security by And Smart Automation” R.K,Kodali V.Jain, S.Bose and L.Boppana	2020	Remotely controlled room temperature, automatic fans, and automatic lights	Security ,privacy, and de signing, developing, manag ing the system .
[6]	“Home Automation And Se curity Using Iot”Dash and P.Choudehar	2020	Drivers/devices, sen sors, Wi-Fi router mobile ESP8266 node MCU Wi-Fi Module, Relay Module, DHT11, Current Sensor configure ESP8266 .	This concept combines home automation and security, both of which are necessary nowadays.
[7]	“A review internet of things based smart home autom ation” V.Nakrani , M.Pan chal D.Thakkar ,s.pedne kar and Y. Mane	2021	NodeMCU , ArduinoNano , Relay LCD , DHT11 sensor, MQ9 Gas sensor ,Touch Sensor, Buzzer Operation Voltage,	IoT digital code lock security is provided as an advanced feature.
[8]	“Face recoginition and ho me automation using tele gram bot”V.S.Reddy, S.Cheerla,S.I nthiyaz, and V.Chakravarthy	2019	Telegram , Telegram bot, Bot Father , The Rasp berry Pi , Temperature sensor DHT11, Pi Cam	Computer vision can be used for motion detection and alerting through telegram
[9]	“Arduino Based Home Automation Using Internet Of Things ”L.M.Satapathy S.K.Bastia and N.Mohanty	2019	Arduino UNO , 4-Channel Relay , ESP8266-01, WIFI, Gas Sensor , Tem perature Sensor, Software Design , Implementation ,	reducing the time it takes an appliance to switch on and off, Adding speech recog nition to the system, uti lising Wi-fi to detect smart phones automatically so that the loads are activated when they are in range, Wi-Fi range
[10]	“Iot Based Web Controlled Home Automation Using Raspberry Pi” G. Rao A.Vinod and Priyanka	2019	Raspberry pi , Voltages , SPI , I2C, Serial, Camera , Pir sensor , Relay mod ule, Digital humidity and temperature sensor , door sensor	Security ,privacy, and de-signing ,developing the sys-tem is very complex

[11]	"Secure home entry using raspberry pi with notification via telegram " N.Hema and J.yadav	2019	Telegram protocol, Remote Support, Meetings Presentations, Remote Access Remote Office Remote Home, Home electronics unit (HEU) , Telegram application unit (TAU),	SMTP server updation can be delayed as usage Of Raspberry Pi makes it more complex as detection of Intruduction Send mail. (It can be enchanced further)
[12]	"Smart Door Security System Using Raspberry Pi With Telegram"Desai, Virendra	2019	Raspberry pi B3 , PIR Sensor , Camera Module , Wi-Fi Module .Telegram App	The system can be further made inclusive of extensions such as attaching of email services as an alternate form of message delivery, in situations of utmost importance. The number of devices that can be connected to the system can not be expanded to a larger range.
[13]	"Advanced Smart Home Security Alert System" S.M.KH.K.Sumathi, V.mona ,I.M,Elias and S. M.Raj	2019	facial recognition, Raspberry Pi 3, camera module , door lock, automation, security	Developing the system is very complex which leads to not reachong all the features
[14]	"Smart Secure Door Lock System Using Iot And Eigenface Approach" Reeta R	2018	IoT, Wi-Fi modem, relay, Python, Eigenface, Raspberry Pi	The development of an interactive smart home security system with the raspberry pi, Web-based control systems and using the Eigenface technology
[15]	"Controlling smart Home Automation using raspber -ry pi"	2018	Home automation, Home security, Internet of Things, Python language, Raspberry Pi3, Android, Telegram Bot	Computer vision can be used for motion detection and alerting through telegram.

[16]	“Improving Smart Home Concept With The Internet Of Things Concept Using Raspberry pi And Nodemc u”Y .Amri abd Setiawan	2018	Raspberry Pi ,NodeMCU, rain sensor, door sen- sor, passive infrared sen- sor (PIR), DHT22	Improve home security The system does not require a great power Users can control and monitoring the house re- motely
[17]	”Iot application developme nt :Home security system” R.G.Anvekat and R.M.Ban akar	2018	facial recognition, Rasp- berry Pi 3,camera mod- ule, door lock, automa- tion, security	Developing the system is very complex which leads to not reachong all the features..
[18]	“A Novel Design And Impl ementation Of Smart Hom eSecurity System: Future Perspective”R .Kumarand P .Mittal	2017	Security, sensors, Internet of Things (IOT), and GSM (Global System Mobile Co- mmunication)	This security system has gene ric concept and implementa- tion with effective GSM to not- ify user with message with raising alarm.
[19]	“Secure and privacy pres- erving iot gateway for hom- e automation ”S.Demir, S.simsek,S.gur and A.levi	2017	IoT device, Vendor, Nonce with identifier	Security ,privacy, and de signing, developing, manag. ing the system
[20]	“Internet Of Things-Based IntelligentmSmart Home Control System” Olutosin Taiwo and Absalom	2017	sensors, an ESP32-CAM board, a 5 V, 4-channel relay module, and an ESP8266 board.	The home automation system allows remote and local cont rol of the home. The system controls electrical home appli ances, monitors environment al conditions through temper ature, humidity, and light sen sors, and ensures home secur ity through a motion sensor and an IoT camera

2.2 Used Software Installations

2.2.1 Open CV

OpenCV is a Python library that allows you to perform image processing and computer vision tasks. It provides a wide range of features, including object detection, face recognition, and tracking.

OpenCV is an open-source software library for computer vision and machine learning. The OpenCV full form is Open Source Computer Vision Library. It was created to provide a shared infrastructure for applications for computer vision and to speed up the use of machine perception in consumer products. OpenCV, as a BSD-licensed software, makes it simple for companies to use and change the code. There are some predefined packages and libraries that make our life simple and OpenCV is one of them

2.3 Computer Vision

The term Computer Vision (CV) is used and heard very often in artificial intelligence (AI) and deep learning (DL) applications. The term essentially means giving a computer the ability to see the world as we humans do

2.4 Open CV working process

2.4.1 How does computer recognize the image

Human eyes provide lots of information based on what they see. Machines are facilitated with seeing everything, convert the vision into numbers and store in the memory. Here the question arises how computer convert images into numbers. So the answer is that the pixel value is used to convert images into numbers. A pixel is the smallest unit of a digital image or graphics that can be displayed and represented on a digital display device

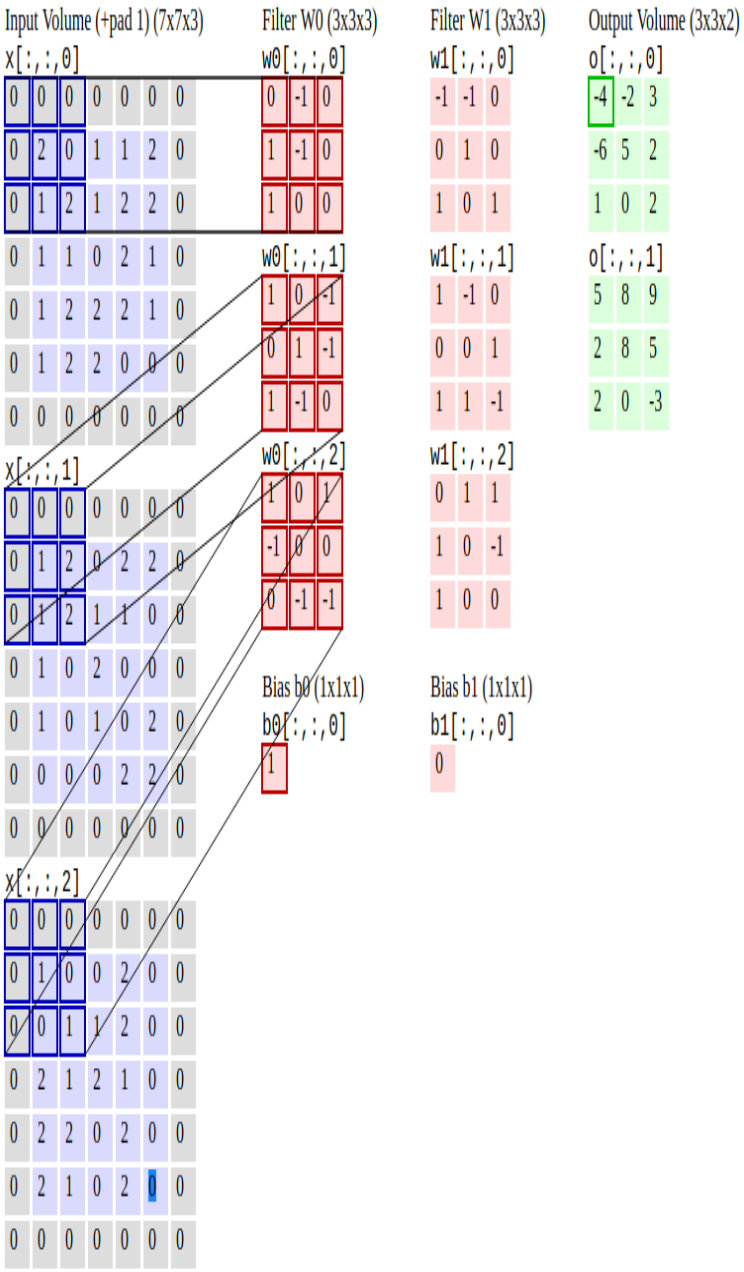


Figure 2.1: Computer vision

The picture intensity at the particular location is represented by the numbers. In the above image, we have shown the pixel values for a grayscale image consist of only one value, the intensity of the black color at that location.

There are two common ways to identify the images:

1. **Grayscale** Grayscale images are those images which contain only two colors black and white. The contrast measurement of intensity is black treated as the weakest intensity, and white as the strongest intensity. When we use the grayscale image, the computer assigns each pixel

value based on its level of darkness.

2. **RGB** An RGB is a combination of the red, green, blue color which together makes a new color. The computer retrieves that value from each pixel and puts the results in an array to be interpreted.

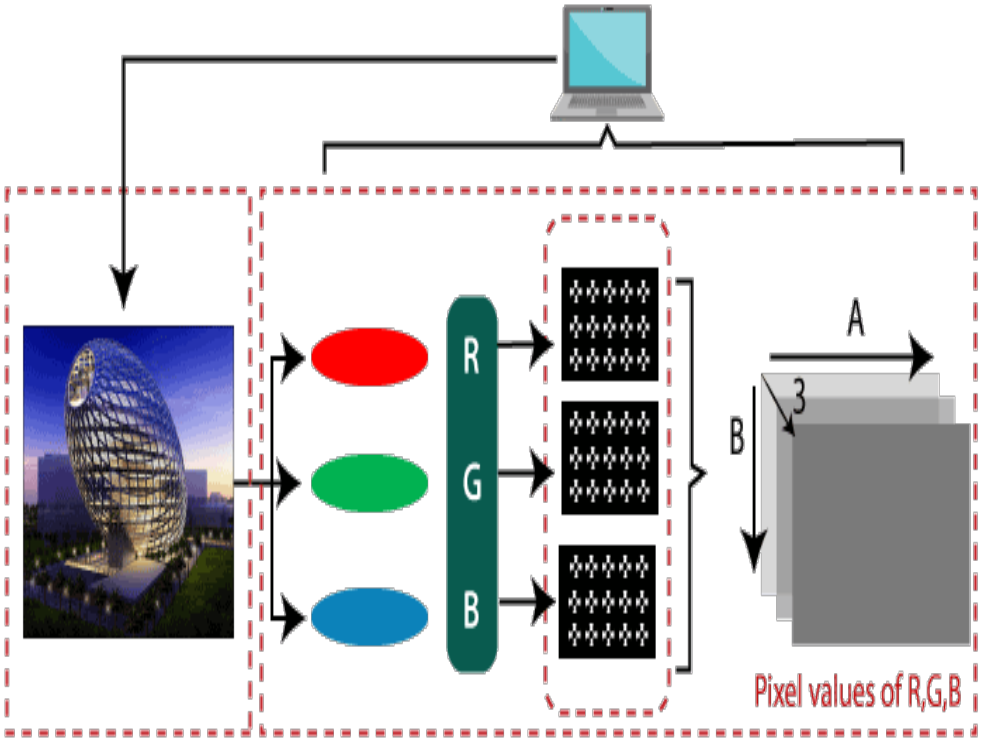


Figure 2.2: RGB recognition

2.5 Advantage of computer vision

1. OpenCV is available for free of cost.
2. Since the OpenCV library is written in C/C++, so it is quit fast. Now it can be used with Python.
3. It require less RAM to usage, it maybe of 60-70 MB.
4. Computer Vision is portable as OpenCV and can run on any device that can run on C.

2.6 Face recognition and Face detection using the OpenCV

The face recognition is a technique to identify or verify the face from the digital images or video frame. A human can quickly identify the faces without much effort. It is an effortless task for us,

but it is a difficult task for a computer. There are various complexities, such as low resolution, occlusion, illumination variations, etc. These factors highly affect the accuracy of the computer to recognize the face more effectively. First, it is necessary to understand the difference between face detection and face recognition.

Face Detection: The face detection is generally considered as finding the faces (location and size) in an image and probably extract them to be used by the face detection algorithm.

Face Recognition: The face recognition algorithm is used in finding features that are uniquely described in the image. The facial image is already extracted, cropped, resized, and usually converted in the grayscale.

There are various algorithms of face detection and face recognition. face detection using the HAAR cascade algorithm.

Chapter 3

SYSTEM DESIGN AND ANALYSIS

3.1 System Architecture

A face recognition door lock system is a security system that uses facial recognition technology to identify authorized individuals and grant them access to a locked area or door. The system captures an image of the person's face, compares it to a database of authorized individuals, and unlocks the door if there is a match. The system can be used in various settings, including homes, offices, and public spaces, to enhance security and prevent unauthorized access. The system is reliable and convenient, eliminating the need for traditional keys or access cards, and reducing the risk of security breaches.

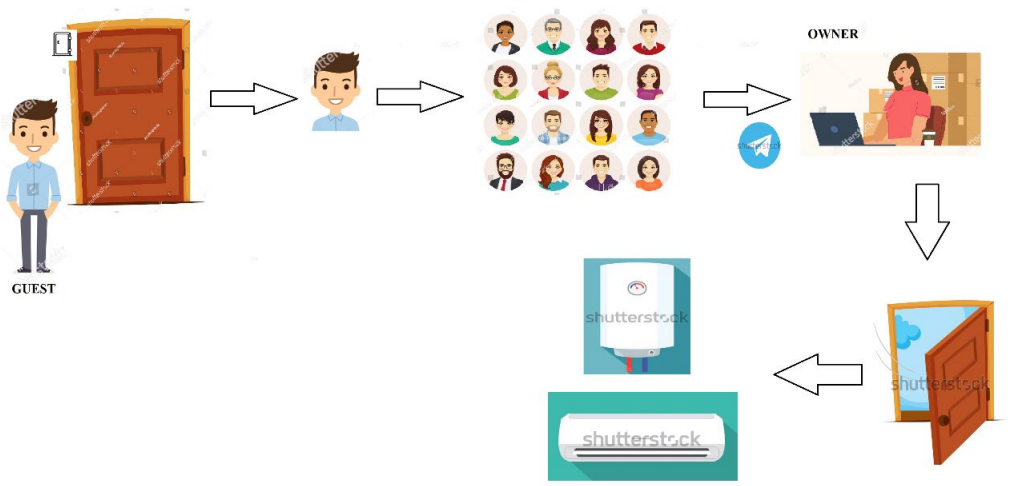


Figure 3.1: Architecture Diagram for Secure Home Automation

3.2 Block Diagram

In this proposal to increase the interaction with home security system various additional modules like image processing and Telegram are used.

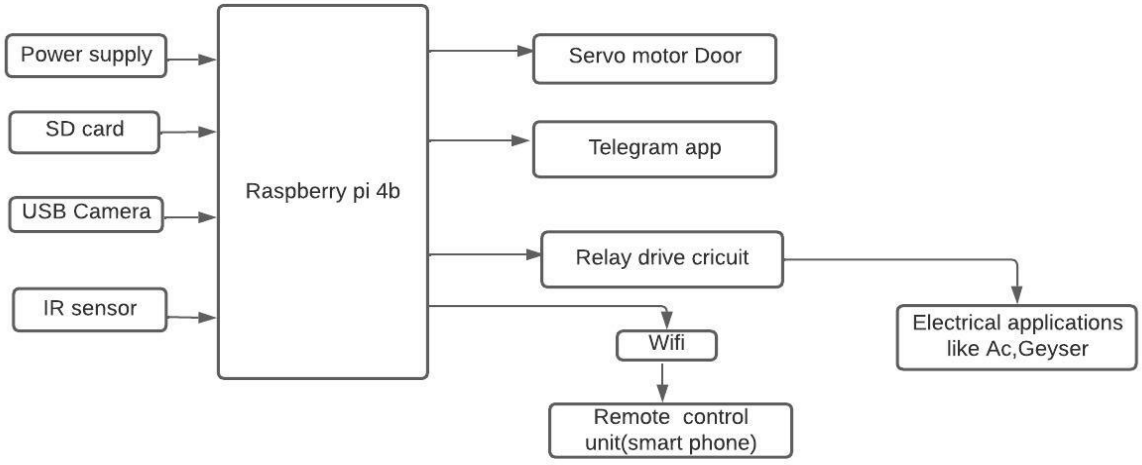


Figure 3.2: Block Diagram for Secure Home Automation

3.3 DFD Diagrams

3.3.1 DFD Diagram

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It can be manual, automated, or a combination of both. It shows how data enters and leaves the system, what changes the information, and where data is stored. The objective of a DFD is to show the scope and boundaries of a system as a whole. It may be used as a communication tool between a system analyst and any person who plays a part in the order that acts as a starting point for redesigning a system. The DFD is also called as a data flow graph or bubble chart.

3.3.2 Levels in Data Flow Diagrams (DFD)

The DFD may be used to perform a system or software at any level of abstraction. Infact, DFDs may be partitioned into levels that represent increasing information flow and functional detail. Levels in DFD are numbered 0, 1, 2 or beyond. Here, we will see primarily three levels in the data flow diagram, which are:

1. 0-level DFD

2. 1-level DFD

3. 2-level DFD

0-level DFD:

It is also known as fundamental system model, or context diagram represents the entire software requirement as a single bubble with input and output data denoted by incoming and outgoing arrows.

Then the system is decomposed and described as a DFD with multiple bubbles. Parts of the system represented by each of these bubbles are then decomposed and documented as more and more detailed DFDs.

This process may be repeated at as many levels as necessary until the program at hand is well understood. It is essential to preserve the number of inputs and outputs between levels, this concept is called leveling by DeMacro.

Thus, if bubble "A" has two inputs x1 and x2 and one output y, then the expanded DFD, that represents "A" should have exactly two external inputs and one external output

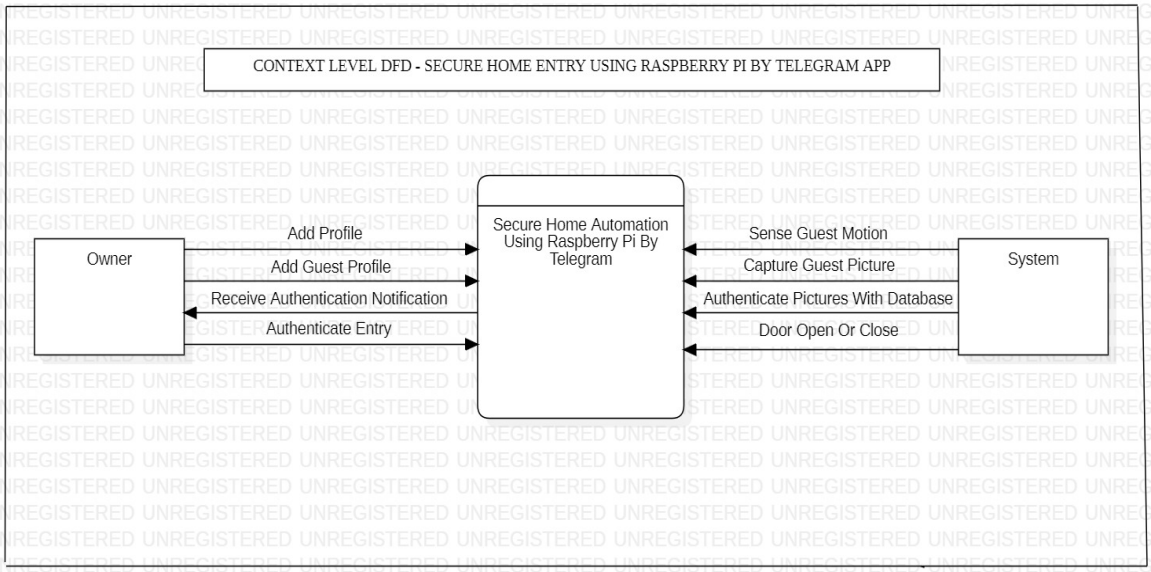


Figure 3.3: Context level for Secure Home Automation

It represents the methodology used in system analysis to identify, clarify and organize system requirements.

1-level DFD

In 1-level DFD, a context diagram is decomposed into multiple bubbles/processes. In this level, we highlight the main objectives of the system and breakdown the high-level process of 0-level DFD into subprocesses.

At Level 1 of a DFD, the diagram provides an overview of the entire system or process, including all major inputs and outputs. It shows the main functions or processes that are involved, as well as the data that flows between them. The Level 1 DFD provides a good starting point for understanding the system or process, and can be used to identify areas for improvement or optimization.

The Level 1 DFD is often used as a basis for developing more detailed diagrams, such as Level 2 or Level 3 DFDs, which break down the system or process into more detailed components and interactions. Overall, the DFD is a useful tool for analyzing and understanding complex systems, and can be used in a variety of contexts, including software development, business process analysis, and systems engineering.

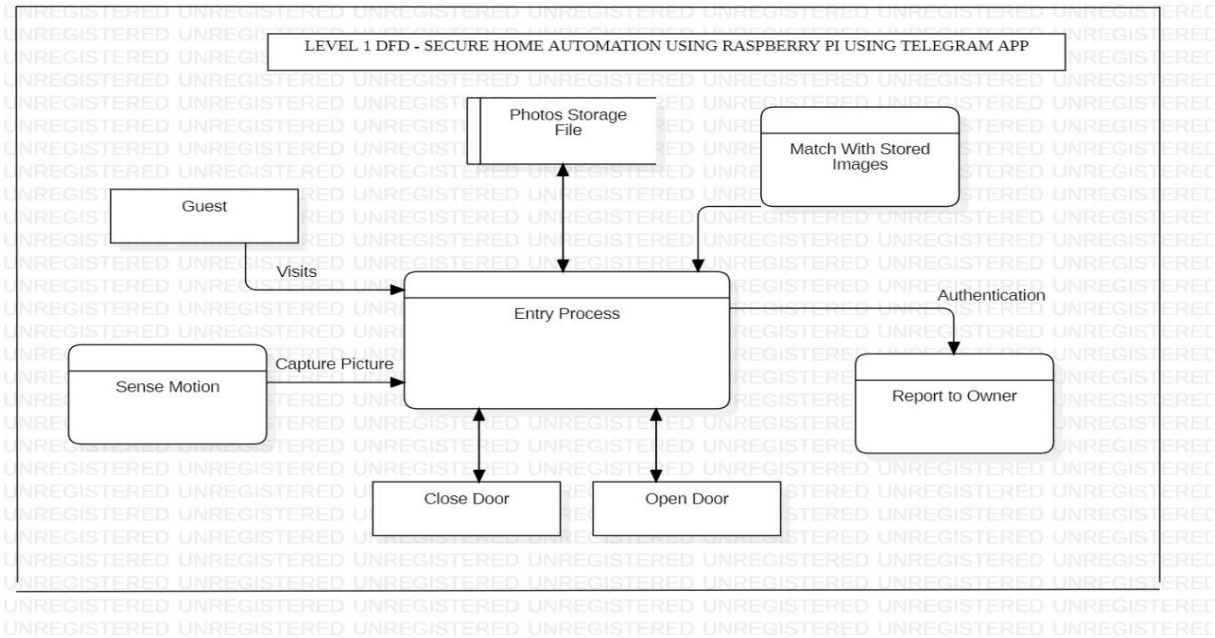


Figure 3.4: LEVEL1 for Secure Home Automation

2-level DFD

2-level DFD goes one process deeper into parts of 1-level DFD. It can be used to project or record the specific/necessary detail about the system's functioning.

In DFD modeling terms we talk of the context diagram as the “parent” and the level 1 diagram as the “child”. This same process can be applied to each process appearing within a level 1 DFD. A DFD that represents a decomposed level 1 DFD process is called a level 2 DFD.

A Data Flow Diagram (DFD) Level 2 is a type of diagram that provides a more detailed view of a specific process or subsystem within a system or process that was depicted in the Level 1 DFD. Level 2 DFDs break down the high-level processes or functions identified in the Level 1 diagram into more specific and detailed components, showing how data moves through the system at a more granular level.

At Level 2, the DFD focuses on a single process or subsystem and shows the inputs, outputs, and processing steps involved in that specific area. The Level 2 DFD will show more detail than the Level 1 DFD, including any sub-processes or tasks that are involved in the system. The data flows shown in the Level 2 diagram should align with the data flows identified in the Level 1 DFD.

The Level 2 DFD can be used to identify any potential bottlenecks or inefficiencies in the system, as well as to help identify areas where changes or improvements could be made. It is often used as a basis for developing even more detailed diagrams, such as Level 3 DFDs or flowcharts, which provide an even more detailed view of the specific process or subsystem.

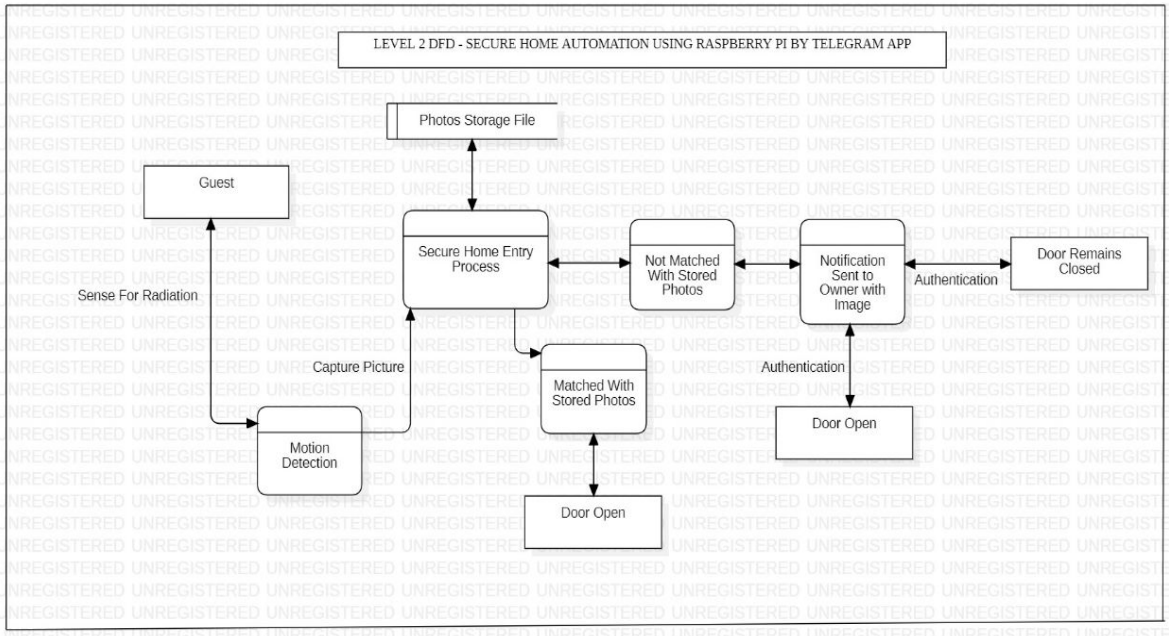


Figure 3.5: LEVEL 2 for Secure Home Automation

3.3.3 ER Diagram

ER model stands for an Entity-Relationship model. It is a high-level data model. This model is used to define the data elements and relationship for a specified system.

- It develops a conceptual design for the database. It also develops a very simple and easy to design view of data.
- In ER modeling, the database structure is portrayed as a diagram called an entity-relationship diagram.
- Entity
- Attribute
- Relationship

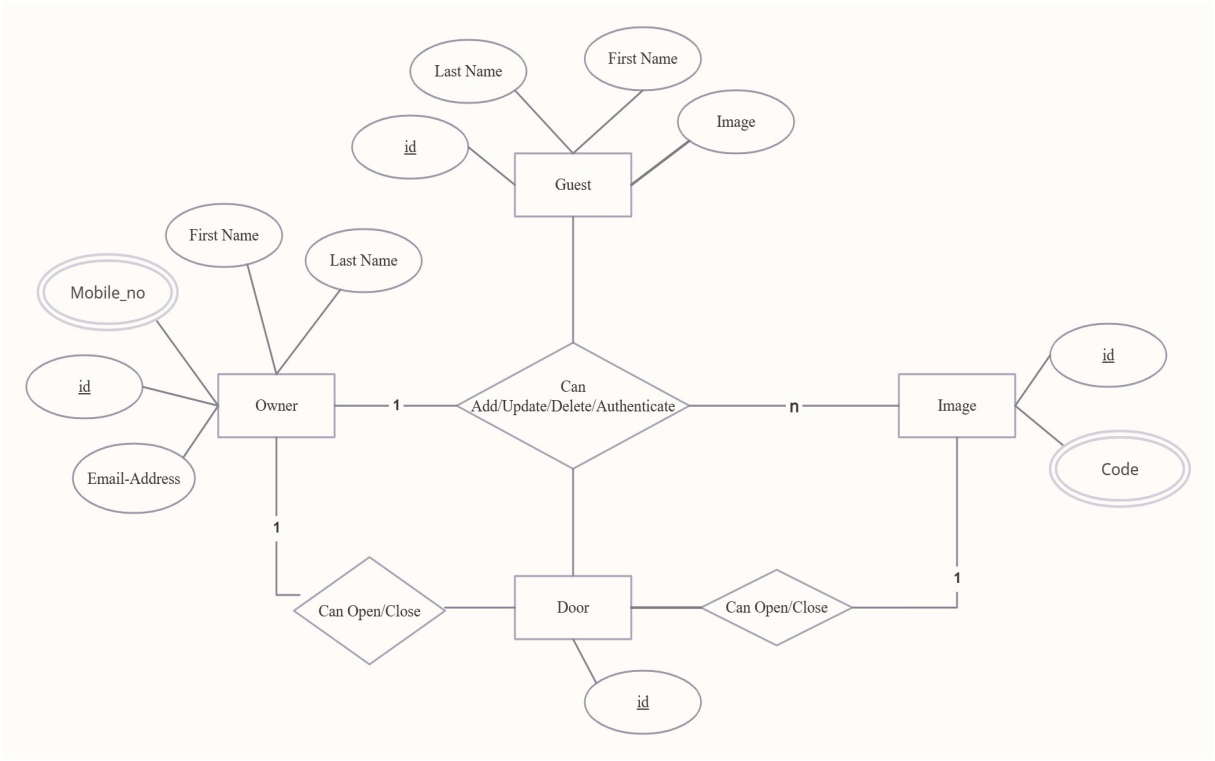


Figure 3.6: ER Diagram for Secure Home Automation

3.3.4 Control Flow

Control flow testing is a testing technique that comes under white box testing. The aim of this technique is to determine the execution order of statements or instructions of the program through a control structure. The control structure of a program is used to develop a test case for the program. In this technique, a particular part of a large program is selected by the tester to set the testing path. It is mostly used in unit testing. Test cases represented by the control graph of the program.

Notations used for Control Flow Graph

1. Node
2. Edge
3. Decision Node
4. Junction node

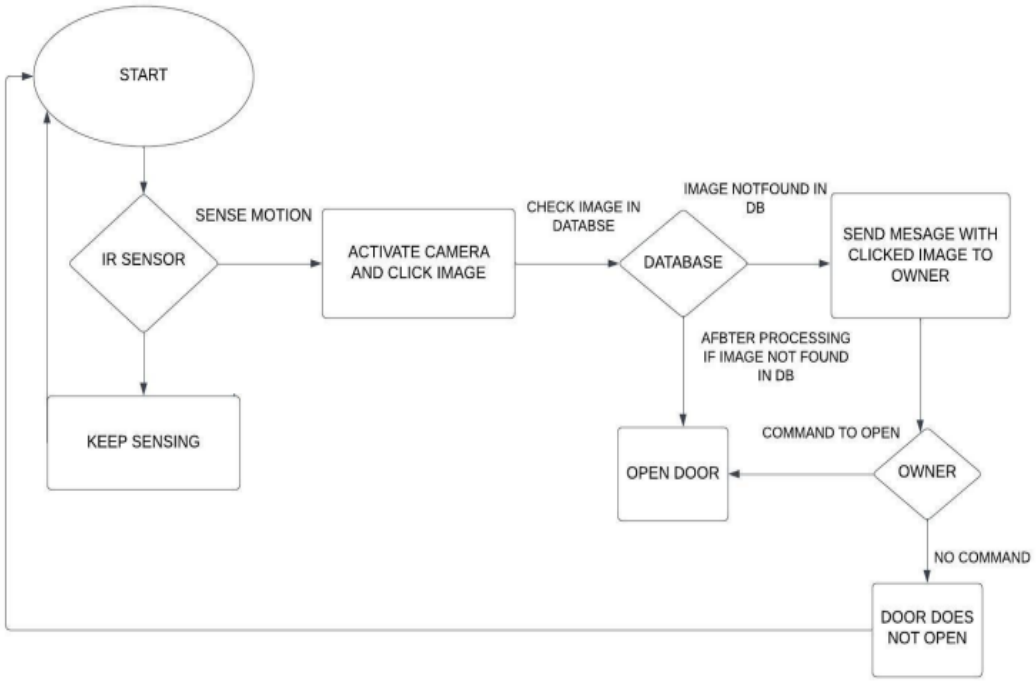


Figure 3.7: Control Flow for Secure Home Automation

3.4 Existing System

There are other existing face recognition door lock systems available in the market, each with their own unique features and specifications. For example, the Latch M-Series Smart Lock is a smart lock system that uses facial recognition technology and is designed for use in multi-family buildings. The Lockly Vision is a smart lock that combines facial recognition with a 3D fingerprint sensor, making it more secure than other systems. The Tapplock One+ is a Bluetooth-enabled smart padlock that uses facial recognition and fingerprint sensors to provide secure access. These systems offer a range of features, including real-time alerts, remote access, and voice control, making them ideal for a variety of settings. With the increasing demand for smart home security systems, the face recognition door lock market is expected to grow in the coming years.

3.5 Proposed System

A proposed face recognition door lock system using Raspberry Pi and Telegram can be created by setting up the Raspberry Pi with necessary software, connecting a camera module, training the facial recognition system with authorized users, developing a Telegram bot for commands, and implementing security measures like encryption, authentication, and access control. The system integrates the facial recognition system with the Telegram bot, which captures and compares images of users to grant authorized access. This system provides a secure and convenient way to control access to a locked area using facial recognition and the Telegram app, making it ideal for various settings like homes, offices, and public spaces.

3.6 Advantages of Proposed System:

1. Cost-effective.
2. Customizable.
3. High processing power.
4. Versatile.
5. Integration with Telegram.

3.7 Requirement Specification

3.7.1 Hardware Requirements:

The hardware requirement specifies each interface of the software elements and the hardware elements of the system. These hardware requirements include configuration characteristics.

Hardware Requirements

- Rasberry pi 4b model
- SD card
- Camera
- Servo motor
- IR sensor
- Telegram app

3.7.2 Software Requirements

The software requirements specify the use of all required software products like data management system. The required software product specifies the numbers and version. Each interface specifies the purpose of the interfacing software as related to this software product.

Software Requirements

- Open cv 3.4.16
- IDLE python software 3.11.0

3.8 HAAR Cascade Classifier

The HAAR cascade is a machine learning approach where a cascade function is trained from a lot of positive and negative images. Positive images are those images that consist of faces, and negative images are without faces. In face detection, image features are treated as numerical information extracted from the pictures that can distinguish one image from another.

We apply every feature of the algorithm on all the training images. Every image is given equal weight at the starting. It founds the best threshold which will categorize the faces to positive and negative. There may be errors and misclassifications. We select the features with a minimum error rate, which means these are the features that best classifies the face and non-face images.

All possible sizes and locations of each kernel are used to calculate the plenty of features.

3.8.1 HAAR-Cascade Detection in OpenCV

OpenCV provides the trainer as well as the detector. We can train the classifier for any object like cars, planes, and buildings by using the OpenCV. There are two primary states of the cascade image classifier first one is training and the other is detection.

OpenCV provides two applications to train cascade classifier opencv haartraining and opencv raincascade. These two applications store the classifier in the different file format.

For training, we need a set of samples. There are two types of samples:

Negative sample: It is related to non-object images.

Positive samples: It is a related image with detect objects.

A set of negative samples must be prepared manually, whereas the collection of positive samples are created using the opencv createsamples utility.

3.8.2 Negative Sample

Negative samples are taken from arbitrary images. Negative samples are added in a text file. Each line of the file contains an image filename (relative to the directory of the description file) of the negative sample. This file must be created manually. Defined images may be of different sizes.

3.8.3 Positive Sample

Positive samples are created by opencv createsamples utility. These samples can be created from a single image with an object or from an earlier collection. It is important to remember that we require a large dataset of positive samples before you give it to the mentioned utility because it only applies the perspective transformation.

3.9 Cascade Classifier

Here we will discuss detection. OpenCV already contains various pre-trained classifiers for face, eyes, smile, etc. Those XML files are stored in opencv/data/haarcascades/ folder. Let's understand the following steps:

Step - 1 First, we need to load the necessary XML classifiers and load input images (or video) in grayscale mode.

Step 2 : After converting the image into grayscale, we can do the image manipulation where the image can be resized, cropped, blurred, and sharpen if required. The next step is image

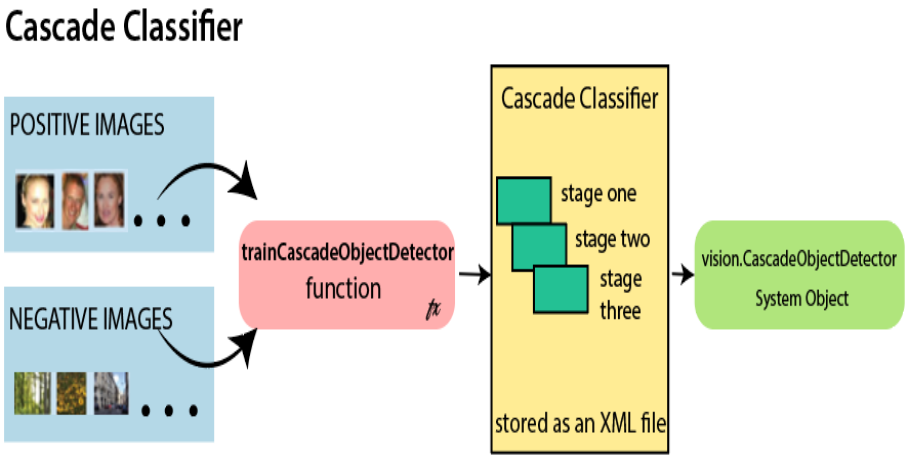


Figure 3.8: Cascade Classifier

segmentation; identify the multiple objects in the single image, so the classifier quickly detects the objects and faces in the picture.

Step 3: The haar-Like feature algorithm is used to find the location of the human faces in frame or image. All the Human faces have some common universal properties of faces like the eye region is darker than it's neighbor's pixels and nose region is more bright than the eye region.

Step 4: In this step, we extract the features from the image, with the help of edge detection, line detection, and center detection. Then provide the coordinate of x, y, w, h, which makes a rectangle box in the picture to show the location of the face. It can make a rectangle box in the desired area where it detects the face.

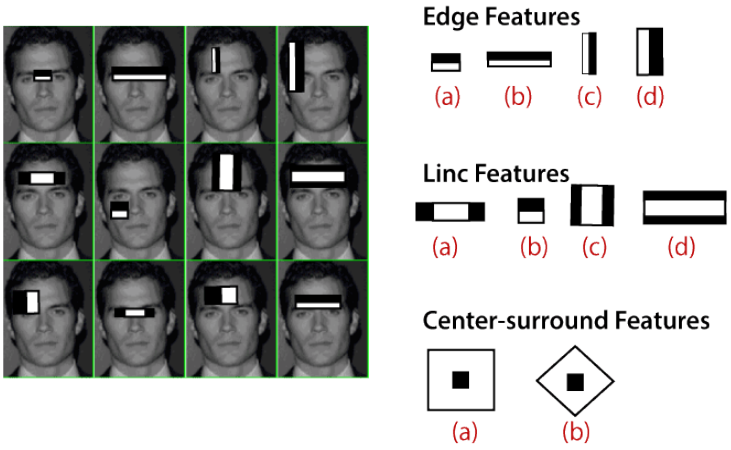


Figure 3.9: Face features recognition

3.10 Face recognition using OpenCV

Face recognition is a simple task for humans. Successful face recognition tends to effective recognition of the inner features (eyes, nose, mouth) or outer features (head, face, hairline). Here the question is that how the human brain encode it?

The basic idea of face recognition is based on the geometric features of a face. It is the feasible and most intuitive approach for face recognition. The first automated face recognition system was described in the position of eyes, ears, nose. These positioning points are called features vector (distance between the points).

The face recognition is achieved by calculating the Euclidean distance between feature vectors of a probe and reference image. This method is effective in illumina:tion change by its nature, but it has a considerable drawback. The correct registration of the maker is very hard.

The face recognition system can operate basically in two modes:

Authentication or Verification of a facial image: It compares the input facial image with the facial image related to the user, which is required authentication. It is a 1x1 comparison.

Identification or facial recognition: It basically compares the input facial images from a dataset to find the user that matches that input face. It is a 1xN comparison.

Figure 3.10: Facial Recognition

3.10.1 Open CV installations

To use the OpenCV library you have two options: Installation by Using the Pre-built Libraries or Installation by Making Your Own Libraries from the Source Files . While the first one is easier to complete, it only works if you are coding with the latest Microsoft Visual Studio IDE and do not take advantage of the most advanced technologies we integrate into our library.

Step 1: Prerequisites

You need Visual Studio pre-installed on your system. You can download the latest version of Visual Studio from Otherwise, you can find older versions.

Step 2:Download the Installer

Once you have set up Visual Studio on your system, download the installer according to the Visual Studio version you have installed.

OpenCV Version	Visual Studio 16	Visual Studio 15	Visual Studio 14
OpenCV-4.5.1	OpenCV-4.5.1-vc16.exe	OpenCV-4.5.1-vc15.exe	OpenCV-4.5.1-vc14.exe
OpenCV-4.5.0	OpenCV-4.5.0-vc16.exe	OpenCV-4.5.0-vc15.exe	OpenCV-4.5.0-vc14.exe
OpenCV-4.4.0	OpenCV-4.4.0-vc16.exe	OpenCV-4.4.0-vc15.exe	OpenCV-4.4.0-vc14.exe
OpenCV-4.1.0	OpenCV-4.1.0-vc16.exe	OpenCV-4.1.0-vc15.exe	OpenCV-4.1.0-vc14.exe

Figure 3.11: Download the Installer

Step 3: Install OpenCV on Windows

Once you download the installer, double click it to run the installer. Before the installer starts, it'll ask you permission to run the executable.

Figure 3.12: Windows protected your PC
Click on "More Info" to get the option to run the Installer

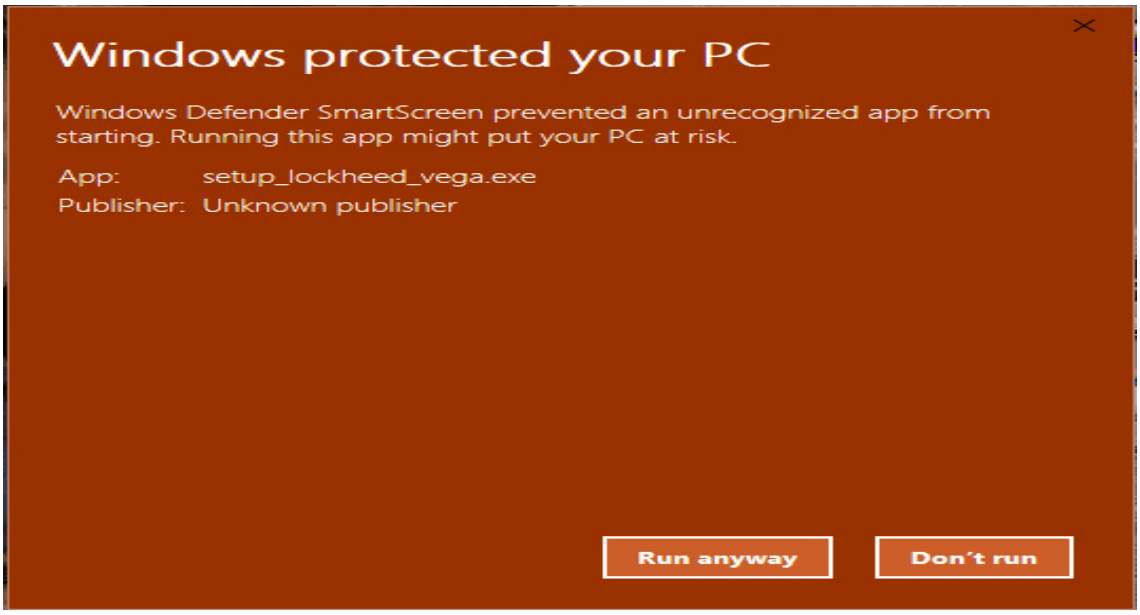


Figure 3.13: Run anyway
Click on "Run anyway" to run the Installer

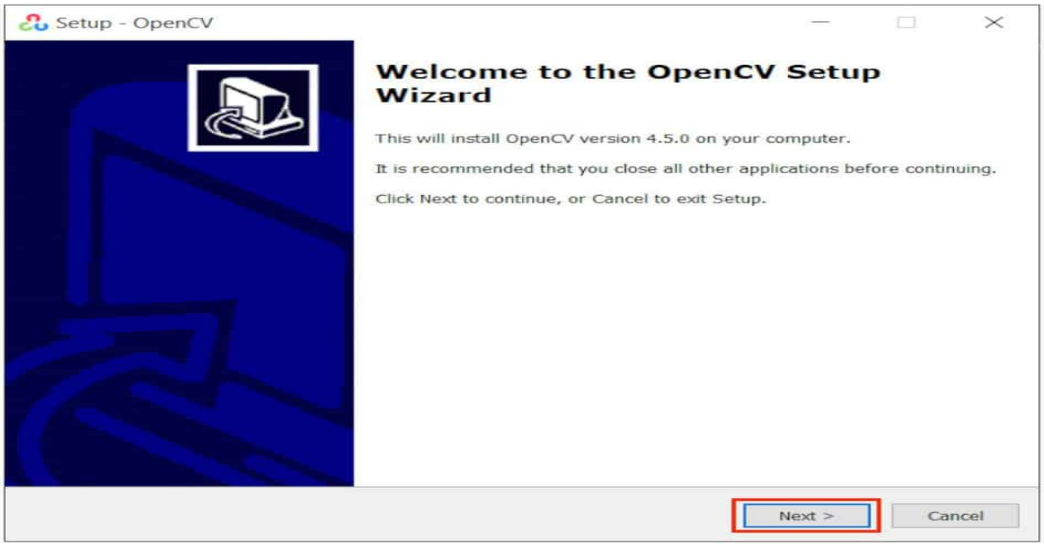


Figure 3.14: Welcome screen
The installer starts with a welcome screen. Click on Next to read the License.

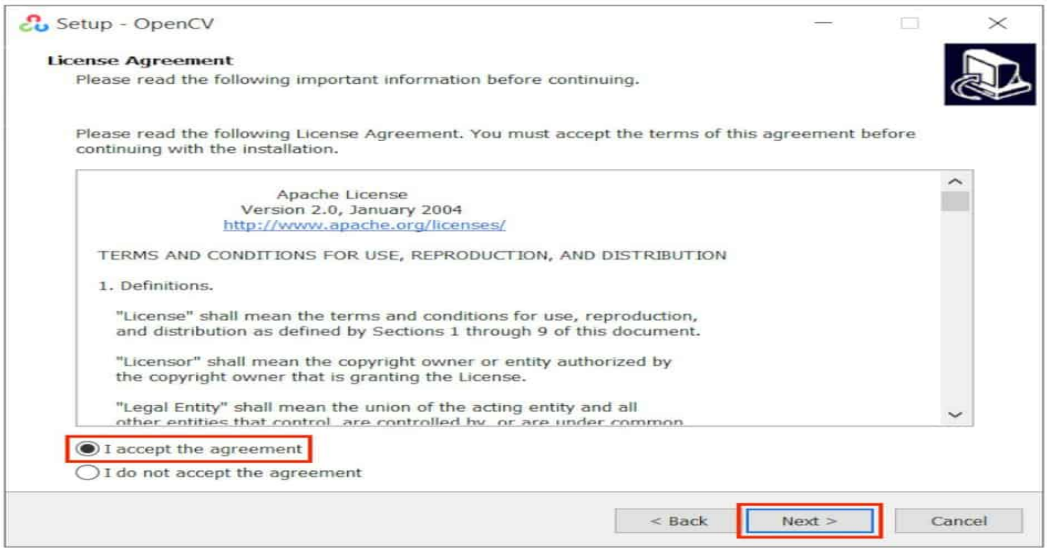


Figure 3.15: License Agreement
If you accept the license, click on I accept the agreement and click on Next.

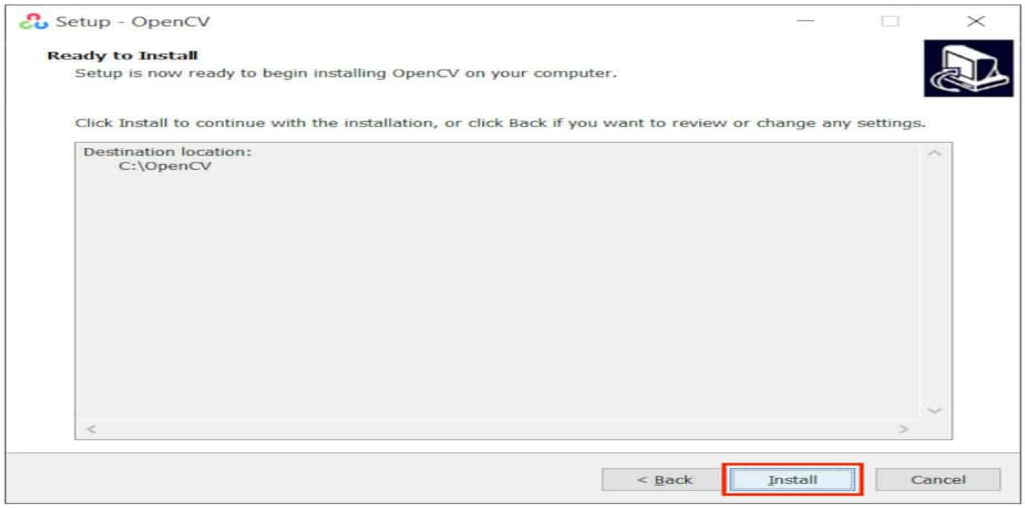


Figure 3.16: Select Installation Location

Next, it'll ask you to choose the installation folder. You can install OpenCV anywhere on the system. The default location is C:

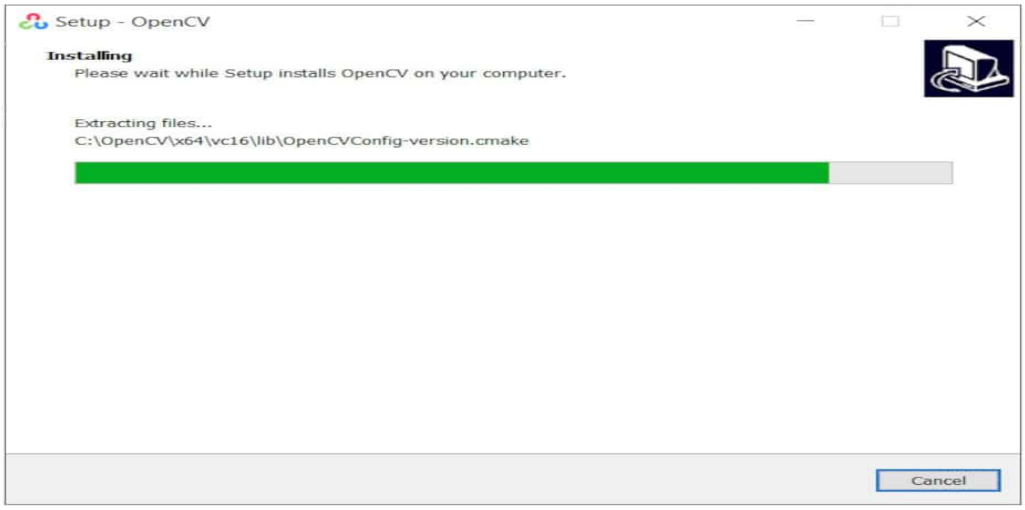


Figure 3.17: Install

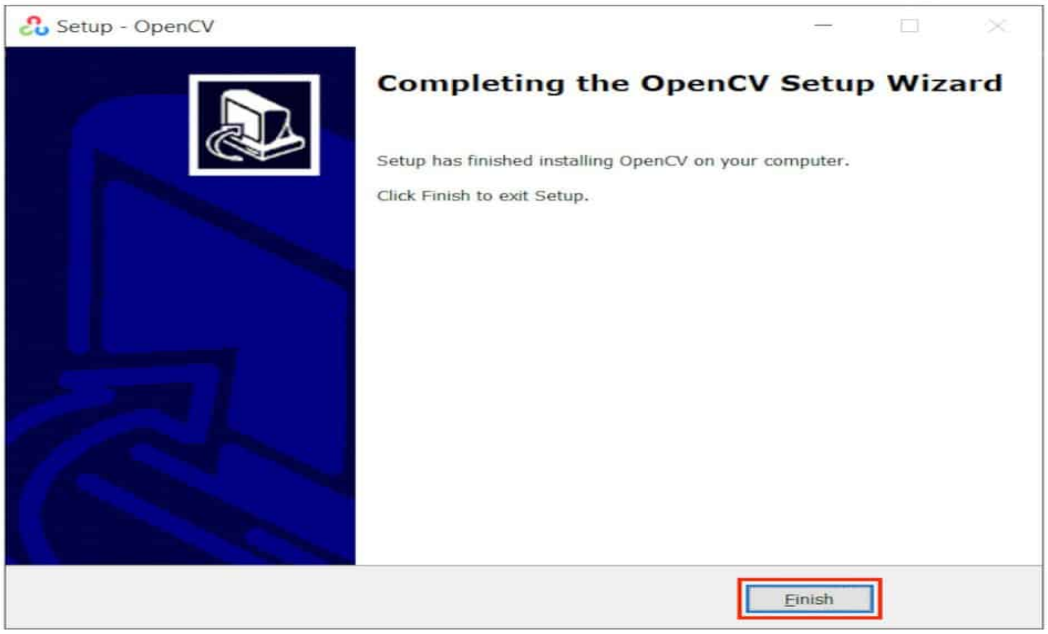


Figure 3.18: Finish Installation

3.11 Raspberry OS Installation

1. Install Raspberry pi 4B model:

   The Raspberry Pi 4 Model B is a versatile single-board computer developed by the Raspberry Pi Foundation. It features a quad-core Cortex-A72 processor, up to 8GB of LPDDR4 RAM, dual-band wireless networking, Gigabit Ethernet, multiple USB ports, and dual micro-HDMI ports. The device is popular among hobbyists, educators, and developers due to its affordability, compact size, and easy-to-use nature. The Raspberry Pi 4 Model B can run a variety of operating systems and programming languages, making it suitable for a wide range of applications.

   Download and Install the IDE: You can download the IDE from the official Raspberry pi website. In this, we use Window 10, so ensure that you download the correct version of the IDE.

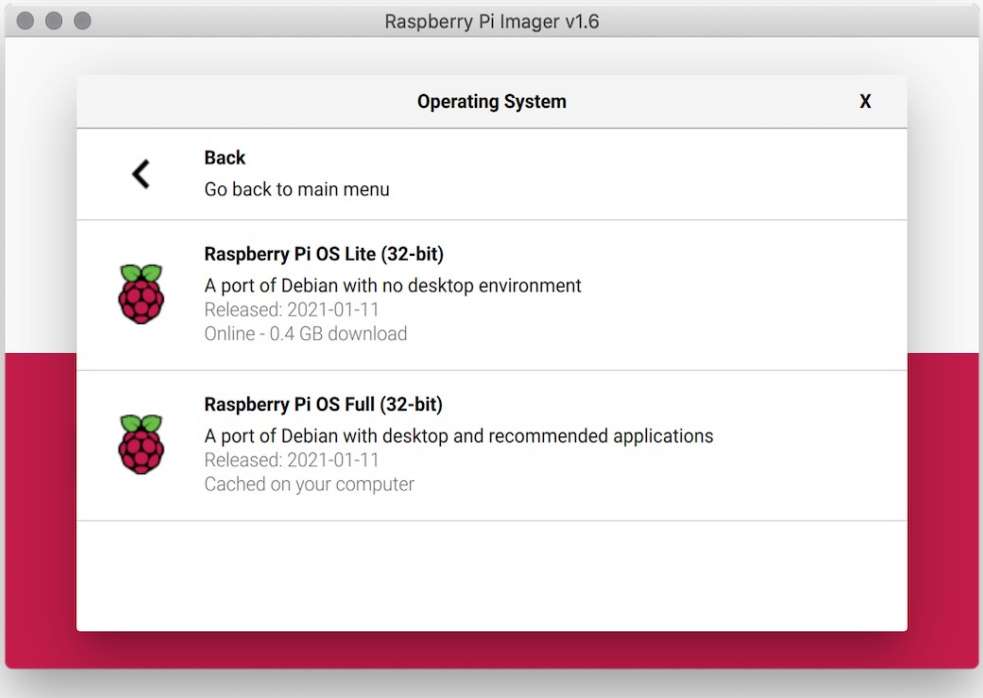


Figure 3.19: Downloading Raspberry pi IDE

2. Install the Raspberry Pi Imager

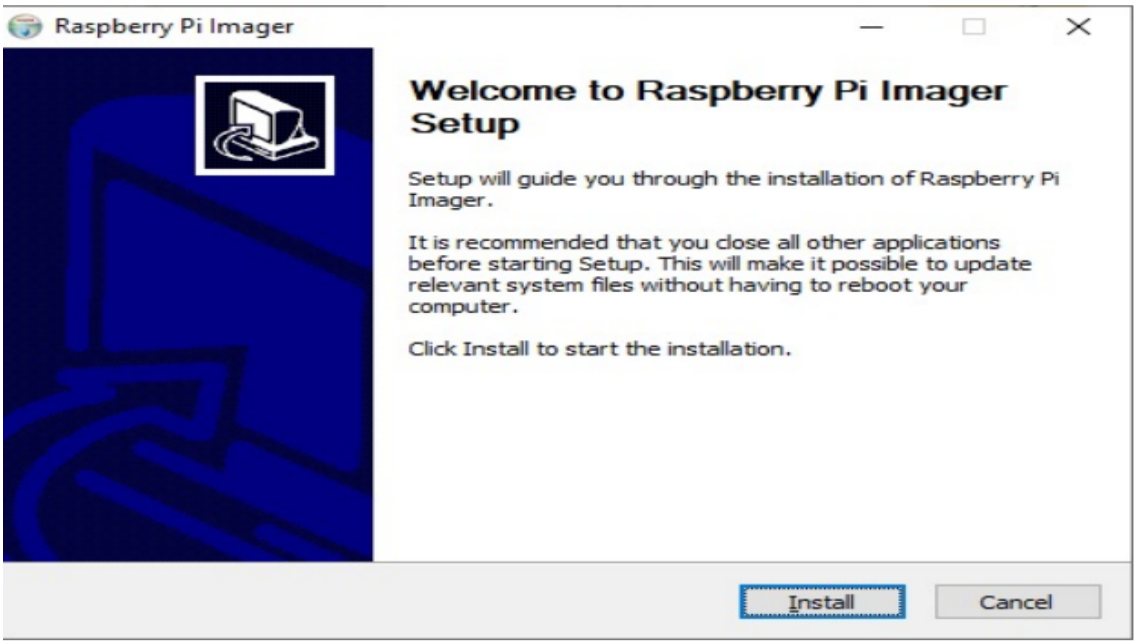


Figure 3.20: Install the Raspberry Pi Imager

3. Click on install Button

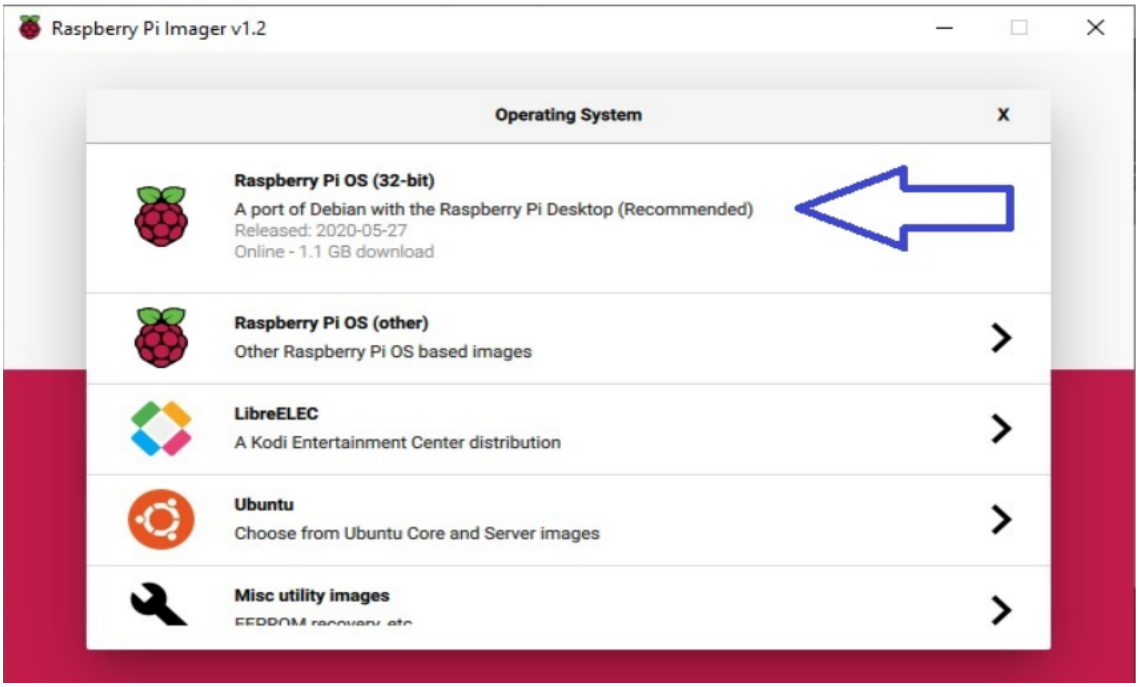


Figure 3.21: Raspberry pi Setup Custom Installation

4. You can also choose the last option Use Custom if you already have a local image file of a compatible OS

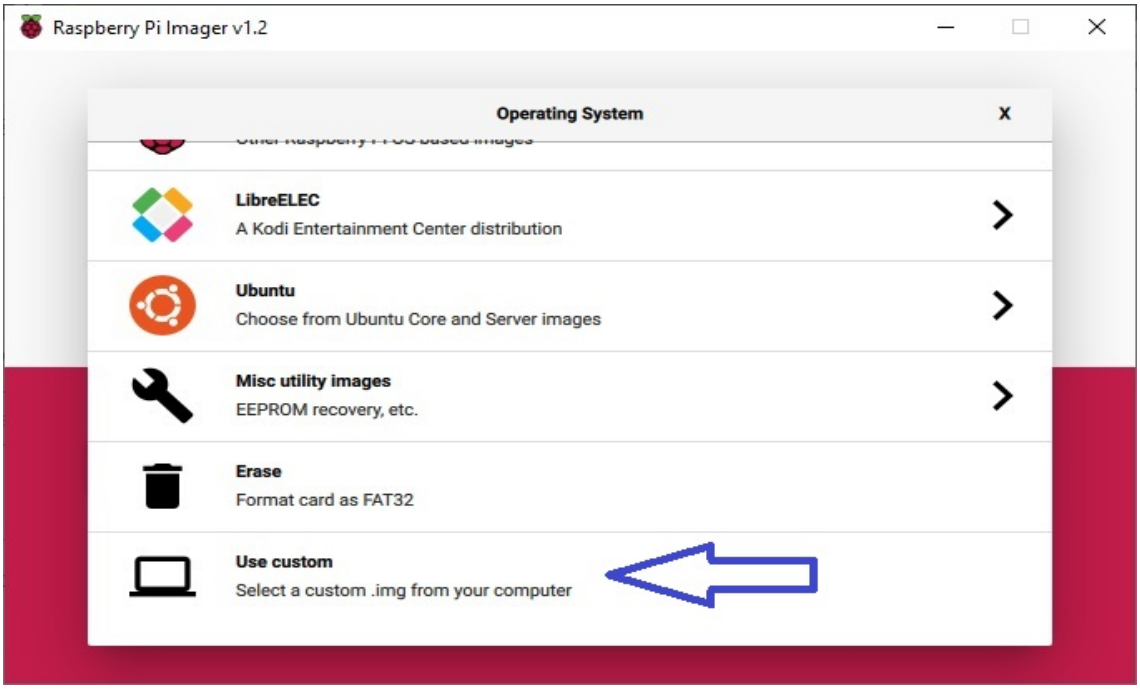


Figure 3.22: Raspberry Pi Imager Last Option – Use Custom

5. After choosing the OS image file, the next step is to select the middle button. This will give you the option to select which of the detected storage devices to use in writing the OS image. Take note that all data in the chosen device will be lost during the image writing process. Select the microSD card you will use.

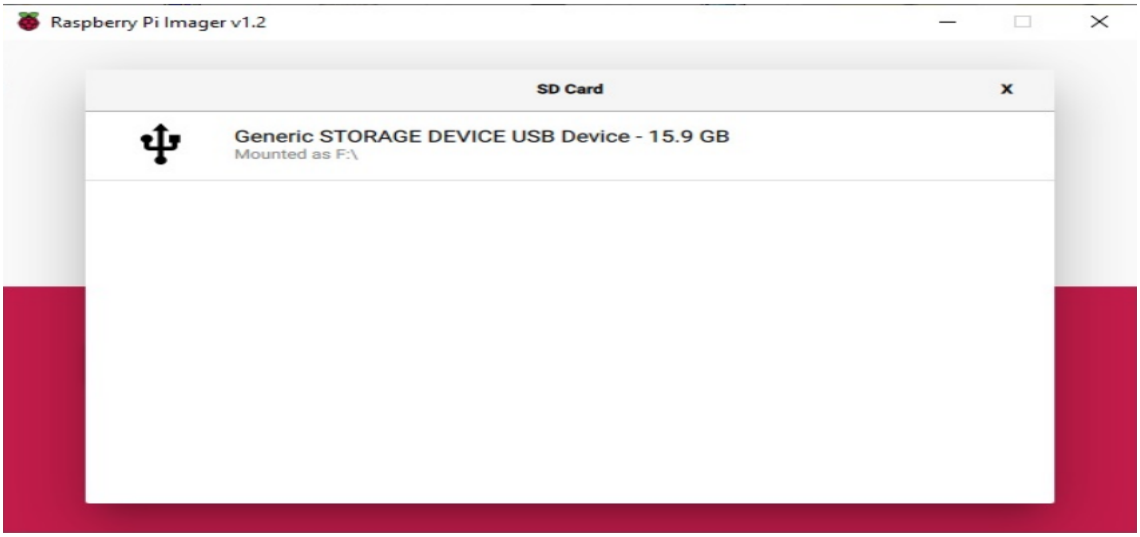


Figure 3.23: Raspberry Pi Imager – Select Storage Device

6. The last step in writing the image file to the microSD card is to select the third button Write. This will write the OS image file to the microSD card.

Figure 3.24: Raspberry Pi Imager – Writing to microSD card

7. Wait for the writing and verification process to finish then click Continue.

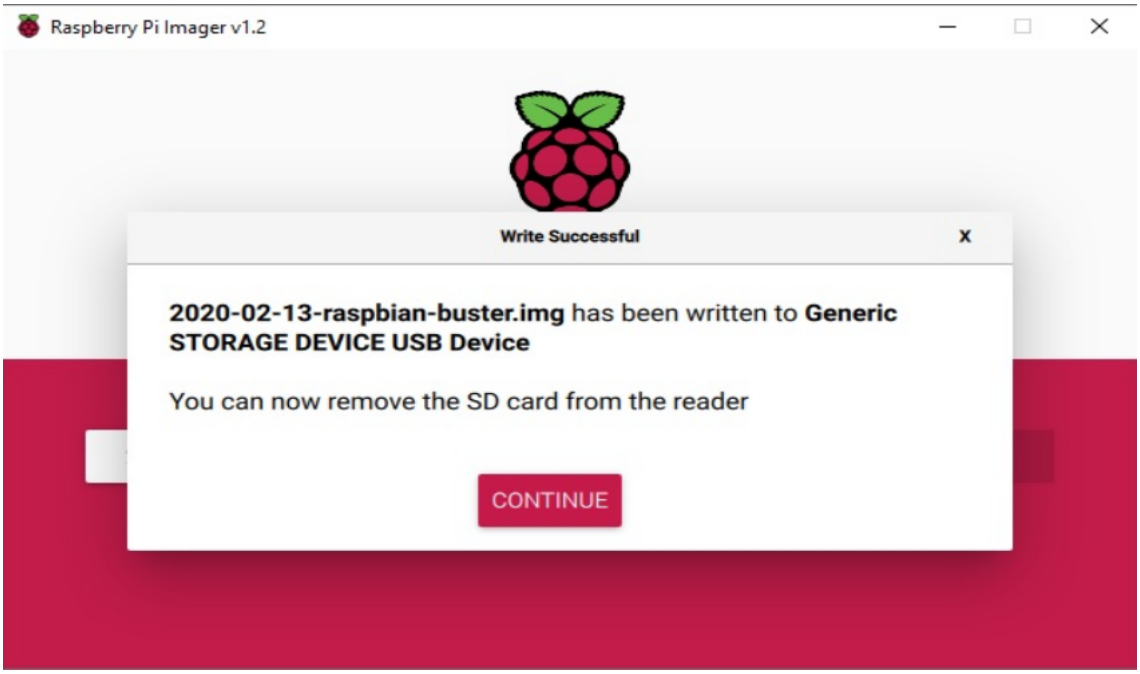


Figure 3.25: Raspberry Pi Imager – Writing and Verification Done

8. Insert the microSD card into the Raspberry Pi, connect an HDMI display, USB keyboard, and USB mouse. After the Raspberry Pi OS boots, you will be asked for your log-in credentials. The default username is pi and default password is raspberry. After logging in, you will be greeted by a desktop with a welcome window. Click Next and follow the on-screen messages to finish the setup.

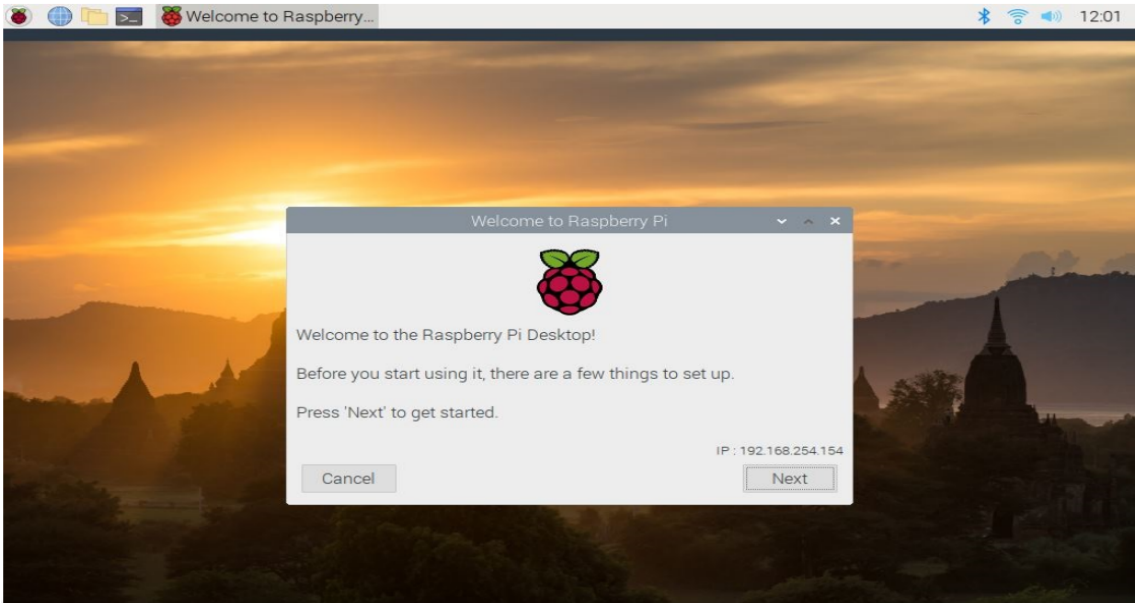


Figure 3.26: Raspberry Pi OS Desktop

9. The Command Line Interface (CLI), a.k.a. Terminal is a powerful tool for modifying configurations and setting/viewing parameters on the Raspberry Pi OS. You can access the command line by clicking the icon on the taskbar.

Figure 3.27: The Terminal Icon on the Taskbar

10. After writing the OS image, we need to add some files in the root of the microSD card to enable SSH and automatically connect to a WiFi Router (if you will use wireless-LAN). Remove and re-insert the microSD to have the new partitions detected. You should now have two partitions detected. If you are running on Windows OS, one of the partitions will not be readable in Windows Explorer, and the other partition will be readable. The readable partition is the root directory. Select the root directory to see the contents.

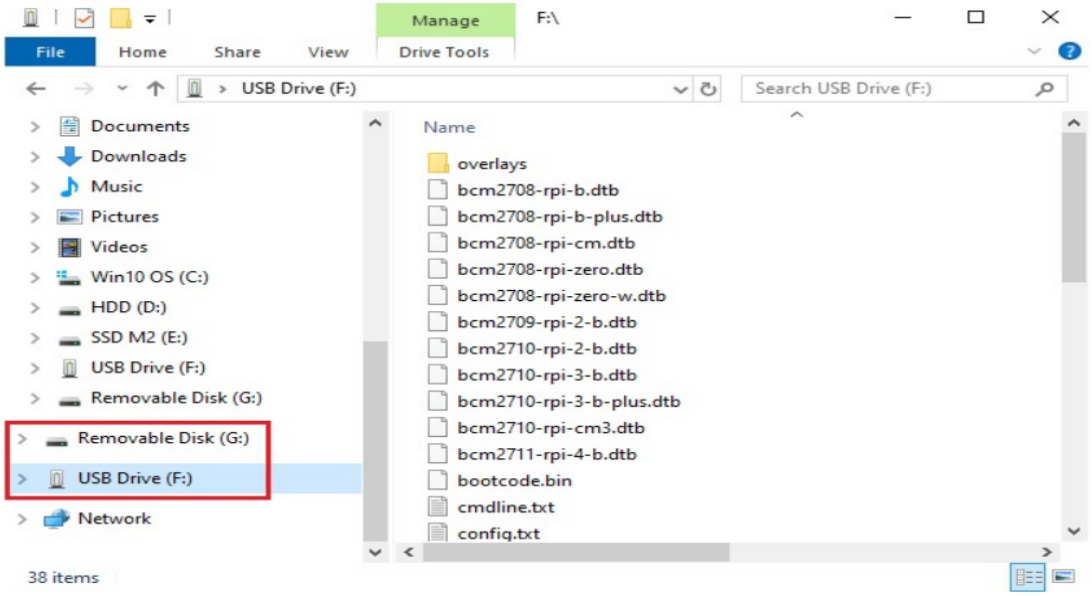


Figure 3.28: Raspberry Pi microSD Partitions

11. SSH is short for Secure Shell. To enable SSH, we need to put a blank file named “SSH” (without file extensions) in the root of the microSD card. The easiest way to do this is to create a new notepad document and rename it to “SSH” and delete the file extension “.txt”.

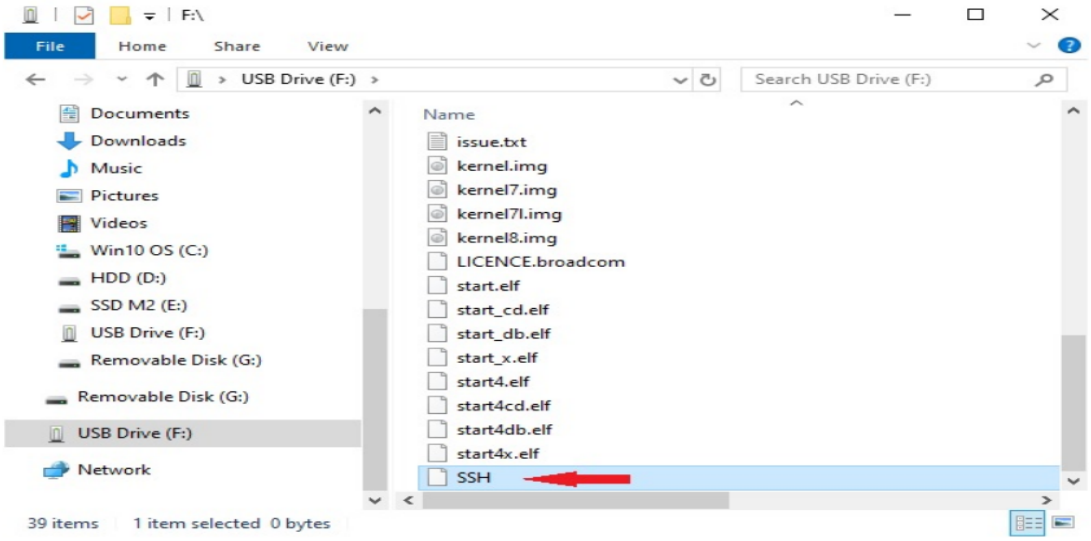


Figure 3.29: Blank SSH file in the microSD root directory

12. A list of values for the two-letter ISO 3166-1 country code can be found in this Wikipedia link. After inserting the correct text for the country, ssid and psk, save the file as wpa supplicant.conf. Copy this file over to the root of the microSD card.

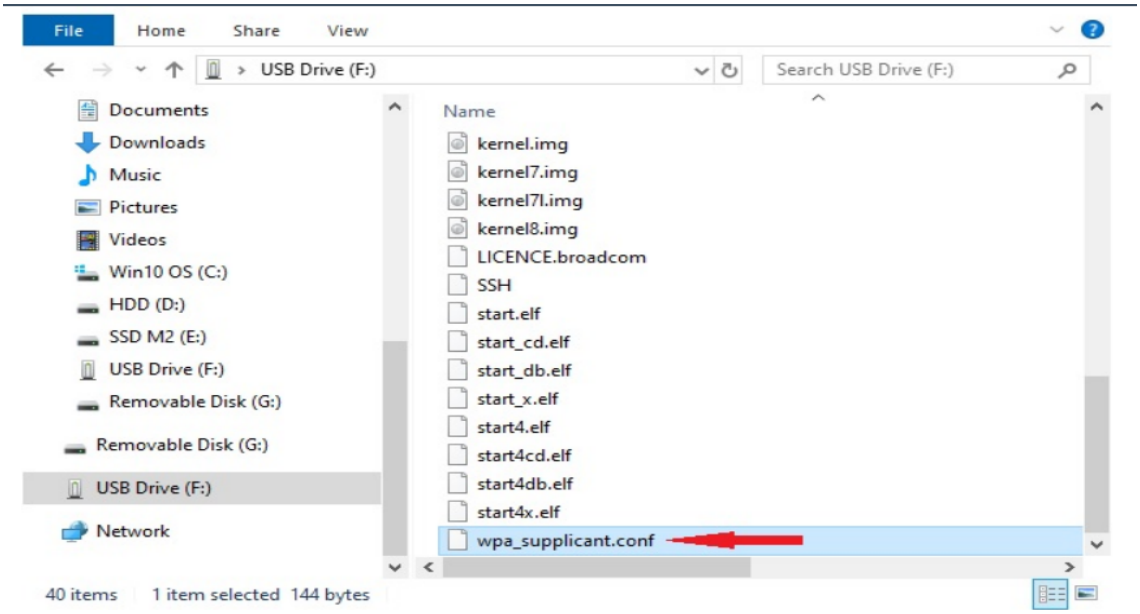


Figure 3.30: wpa supplicant.conf

13. To connect to our Raspberry Pi via SSH, we need to use a software called an SSH Client. I use PuTTY to do this and you can download.

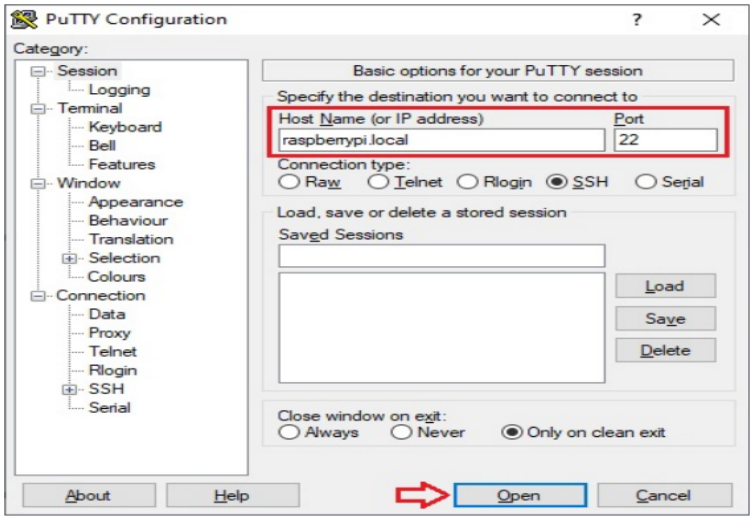


Figure 3.31: Open PuTTY

14. Open PuTTY and put raspberrypi.local in the Host Name textbox and make sure Port is set to 22. Click Open at the bottom of the window, and a command-line interface (CLI) should pop-up asking for log-in credentials. The default log-in username is pi, and the default password is raspberry. After successful log-in, a message will show reminding you that you need to change your password for security reasons, including instructions on how to do it. It is highly advisable to do so. The last line will be the default prompt pi@raspberrypi:

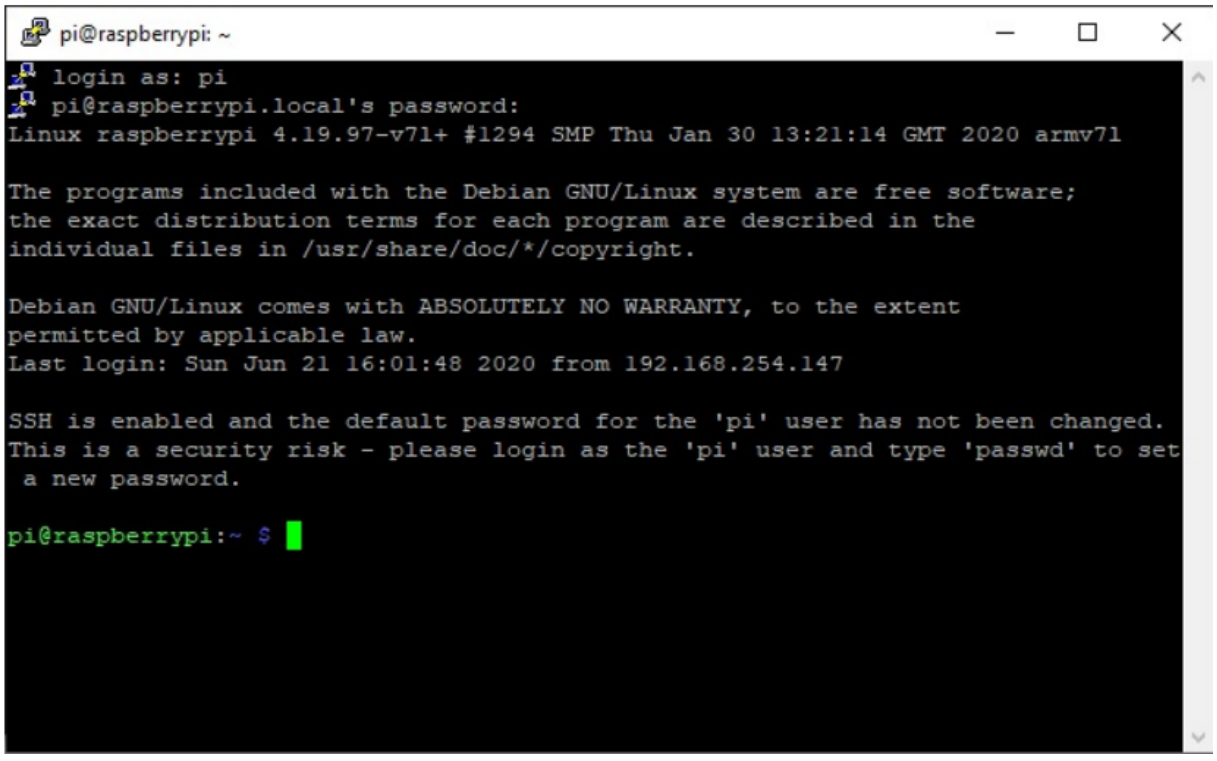


Figure 3.32: Raspberry pi

15. To connect via VNC, open your VNC Viewer. Create a new connection and put raspberrypi.local as the Host Name and put a descriptive label in the Name textbox. Click OK. Open your newly created connection and log in to the Raspberry Pi OS desktop. At this point, we are already working with the Raspberry Pi remotely via the Desktop GUI.

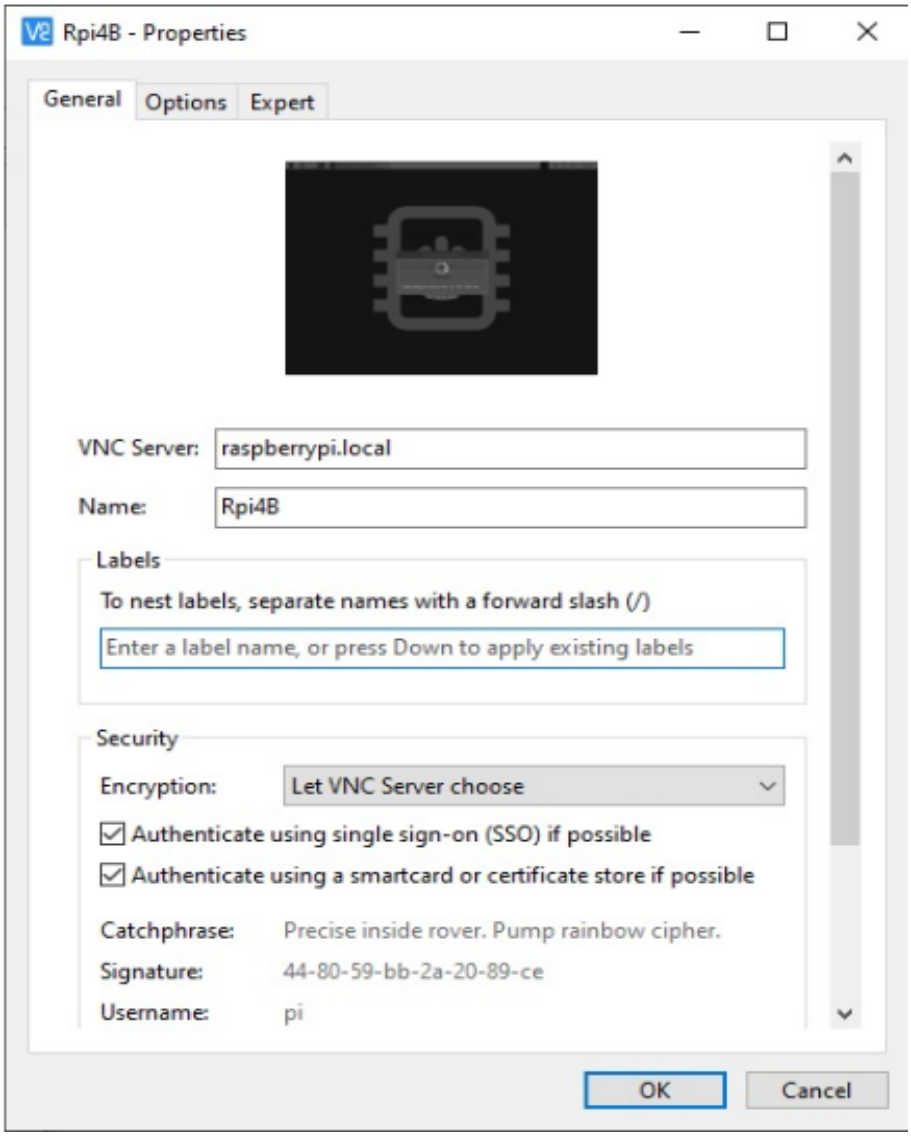


Figure 3.33: VNC Viewer connection

3.12 Telegram Bot

Telegram is one of the more popular IM platforms today, as it allows you to store messages on the cloud instead of just your device and it boasts good multi-platform support, as you can have Telegram on Android, iOS, Windows, and just about any other platform that can support the web version. Building a chatbot on Telegram is fairly simple and requires few steps that take very

little time to complete. The chatbot can be integrated in Telegram groups and channels and it also works on its own.

3.12.1 Getting Started: How to Make a Telegram Bot

To create a chatbot on Telegram, you need to contact the BotFather, which is essentially a bot used to create other bots.

The command you need is /newbot which leads to the following steps to create your bot:

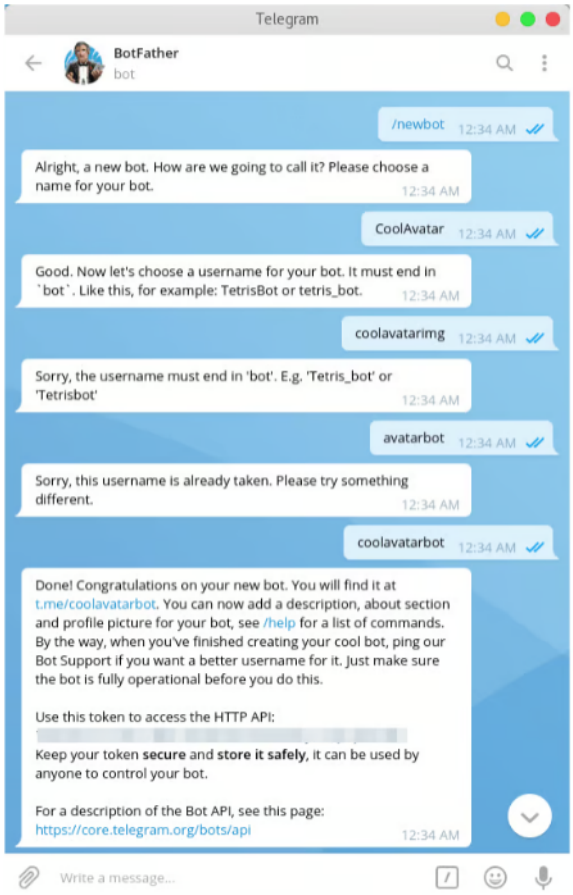


Figure 3.34: Telegram Bot

Your bot should have two attributes: a name and a username. The name will show up for your bot, while the username will be used for mentions and sharing.

After choosing your bot name and username—which must end with “bot”—you will get a message containing your access token, and you’ll obviously need to save your access token and username for later, as you will be needing them.

Chapter 4

MODULE IMPLEMENTATION

4.1 IOT Boards

4.1.1 Raspberry pi Board

The idea behind a tiny and affordable computer for kids came in 2006, when Eben Upton, Rob Mullins, Jack Lang and Alan Mycroft, based at the University of Cambridge's Computer Laboratory, became concerned about the year-on-year decline in the numbers and skills levels of the A Level students applying to read Computer Science. From a situation in the 1990s where most of the kids applying were coming to interview as experienced hobbyist programmers, the landscape in the 2000s was very different a typical applicant might only have done a little web design.

Something had changed the way kids were interacting with computers. A number of problems were identified: majority of curriculums with lessons on using Word and Excel, or writing web-pages the end of the dot-com boom and the rise of the home PC and games console to replace the Amigas, BBC Micros, Spectrum ZX and Commodore 64 machines that people of an earlier generation learned to program on.

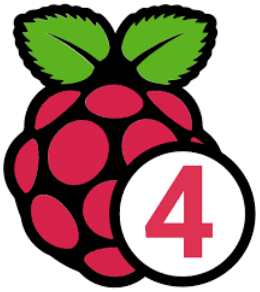


Figure 4.1: Raspberry pi

There isn't much any small group of people can do to address problems like an inadequate school curriculum or the end of a financial bubble. But those students felt that they could try

to do something about the situation where computers had become so expensive and arcane that programming experimentation on them had to be forbidden by parents; and to find a platform that, like those old home computers, could boot into a programming environment. Thus came the idea of creating the device which kids could buy and learn programming or hardware on – The Raspberry Pi.

4.1.2 Initial Design Considerations

From 2006 to 2008 they created many designs and prototypes of what we now know as the Raspberry Pi. One of the earliest prototypes is shown below:

These boards use an Atmel ATmega644 microcontroller clocked at 22.1MHz, and a 512K SRAM for data and frame buffer storage. By 2008, processors designed for mobile devices were becoming more affordable, and powerful enough to provide excellent multimedia, a feature which would make the board desirable to kids who wouldn't initially be interested in a purely programming-oriented device. The project started to look very realisable and feasible.

Eben (now a chip architect at Broadcom), Rob, Jack and Alan, teamed up with Pete Lomas, MD of hardware design and manufacture company Norcott Technologies, and David Braben, co-author of the BBC Micro game Elite, to form the Raspberry Pi Foundation to make it a reality. Three years later, the Raspberry Pi Model B entered mass production through licensed manufacture deals with Element 14/Premier Farnell and RS Electronics, and within two years it had sold over two million units.

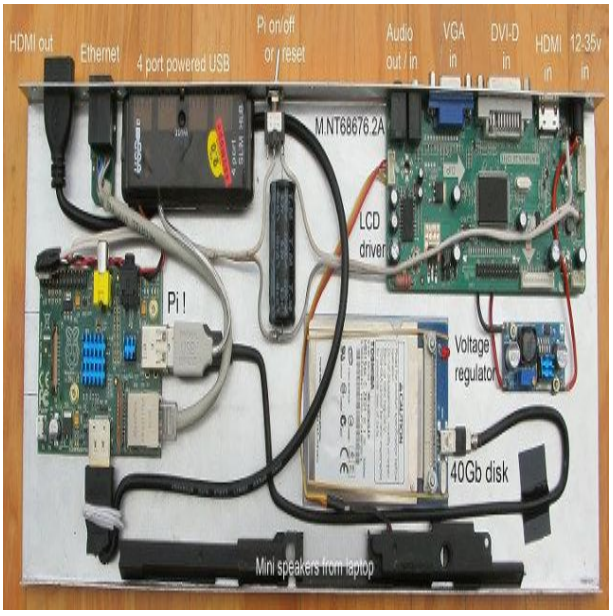


Figure 4.2: One of the earliest prototype of the Pi

Technical specifications of Raspberry pi:

- Processor: Broadcom BCM2711 quad-core Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz
- RAM: 2GB, 4GB or 8GB LPDDR4-3200 SDRAM (depending on model)
- Connectivity:
- Gigabit Ethernet
- Dual-band 802.11ac wireless
- Bluetooth 5.0
- BLE (Bluetooth Low Energy)
- Ports:
- 2 USB 3.0 ports
- 2 USB 2.0 ports
- 2 micro-HDMI ports (up to 4Kp60 supported)
- 3.5mm analogue audio jack
- 2 microSD card slots (one for loading operating system and one for data storage)
- Video and Audio:
- H.265 (4Kp60 decode); H.264 (1080p60 decode, 1080p30 encode)
- OpenGL ES 3.0 graphics
- 3.5mm analogue audio jack, supporting stereo audio and composite video GPIO: Standard 40-pin GPIO header (fully backwards-compatible with previous boards)
- Power:
- 5V DC via USB-C connector (minimum 3A*)
- 5V DC via GPIO header (minimum 3A*)
- Dimensions: 88 x 58 x 19.5 mm, 46 g
- Power supply requirements may vary depending on the peripherals used with the Raspberry Pi.

Hardware

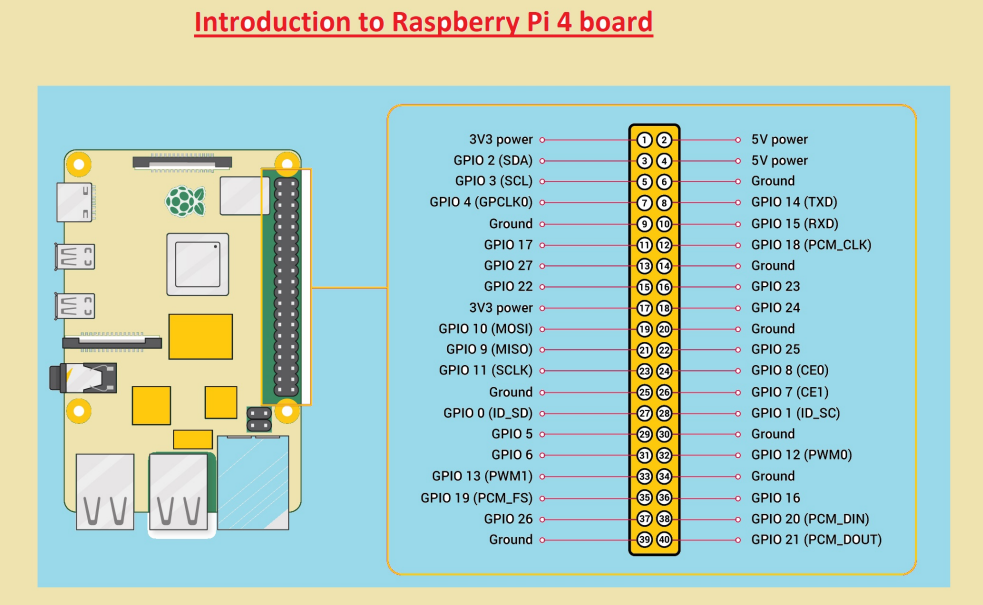


Figure 4.3: Raspberry Pi 4B

4.1.3 A brief description of the components on the Pi

Processor / SoC (System on Chip):

The Raspberry Pi has a Broadcom BCM2835 System on Chip module. It has a ARM1176JZF-S processor The Broadcom SoC used in the Raspberry Pi is equivalent to a chip used in an old smartphone (Android or iPhone). While operating at 700 MHz by default, the Raspberry Pi provides a real world performance roughly equivalent to the 0.041 GFLOPS. On the CPU level the performance is similar to a 300 MHz Pentium II of 1997-1999, but the GPU, however, provides 1 Gpixel/s, 1.5 Gtexel/s or 24 GFLOPS of general purpose compute and the graphics capabilities of the Raspberry Pi are roughly equivalent to the level of performance of the Xbox of 2001. The Raspberry Pi chip operating at 700 MHz by default, will not become hot enough to need a heatsink or special cooling.

Power source:

The Pi is a device which consumes 700mA or 3W or power. It is powered by a MicroUSB charger or the GPIO header. Any good smartphone charger will do the work of powering the Pi.

SD Card:

The Raspberry Pi does not have any onboard storage available. The operating system is loaded on a SD card which is inserted on the SD card slot on the Raspberry Pi. The operating system can be loaded on the card using a card reader on any computer.

GPIO:

GPIO – General Purpose Input Output General-purpose input/output (GPIO) is a generic pin on an integrated circuit whose behaviour including whether it is an input or output pin, can be controlled by the user at run time. GPIO pins have no special purpose defined, and go unused by default. The idea is that sometimes the system designer building a full system that uses the chip might find it useful to have a handful of additional digital control lines, and having these available from the chip can save the hassle of having to arrange additional circuitry to provide them.

GPIO capabilities may include:

1. GPIO pins can be configured to be input or output
2. GPIO pins can be enabled/disabled
3. Input values are readable (typically high=1, low=0)
4. Output values are writable/readable
5. Input values can often be used as IRQs (typically for wakeup events)

The production Raspberry Pi board has a 26-pin 2.54 mm (100 mil) expansion header, marked asP1, arranged in a 2x13 strip. They provide 8 GPIO pins plus access to I²C, SPI, UART), as well as +3.3 V, +5 V and GND supply lines. Pin one is the pin in the first column and on the bottom row.

4.1.4 DSI Connector

The Display Serial Interface (DSI) is a specification by the Mobile Industry Processor Interface (MIPI) Alliance aimed at reducing the cost of display controllers in a mobile device. It is commonly targeted at LCD and similar display technologies. It defines a serial bus and a communication protocol between the host (source of the image data) and the device (destination of the image data). A DSI compatible LCD screen can be connected through the DSI connector, although it may require additional drivers to drive the display.

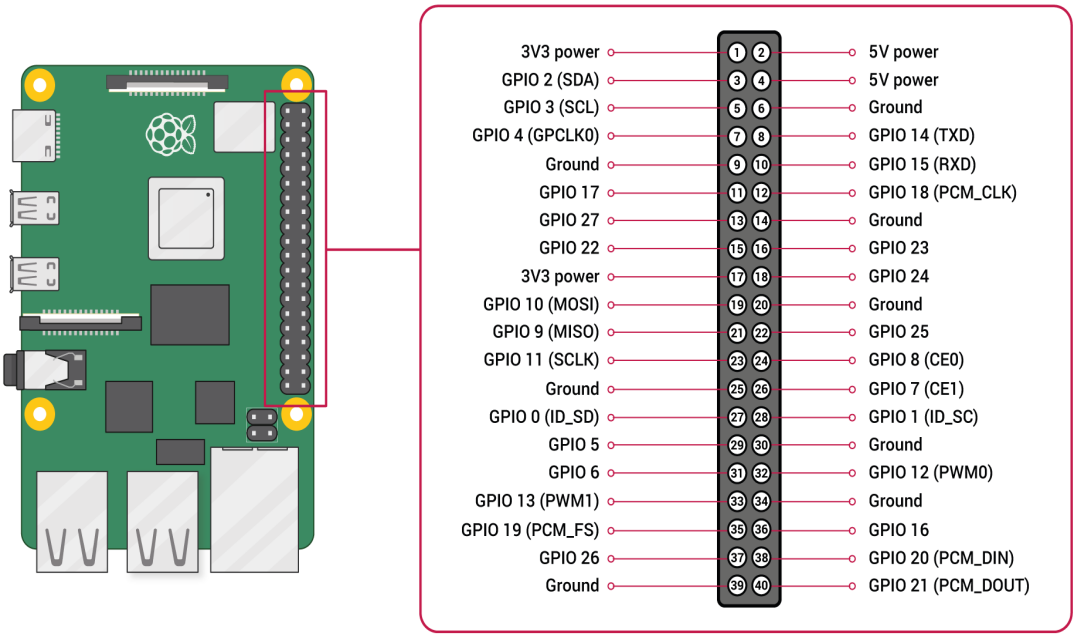


Figure 4.4: GPIO connector on RPI

4.1.5 RCA Video

RCA Video outputs (PAL and NTSC) are available on all models of Raspberry Pi. Any television or screen with a RCA jack can be connected with the RPi.

Figure 4.5: RCA Video Connector

The NOOBS installer

The Raspberry Pi package only comes with the main board and nothing else. It does not come shipped with an operating system. Operating systems are loaded on a SD card from a computer and then the SD card is inserted in the Pi which becomes the primary boot device.

Installing operating system can be easy for some enthusiasts, but for some beginners working with image files of operating systems can be difficult. So the Raspberry Pi foundation made a software called NOOBS – New Out Of Box Software which eases the process of installing an operating system on the Pi.

The NOOBS installer can be downloaded from the official website. A user only needs to connect a SDcard with the computer and just run the setup file to install NOOBS on the SD card. Next, insert the card on the Raspberry Pi. On booting the first time, the NOOBS interface is loaded and the user can select from a list of operating systems to install. It is much convenient to install the operating system this way. Also once the operating system is installed on the card with the NOOBS installer, every time the Pi boots, a recovery mode provided by the NOOBS can be accessed by holding the shift key during boot. It also allows editing of the config.txt file for the operating system

4.1.6 Power Supply

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

This power supply section is required to convert AC signal to DC signal and also to reduce the amplitude of the signal. The available voltage signal from the mains is 230V/50Hz which is an AC voltage, but the required is DC voltage(no frequency) with the amplitude of +5V and +12V for various applications.

In this section we have Transformer, Bridge rectifier, are connected serially and voltage regulators for +5V and +12V (7805 and 7812) via a capacitor (1000µF) in parallel are connected parallel as shown in the circuit diagram below. Each voltage regulator output is again is connected to the capacitors of values (100µF, 10µF, 1 µF, 0.1 µF) are connected parallel through which the corresponding output(+5V or +12V) are taken into consideration.

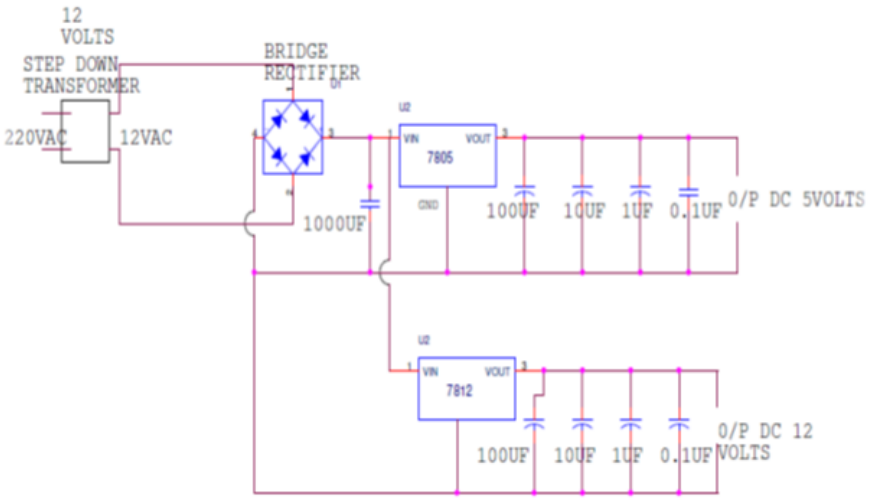


Figure 4.6: Power Supply

4.1.7 Transformer

A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled electrical conductors. A changing current in the first Power Supply circuit (the primary) creates a changing magnetic field; in turn, this magnetic field induces a changing voltage in the second circuit (the secondary). By adding a load to the secondary circuit, one can make current flow in the transformer, thus transferring energy from one circuit to the other. The secondary induced voltage V S , of an ideal transformer, is scaled from the primary V P by a factor equal to the ratio of the number of turns of wire in their respective windings

4.1.8 Basic principle

The transformer is based on two principles: firstly, that an electric current can produce a magnetic field (electromagnetism) and secondly that a changing magnetic field within a coil of wire induces a voltage across the ends of the coil (electromagnetic induction). By changing the current in the primary coil, it changes the strength of its magnetic field since the changing magnetic field extends into the secondary coil, a voltage is induced across the secondary. A simplified transformer design is shown below. A current passing through the primary coil creates a magnetic field. The primary and secondary coils are wrapped around a core of very high magnetic permeability, such as iron; this ensures that most of the magnetic field lines produced by the primary current are within the iron and pass through the secondary coil as well as the primary coil.

4.1.9 Relays

A relay is an electrical switch that opens and closes under the control of another electrical circuit. In the original form, the switch is operated by an electromagnet to open or close one or many sets of contacts. A relay is able to control an output circuit of higher power than the input circuit, it can be considered to be, in a broad sense, a form of an electrical amplifier.

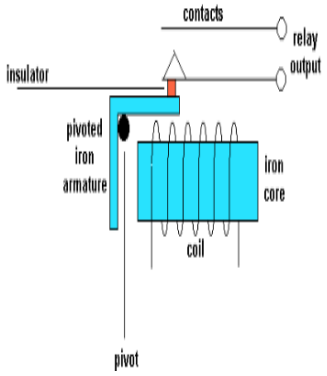


Figure 4.7: Relay

Basic operation of a relay:

An electric current through a conductor will produce a magnetic field at right angles to the direction of electron flow. If that conductor is wrapped into a coil shape, the magnetic field produced will be oriented along the length of the coil. The greater the current, the greater the strength of the magnetic field, all other factors being equal

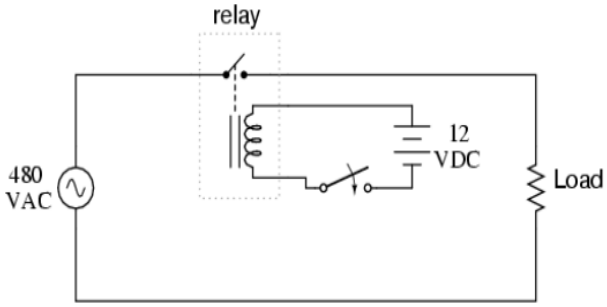


Figure 4.8: Circuit Diagram

Inductors react against changes in current because of the energy stored in this magnetic field. When we construct a transformer from two inductor coils around a common iron core, we use this field to transfer energy from one coil to the other. However, there are simpler and more direct uses for electromagnetic fields than the applications we ve seen with inductors and trans-

formers. The magnetic field produced by a coil of current-carrying wire can be used to exert a mechanical force on any magnetic object, just as we can use a permanent magnet to attract magnetic objects, except that thisnmagnet (formed by the coil) can be turned on or off by switching the current on or off through the coil.

If we place a magnetic object near such a coil for the purpose of making that object move when we energize the coil with electric current, we have what is called a solenoid. The movable magnetic object is called an armature, and most armatures can be moved with either direct current (DC) or alternating current (AC) energizing the coil. The polarity of the magnetic field is irrelevant for the purpose of attracting an iron armature. Solenoids can be used to electrically open door latches, open or shut valves, move robotic limbs, and even actuate electric switch mechanisms and is used to actuate a set of switch contacts.

4.2 Relays can be categorized according to the magnetic system and operation:

4.2.1 Neutral Relays

This is the most elementary type of relay. The neutral relays have a magnetic coil, which operates the relay at a specified current, regardless of the polarity of the voltage applied.

4.2.2 Biased Relays

Biased relays have a permanent magnet above the armature. The relay operates if the current through the coil winding establishes a magneto-motive force that opposes the flux by the permanent magnet. If the fluxes are in the same direction, the relay will not operate, even for a greater current through the coil.

4.2.3 Polarized Relays

Like the biased relays, the polarized relays operate only when the current through the coil in one direction. But there the principle is different. The relay coil has a diode connected in series with it. This blocks the current in the reverse direction. The major difference between biased relays and polarized relays is that the former allows the current to pass through in the reverse direction, but does the not operate the relay and the later blocks the current in reverse direction. You can imagine how critical these properties when relays are connected in series to form logic circuits.

4.2.4 Magnetic Stick Relays or Perm polarized Relays

These relays have a magnetic circuit with high permanence. Two coils, one to operate (pick up) and one to release (drop) are present. The relay is activated by a current in the operate coil. On the interruption of the current the armature remains in picked up position by the residual magnetism. The relay is released by a current through the release coil.

4.2.5 Slow Release Relays

These relays have a capacitor connected in parallel to their coil. When the operating current is interrupted the release of relay is delayed by the stored charge in the capacitor. The relay releases as the capacitor discharges through the coil.

4.2.6 Relays for AC

These are neutral relays and picked up for a.c. current through their coil. These are very fast in action and used on power circuits of the point motors, where high current flows through the contacts. A normal relay would be slow and make sparks which in turn may weld the contacts together.

All relays have two operating values (voltages), one pick-up and the other other drop away. The pick-up value is higher than the drop away value.

4.3 Applications:

- To control a high-voltage circuit with a low-voltage signal, as in some types of modems or audio amplifiers,
- To control a high-current circuit with a low-current signal, as in the starter solenoid of an automobile,
- To detect and isolate faults on transmission and distribution lines by opening and closing circuit breakers (protection relays),
- To isolate the controlling circuit from the controlled circuit when the two are at different potentials, for example when controlling a mains-powered device from a low-voltage switch. The latter is often applied to control office lighting as the low voltage wires are easily installed in partitions, which may be often moved as needs change. They may also be controlled by room occupancy detectors in an effort to conserve energy,
- To perform logic functions. For example, the boolean AND function is realised by connecting NO relay contacts in series, the OR function by connecting NO contacts in parallel. The

change-over or Form C contacts perform the XOR (exclusive or) function. Similar functions for NAND and NOR are accomplished using NC contacts. The Ladder programming language is often used for designing relay logic networks.

- Early computing. Before vacuum tubes and transistors, relays were used as logical elements in digital computers. See ARRA (computer), Harvard Mark II, Zuse Z2, and Zuse Z3.
- o Safety-critical logic. Because relays are much more resistant than semiconductors to nuclear radiation, they are widely used in safety-critical logic, such as the control panels of radioactive waste-handling machinery.
- To perform time delay functions. Relays can be modified to delay opening or delay closing a set of contacts. A very short (a fraction of a second) delay would use a copper disk between the armature and moving blade assembly. Current flowing in the disk maintains magnetic field for a short time, lengthening release time. For a slightly longer (up to a minute) delay, a dashpot is used. A dashpot is a piston filled with fluid that is allowed to escape slowly. The time period can be varied by increasing or decreasing the flow rate. For longer time periods, a mechanical clockwork timer is installed.

4.4 Servo Motor SG-90

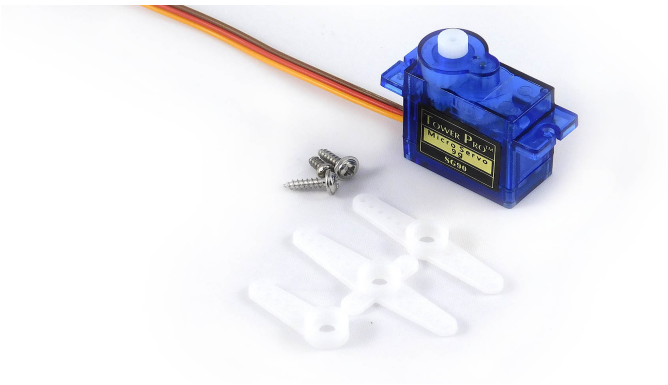


Figure 4.9: Circuit Diagram

Table 4.1: Servo Motor Wire Configuration.

Wire Number	Wire Colour	Description
1	Brown	Ground wire connected to the ground of system
2	Red	Powers the motor typically +5V is used
3	Orange	PWM signal is given in through this wire to drive the motor

4.4.1 TowerPro SG-90 Features

- Operating Voltage is +5V typically
- Torque: 2.5kg/cm
- Operating speed is 0.1s/60°
- Gear Type: Plastic
- Rotation : 0°-180°
- Weight of motor : 9gm
- Package includes gear horns and screws

4.5 SG-90 Servo Motor Equivalent

MG90S Metal Gear, MG995 High Torque Metal Gear, VTS-08A Analog Servo

4.5.1 Selecting your Servo Motor

There are lots of servo motors available in the market and each one has its own speciality and applications. The following two paragraphs will help you identify the right type of servo motor for your project/system. Most of the hobby Servo motors operates from 4.8V to 6.5V, the higher the voltage higher the torque we can achieve, but most commonly they are operated at +5V. Almost all hobby servo motors can rotate only from 0° to 180° due to their gear arrangement so make sure you project can live with the half circle if no, you can prefer for a 0° to 360° motor or modify the motor to make a full circle. The gears in the motors are easily subjected to wear and tear, so if your application requires stronger and long running motors you can go with metal gears or just stick with normal plastic gear. Next comes the most important parameter, which is the torque at which the motor operates. Again there are many choices here but the commonly available one is the 2.5kg/cm torque which comes with the Towerpro SG90 Motor. This 2.5kg/cm torque means that the motor can pull a weight of 2.5kg when it is suspended at a distance of 1cm. So if you suspend the load at 0.5cm then the motor can pull a load of 5kg similarly if you suspend the load at 2cm then can pull only 1.25. Based on the load which you use in the project you can select the motor with proper torque. The below picture will illustrate the same.

4.5.2 How to use a Servo Motor

After selecting the right Servo motor for the project, comes the question how to use it. As we know there are three wires coming out of this motor. The description of the same is given on top of

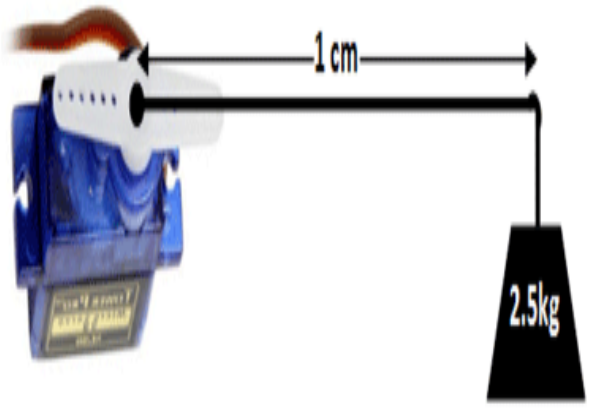


Figure 4.10: Servo motor torque

this page. To make this motor rotate, we have to power the motor with +5V using the Red and Brown wire and send PWM signals to the Orange colour wire. Hence we need something that could generate PWM signals to make this motor work, this something could be anything like a 555 Timer or other Microcontroller platforms like Arduino, PIC, ARM or even a microprocessor like Raspberry Pie. Now, how to control the direction of the motor? To understand that let us a look at the picture given in the datasheet. From the picture we can understand that the PWM

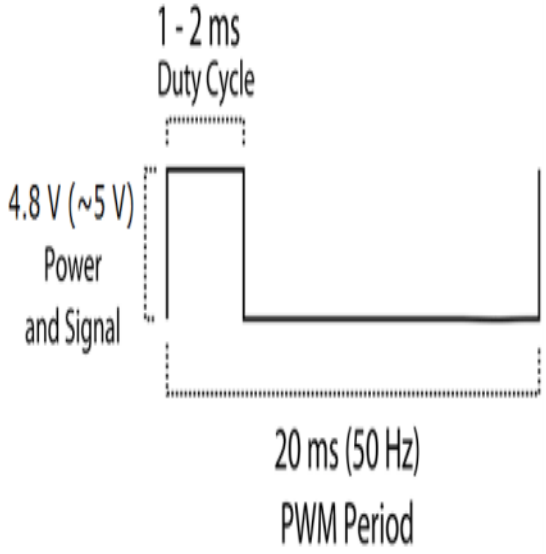


Figure 4.11: uses of Servo Motor

signal produced should have a frequency of 50Hz that is the PWM period should be 20ms. Out of which the On-Time can vary from 1ms to 2ms. So when the on-time is 1ms the motor will be in 0° and when 1.5ms the motor will be 90°, similarly when it is 2ms it will be 180°. So, by varying the on-time from 1ms to 2ms the motor can be controlled from 0° to 180°

Applications

- Used as actuators in many robots like Biped Robot, Hexapod, robotic arm etc..
- Commonly used for steering system in RC toys
- Robots where position control is required without feedback
- Less weight hence used in multi DOF robots like humanoid robots

Figure 4.12: SG90 Servo Motor Dimensions

4.5.3 IR Sensor

An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. Infrared radiation was accidentally discovered by an astronomer named William Herchel in 1800. While measuring the temperature of each color of light (separated by a prism), he noticed that the temperature just beyond the red light was highest. IR is invisible to the human eye, as its wavelength is longer than that of visible light (though it is still on the same electromagnetic spectrum). Anything that emits heat (everything that has a temperature above around five degrees Kelvin) gives off infrared radiation.

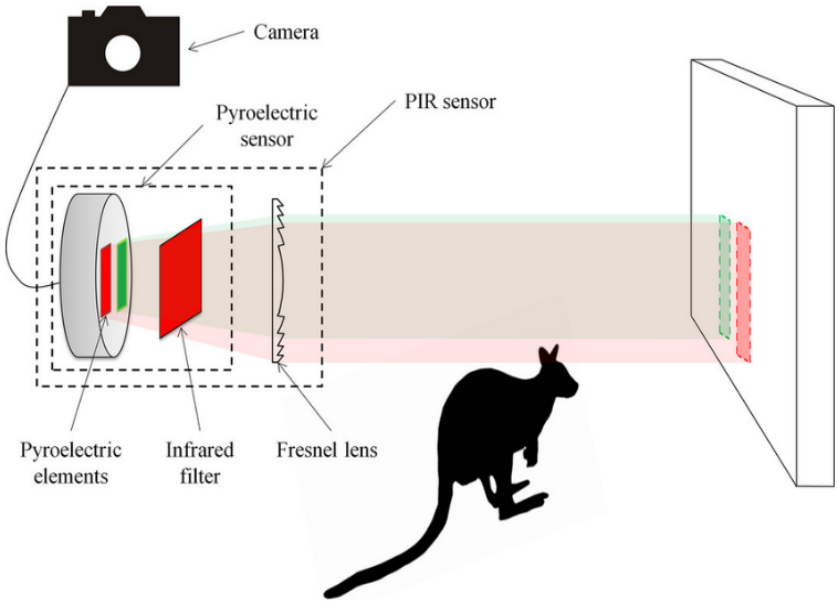


Figure 4.13: PIR Sensor Diagram Source

Passive infrared (PIR) sensors only detect infrared radiation and do not emit it from an LED. Passive infrared sensors are comprised of

1. Two strips of pyroelectric material (a pyroelectric sensor)
2. An infrared filter (that blocks out all other wavelengths of light)
3. A fresnel lens (which collects light from many angles into a single point)
4. A housing unit (to protect the sensor from other environmental variables, such as humidity)

PIR sensors are most commonly used in motion-based detection, such as in-home security systems. When a moving object that generates infrared radiation enters the sensing range of the detector, the difference in IR levels between the two pyroelectric elements is measured. The sensor then sends an electronic signal to an embedded computer, which in turn triggers an alarm.

The IR Sensor Module has only three Pins: VCC, GND and Data. Connect the VCC and GND pins of the IR Sensor to +5V and GND pins of the Raspberry Pi. Then connect the Data pin of the IR Sensor to GPIO23 i.e. Physical Pin 16 of the Raspberry Pi. In order to indicate the alarm, I have used a simple 5V Buzzer

4.5.4 Working

All the magic happens in the IR Sensor Module. As it is a Reflective type IR Sensor, whenever an object is placed in front of the sensor, the Infrared light from the IR LED gets reflected back after hitting the object and falls on the Photo Diode.

An IR (infrared) sensor detects infrared radiation, which is a type of electromagnetic radiation with longer wavelengths than visible light. Infrared radiation is emitted by all objects with a temperature above absolute zero, including people, animals, and machines.

The basic working principle of an IR sensor is to detect the intensity of infrared radiation emitted by an object and convert it into a measurable electrical signal. The sensor has a special material that absorbs the incoming infrared radiation and produces an electrical output proportional to the intensity of the radiation. This output is then processed and used to provide information about the presence, distance, or temperature of the object.

There are different types of IR sensors, including passive and active sensors. Passive IR sensors detect infrared radiation emitted by objects, while active IR sensors emit infrared radiation and measure the reflection or absorption of the radiation by objects. Both types of sensors are used in a variety of applications, such as security systems, temperature sensing, and motion detection.

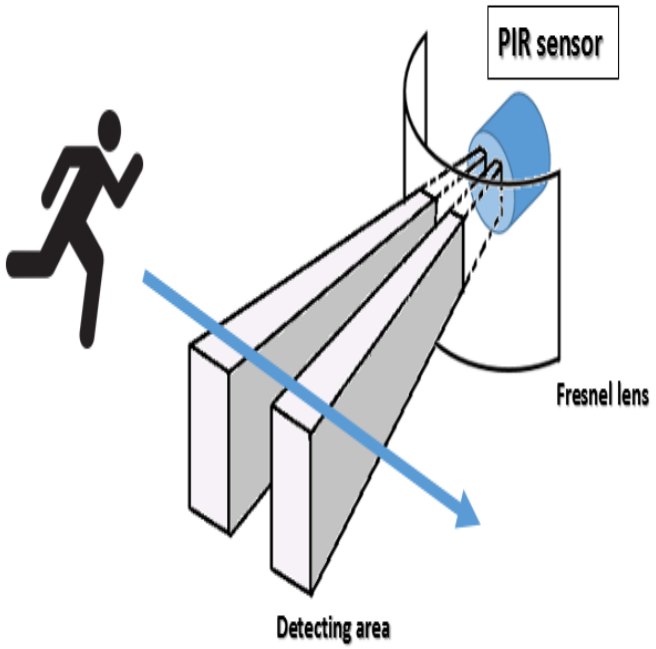


Figure 4.14: PIR Sensor Working Process

Chapter 5

RESULTS

Project results are the changes or effects expected to take place after implementing the project. The results are generally positive improvements to the lives of the beneficiaries.

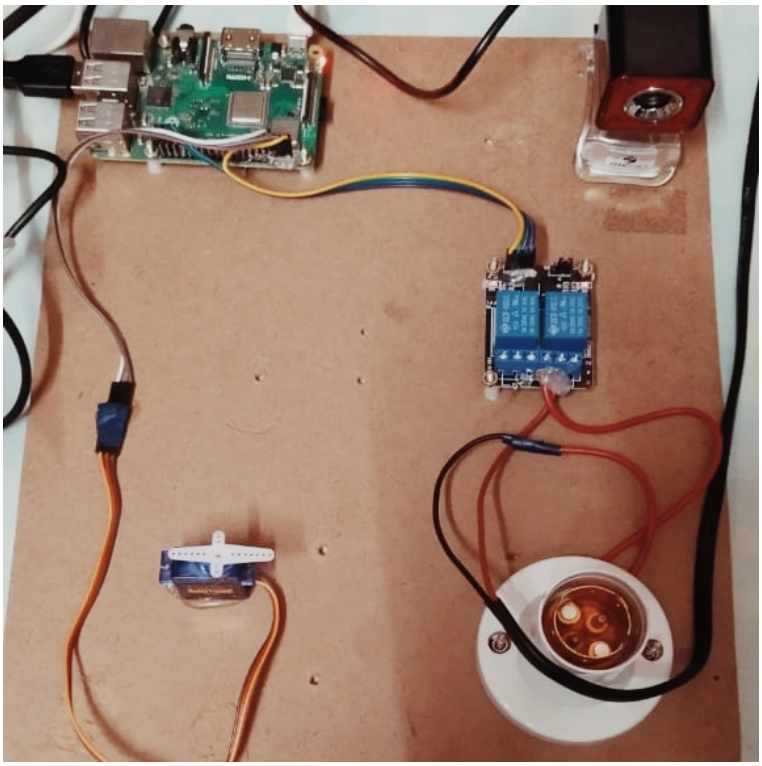


Figure 5.1: Overall Project Prototype

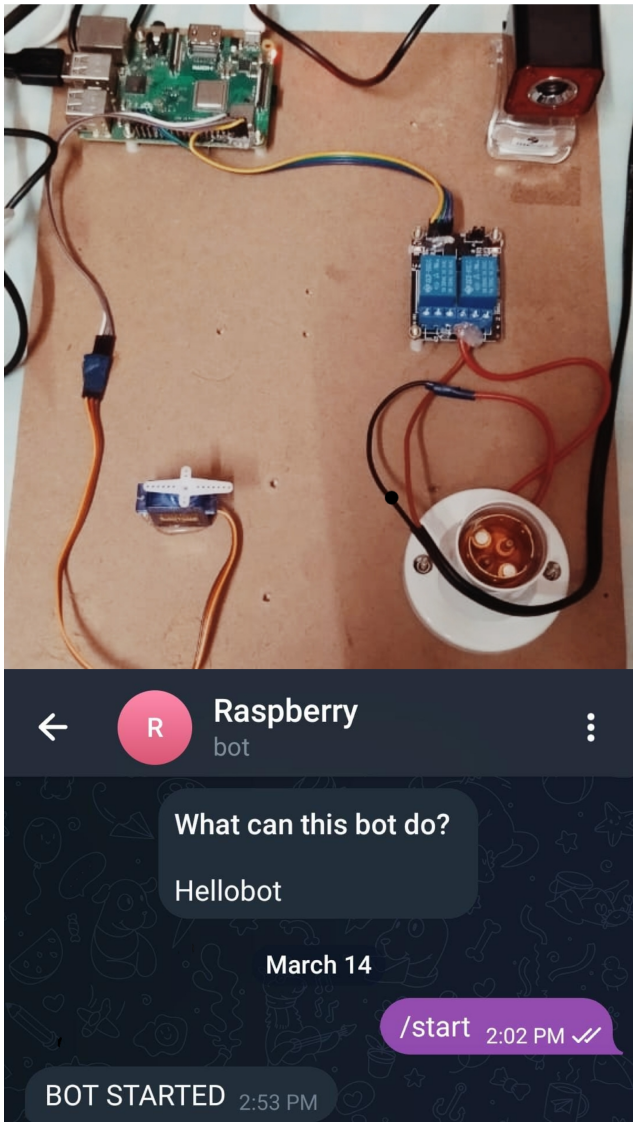


Figure 5.2: Project kit and Telegram coonective

When kit is activited then automatically telegram bot will be started by giving a message in telegram app **BOT STARTED**

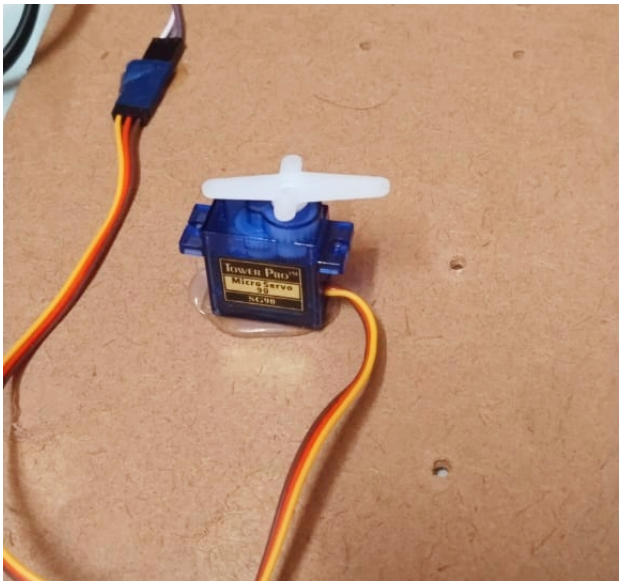


Figure 5.3: Closed Door

initial state means closed door or locked door

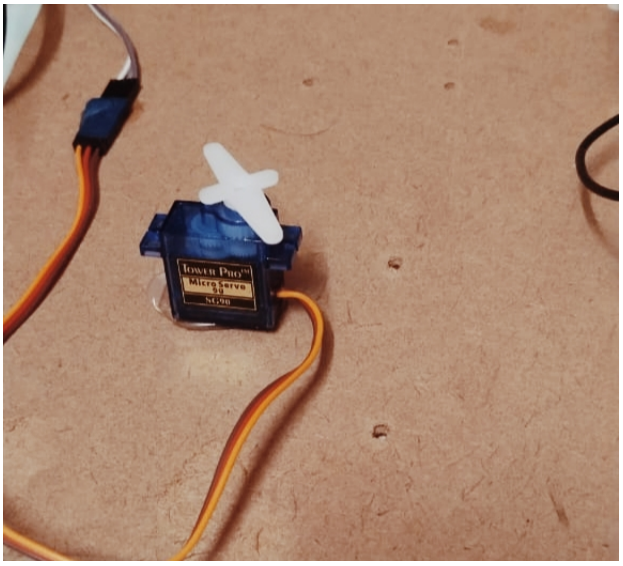


Figure 5.4: open Door

In this below figure the is open which means an authorized person home

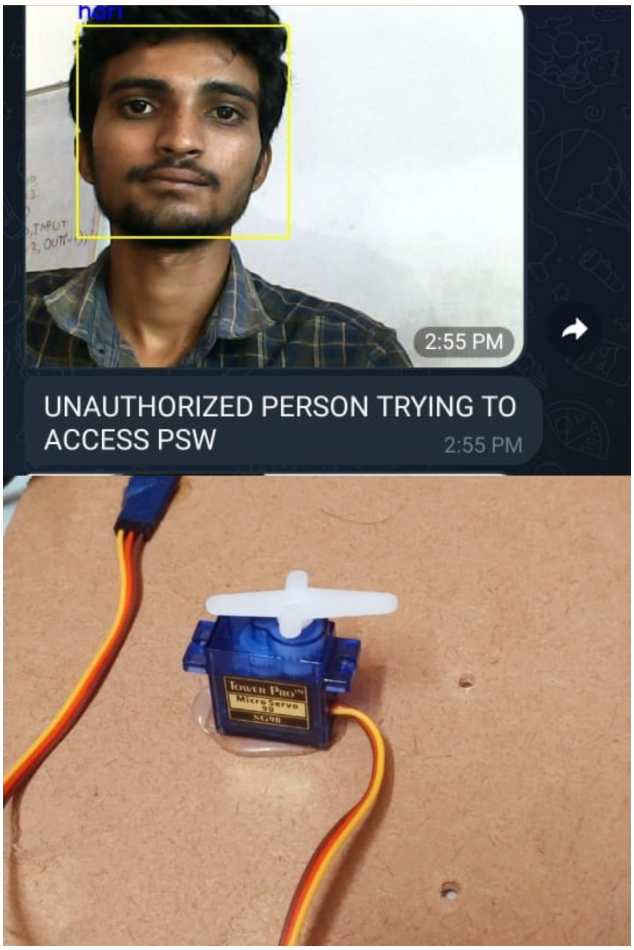


Figure 5.5: Unauthorized Person

If an unauthorized is trying to enter the home then automatically the system will sent warning notification to owner by sending image of the un authorized person with a message **UNAUTHORIZED PERSON TRYING TO ACCESS PSW** Door will not be accessed as we can see the door is in closed start in the above image.

If the unauthorized person is know to you and to open the door you can access the door open option as shown in figure below

Figure 5.6: Manual Access

Chapter 6

TESTING

6.1 Testing

Testing is the process of detecting errors. Testing performs a very critical role for quality assurance and for ensuring the reliability of software. The results of testing are used later on during maintenance also. Software testing is the process used to access the quality of computer software. Software testing the empirical technical investigation conducted to provide stakeholder with information about the quality of the product or service under test, with respect to the context in which it is intended to operate

There are many approaches to software testing. Reviews, walk throughs or inspections are considered as static testing, and where actually running the program with a gives t test cases in a given development stage is referred to as dynamic testing Software testing is ed in association with verification and validation.

Verification:

Have we built the software right (i.e., does it match the specification).

Validation:

Have we built the right software (i.e., is this what the user wants). Software testing methods are traditionally divided into black box testing and white box testing these two approaches are used to describe the point of view that a test engineer takes when designing test cases.

6.1.1 Black Box Testing

Black box testing treats the software as a black-box without any understanding as to how the internals behave. t aims to test the functionality according to the requirements. Thus, the tester inputs the data and only sees the output from the test object. This level of testing usually requires through test cases to be provided to the tester who then can simply verify that for a given input, the output value (or behavior), is the same as the expected value specified in the test cases, Black box testing methods include equivalence partitioning boundary.

6.1.2 White Box Testing

White box testing is done when the tester has access to the internal data structure, code, and algorithms white box testing methods including creating tests to cause all statements in the program to be executed at least once. Other examples white box testing are mutations testing and fault injection methods White box testing methods can also be used to evaluate the completeness of a test suite that was created with black box testing methods.

6.1.3 Pre-Release Testing

Unit testing tests the minimal software component, or module. Each unit (basic component) of the software is tested to verify that the detailed design for the unit has been correctly implemented. In an object-oriented environment this is usually at the class level, and the minimal unit tests include the constructors and destructors.

6.1.4 Integration Testing

Integration testing exposes defects in the interfaces and interaction between integrated components(modules). Progressively larger groups of tested software components correspond to the element of architectural design are integrated and tested until the software works as a system. Functional testing tests at any level (class, module, interface or system) for proper functionality as defined in the specification.

6.1.5 Acceptance Testing

Acceptance testing can be conducted by the end-user, customer, or client to validate whether or not to accept the product. Acceptance testing may be performed as a part of the hand-on the process between any two phases of development.

6.1.6 Post Release Testing

Alpha testing is simulated or actual operation testing by potential users or customers or an independent test team at the developer's site. Alpha testing is often employed for on-the shelf software as a form of internal acceptance testing Beta testing comes after alpha testing Versions of the software, known as beta versions, are released to limited audience outside of the programming team. The software is released to groups of people so that further testing can ensure the product has few faults or bugs sometimes, beta versions are made available to public to increase the feedback field to a maximal number of future users.

6.2 Software Testing Strategies

The software testing strategies are:

1. Unit Testing
2. Integration Testing
3. Functional Testing
4. System Testing
5. Acceptance Testing
6. Maintenance Testing

6.2.1 Unit Testing

unit testing is a critical step in ensuring the quality and reliability of a smart door lock system using facial recognition by Raspberry Pi. It plays an important role in ensuring that each component of the system functions correctly and that the system as a whole performs as intended.

6.2.2 Integration Testing

Integration testing is an important step in the development process of a smart door lock system using facial recognition by Raspberry Pi. Integration testing is a process of testing how different components of the system interact and work together as a whole.
During integration testing, the smart door lock system's various components, such as the facial recognition algorithm, door lock mechanism, and Raspberry Pi, will be tested together to ensure that they function correctly as a unified system. The integration testing phase will involve testing the system's communication protocols, data transfer, and user interface.
Integration testing ensures that the system's individual components work together correctly and

that any defects or inconsistencies are identified and resolved early in the development process. For example, during integration testing, the facial recognition algorithm's output will be tested to ensure that it properly controls the door lock mechanism.
The integration testing phase will also involve testing the system's compatibility with external devices, such as smartphones or tablets, and ensuring that the system functions as intended across different platforms.

6.2.3 Functional Testing

Functional testing plays an important role in ensuring the quality and reliability of a smart door lock system using facial recognition by Raspberry Pi. It helps to identify and resolve issues early in the development process, ensuring that the system performs as intended and providing a high level of security and convenience for users.
Functional testing mainly involves black box testing and it is not concerned about the source code of the application. This testing checks User Interface, APIs, Database, Security, Client/Server communication and other functionality of the Application Under Test. The testing can be done either manually or using automation.

6.2.4 System Testing

system testing plays an important role in ensuring the quality and reliability of a smart door lock system using facial recognition by Raspberry Pi. It ensures that the system performs as intended and meets the requirements and specifications defined during the planning phase, providing a high level of security and convenience for users.

6.2.5 Acceptance Testing

Acceptance testing is an important step in the development process of a smart door lock system using facial recognition by Raspberry Pi. Acceptance testing is a process of evaluating the system's compliance with specified requirements and ensuring that it is ready for deployment.

During acceptance testing, the smart door lock system will be tested to ensure that it meets the functional and non-functional requirements that were specified during the development phase. This includes testing the facial recognition algorithm's accuracy and the reliability of the door lock mechanism.

6.2.6 Maintenace Testing

maintenance testing plays an important role in ensuring the continued quality and reliability of a smart door lock system using facial recognition by Raspberry Pi. It ensures that the system

continues to function correctly over time, providing a high level of security and convenience for users.

6.3 Test Cases

Test case in software engineering in a set of conditions or variables under which tester will determine whether an application or software system meets specifications. The mechanism for determining whether a software program or system has passed or failed such a s known as a test oracle. It may take many test cases to determine that a software program system is functioning correctly. The written test cases are usually collected into test suites.

6.3.1 Objective

To verify the functionality of the Secure home automation using raspberry pi by telegram app **Assumptions:**

1. The smart door is installed and configured properly.
2. The face recognition software is installed and configured properly.
3. A test subject is available for testing.

6.3.2 Preconditions:

1. The smart door is in a locked state.
2. The face recognition software is running.

6.3.3 Test Steps:

1. Stand in front of the smart door.
2. Wait for the face recognition software to detect the face.
3. Verify that the face is recognized by the system.
4. Verify that the door unlocks automatically.
5. Open the door and enter the room.
6. Wait for the door to close automatically.
7. Wait for the door to lock automatically

Test ID	Test Steps	Expected Result	Actual Result	Status Pass/Fail
T1	Verify that the face lock door open system is pro -perly installed and conn -ected to a power source.	The system is installed and connected to a power source.	System is properly installed and connected.	Pass
T2	Add authorized users to the system's database, includ -ing their name and face images.	Authorized users are added to the system's database.	Authorized users are added successfully.	Pass
T3	Attempt to access the door with an unauthorized user's face.	The door remains locked.	The door remained locked.	Pass
T4	Attempt to access the door with an authorized user's face.	The door unlocks and grants access to the authorized user.	The door unlocked and granted access.	Pass
T5	Attempt to access the door with an image of an authorized user's face on a mobile device.	The door remains locked.	The door remained locked.	Pass
T6	Attempt to access the door with a photograph of an authorized user's face.	The door remains locked.	The door remained locked.	Pass
T7	Verify that the door's logs are properly recorded.	The logs should show the time, date, and user who accessed door the	The logs are properly recorded and contain the required information.	Pass

Table 6.1: Test Cases

Chapter 7

CONCLUSION & FUTURE ENHANCEMENTS

Conclusion

The proposed securing home automation using Raspberry Pi and Telegram app is a convenient and effective solution for homeowners who want to enhance the security and automation of their homes. The use of Raspberry Pi allows for easy integration of various smart devices and sensors, while the Telegram app provides a secure and convenient means of controlling and monitoring the system remotely. By using a secure communication protocol, such as HTTPS, and implementing proper security measures, such as two-factor authentication and encryption, the system can be protected against unauthorized access and data breaches. Additionally, regular updates and maintenance of the system can help to ensure that it remains secure and up-to-date. Overall, using Raspberry Pi and Telegram app for home automation offers a cost-effective and customizable solution that can be tailored to meet the specific needs of homeowners. However, it is important to implement proper security measures to ensure that the system remains secure and protected from potential threats.

Future Enhancements

Future enhancements to a smart door with facial recognition technology could include multi-factor authentication, mobile app integration, real-time monitoring, cloud connectivity, and artificial intelligence and machine learning for improved facial recognition capabilities.

Bibliography

[1] S. Dey, A. Roy, and S. Das, "Home automation using internet of thing," in *2016 IEEE 7th annual ubiquitous computing, electronics & mobile communication conference (UEMCON)*, IEEE, 2016, pp. 1–6.

[2] D. Sunehra and G. V. Ramana, "Webpage and telegram bot controlled home automation system using raspberry pi3," *INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH*, vol. 9, no. 02, 2020.

[3] B. Kadali, N. Prasad, P. Kudav, and M. Deshpande, "Home automation using chatbot and voice assistant," in *ITM Web of Conferences*, EDP Sciences, vol. 32, 2020, p. 01 002.

[4] P. Biswas and M. Mynuddin, "Design and implementation of smart home security system,"

[5] R. K. Kodali, V. Jain, S. Bose, and L. Boppana, "Iot based smart security and home automation system," in *2016 international conference on computing, communication and automation (ICCCA)*, IEEE, 2016, pp. 1286–1289.

[6] S. Dash and P. Choudekar, "Home automation using smart devices and iot," in *2021 9th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions)(ICRITO)*, IEEE, 2021, pp. 1–5.

[7] V. Nakrani, M. Panchal, D. Thakkar, S. Pednekar, and Y. Mane, "A review: Internet of things (iot) based smart home automation," *International Journal of Recent Trends in Engineering and Research*, vol. 3, no. 3, p. 231, 2017.

[8] V. S. Reddy, S. Cheerla, S. Inthiyaz, V. Chakravarthy, and V. G. Ram, "Face recognition and home automation using telegram bot," in *AIP Conference Proceedings*, AIP Publishing LLC, vol. 2407, 2021, p. 020 004.

[9] L. M. Satapathy, S. K. Bastia, and N. Mohanty, "Arduino based home automation using internet of things (iot)," *International Journal of Pure and Applied Mathematics*, vol. 118, no. 17, pp. 769–778, 2018.

[10] G. Rao, A. Vinod, N. Priyanka, C. H. Kumar, *et al.*, "Iot based web controlled home automation using raspberry pi," *International Journal of Scientific Research in Science, Engineering (IJSRSET)*, vol. 6, no. 2, pp. 229–234, 2019.

[11] N. Hema and J. Yadav, "Secure home entry using raspberry pi with notification via telegram," in *2020 6th International Conference on Signal Processing and Communication (ICSC)*, IEEE, 2020, pp. 211–215.

[12] S. Desai and V. D. Pawar, "Smart door security system using raspberry pi with telegram," *Int. Res. J. Eng. Technol*, vol. 6, no. 6, pp. 1400–1404, 2019.

[13] S. M. KH, K. Sumathi, V. Mano, I. M. Elias, and S. M. Raj, "Advanced smart home security alert system,"

[14] R. Reeta, "Smart secure door lock system using iot and eigenface approach," *IJCRT*, vol. 5, no. 4, pp. 2414–2418,

[15] K. Pallavi *et al.*, "Controlling smart home appliances using raspberry pi," *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, vol. 12, no. 12, pp. 3105–3109, 2021.

[16] Y. Amri and M. A. Setiawan, "Improving smart home concept with the internet of things concept using raspberrypi and nodemcu," in *IOP Conference Series: Materials Science and Engineering*, IOP Publishing, vol. 325, 2018, p. 012 021.

[17] R. G. Anvekar and R. M. Banakar, "Iot application development: Home security system," in *2017 IEEE Technological Innovations in ICT for Agriculture and Rural Development (TIAR)*, IEEE, 2017, pp. 68–72.

[18] R. Kumar and P. Mittal, "A novel design and implementation of smart home security system: Future perspective," *International Journal of Applied Engineering Research*, vol. 14, no. 2, pp. 363–368, 2019.

[19] S. Demir, Ş. Şimşek, S. Gür, and A. Levi, "Secure and privacy preserving iot gateway for home automation," *Computers and Electrical Engineering*, vol. 102, p. 108 036, 2022.

[20] O. Taiwo and A. E. Ezugwu, "Internet of things-based intelligent smart home control system," *Security and Communication Networks*, vol. 2021, pp. 1–17, 2021.

PRO vs PO RELEVANCE

Project Outcomes:

Outcome No.	Description
PRO1	Identifying the problems by doing a thorough literature survey of the existing research related to secure home automation using raspberry pi by telegram app.
PRO2	Analyze, design and develop a solution for "Secure Home Automation Using Raspberry Pi by Telegram App" to meet societal needs and industry standards for project management and finance.
PRO3	Develop employability and the ability to work in a team following the best ethical practices with a spirit for life-long learning and sharpening communication and presentation skills for authorized person through webcam.
PRO4	Make use of appropriate tools or techniques for sustainable development of a solution.
PRO5	Create interest to research different sources to check authorized or unauthorized person information automatically and authorizing the unauthorized through Telegram Notification.
PRO6	Construct a platform that makes users to interact with proposed system.

Table 7.1: Project Outcomes

PRO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PRO1	3	2	2	2	0	0	3	0	2	3	0	1	3	2
PRO2	2	2	3	2	3	1	3	0	2	3	1	2	3	2
PRO3	2	2	2	1	3	2	1	3	0	2	1	1	3	2
Overall Course	2	2	1	2	3	1	2	1	2	3	1	1	3	2

Table 7.2: Summary of Project Outcomes mapping to Program Outcomes Project Phase - 1

PRO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PRO4	2	3	2	1	3	0	1	1	1	3	2	0	3	1
PRO5	2	3	2	2	2	1	1	1	3	2	1	1	3	1
PRO6	2	3	1	2	2	2	2	0	3	3	1	2	3	3
Overall Course	2	3	2	2	2	1	1	1	2	1	3	1	3	2

Table 7.3: Summary of Project Outcomes mapping to Program Outcomes Project Phase - 2

PROs Relevance TO POs

PRO	PO	PI	Relevance
PRO1	PO1	1.2.2	Apply the concepts of Image processing, Training on database modeling of computer-based system,
	PO2	2.5.1	Ability to identify problem statements and objectives for evaluating subjective
	PO3	3.5.1	Ability to define a precise problem statement with objectives and scope for answer evaluation.
	PO4	4.5.1	Design and develop appropriate procedures methodologies based on the study objectives.
	PO7	7.3.1	Identify risks/impacts in the life-cycle of an engineering process or activity
	PO9	9.4.1	Recognize a variety of working and learning preferences; appreciate the value of team work
	P10	10.4.3	Create flow in a document or presentation - a logical progression of ideas so that the main point is clear
	P12	12.5.2	Read image, Recognize the image in data base vitally important to keep current regarding new developments in your system
PRO2	PO1	1.2.2	Apply the home application its control by remote.
	PO2	2.7.2	Identify design constraints for required performance criteria applications.
	PO3	3.7.1	Able to perform systematic evaluation of the degree to which several design implemented the image processing.
	PO4	4.4.2	Able to choose haar cascade classifier, image dataset and test cases.
	PO5	5.4.2	Create modify tools and techniques to solve content validating and verifying detecting image processing.
	PO6	6.4.1	To Interpret regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the people for door automation
	PO7	7.3.1	Identify impacts in the automation of implement answer checking on image.
	PO9	9.4.1	Recognize a variety of working and learning preferences of team members.

PRO	PO	PI	Relevance
	PO10	10.4.3	Create flow in a document or presentation-CV of idea so that the main point of the automation.
	PO11	11.6.2	Use project management tools to schedule an engineering project, so it is completed on time and on budget.
	PO12	12.6.2	Analyze sourced technical and popular information for feasibility, viability, sustainability, etc..
PRO3	PO1	1.5.1	Apply implementation work on project and code implementation.
	PO2	2.6.2	Identify functionalities and computing resources like data preprocessing techniques for open CV.
	PO3	3.7.2	create a design for prototype to select subjective answer design development.
	PO4	4.6.1	Use appropriate procedures, tools, and techniques to collect and analyze data such as open cv.
	PO5	5.6.1	Discuss limitations like only files with .xml extensions are allowed.
	PO6	6.4.1	Interpret Open cv legislation, regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the public.
	PO7	7.4.1	Describe Subjective answer verifier management techniques for sustainable development form automation.
	PO8	8.4.1	Identify situations of unethical professional conduct and propose ethical alternatives identified unauthorized person
	PO10	10.5.1	Listen to and comprehend information instructions, and viewpoints of public
	PO11	11.4.1	Analyze different forms of financial statements to evaluate the financial status of an iot project.
	PO12	12.5.2	Recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in your automation iot lidating
PRO4	PO1	1.6.1	Apply engineering fundamentals for Content Validating and verifying image checking in data base .
	PO2	2.8.1	Applies automation to implement the solution of coding like open cv and os .
	PO3	3.8.2	Able to implement Raspberry pi modules and integrate the modules.

PRO	PO	PI	Relevance
	PO4	4.6.2	Critically analyzed evaluator data testing secure home automation in , stating possible errors and limitations.
	PO5	5.5.2	Demonstrate cvvs proficiency in using motor,realy,camera,sd card tools.
	PO7	7.4.2	Apply principles of preventive engineering and sustainable development to an engineering activity or product relevant to the subjective answer verifier.
	PO8	8.4.2	Examine and home application & ethical of telegram bot creating process.
	PO9	9.5.4	Maintain composure in difficult situations like in giving inputs as installing os and open cv only.
	PO10	10.5.1	Listen to and comprehend information, instructions, and viewpoints of others in the team of project.
	PO11	11.6.2	Use project management tools to schedule an secure home automation, so it is completed on time and on budget..
PRO5	PO1	1.2.1	Apply the knowledge of haar cascade classifier similarity to solve problems home automation
	PO2	2.6.1	Reframe the cv computer-based system into interconnected subsystems.
	PO3	3.8.1	Able to refine content by validating and verifying IOT system architecture design into a detailed design within the existing constraints
	PO4	4.4.1	Ability to define a problem for purposes of content validating and verifying the IOT system, its scope, and importance.
	PO5	5.6.2	Verify the credibility of results from open Cv Packages use with reference to the accuracy and limitations, and the assumptions in the use of CV.
	PO6	6.4.1	Interpret legislation, regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the public.
	PO7	7.3.1	Reframe the cv computer-vision system into interconnected Open CV.
	PO8	8.3.1	Identify situations of unethical professional conduct and propose ethical method of mobile remote control.

PRO	PO	PI	Relevance
	PO9	9.4.1	Identify situations of unethical professional conduct and propose ethical alternatives.
	PO10	10.4.3	Create flow in a document or presentation - a logical progression of ideas so that the main point of the Secure Home Automation
	PO11	11.5.1	Analyze and select the most appropriate proposal based on economic and financial considerations.
	PO12	12.5.1	Listen to other members of the CV project included.
PRO6	PO1	1.6.1	Apply engineering fundamentals for Content validating and IOT system..
	PO2	2.8.2	Analyze and interpret the results using Raspberry pi tools.
	PO3	3.5.4	Able to choose flask framework quality attributes as defined by IEEE paper reference in home application project.
	PO4	4.6.3	Represent grading and test cases data in tabular forms so as to facilitate analysis and explanation of the data, and implementation process haar cascade classifier.
	PO5	5.5.2	Demonstrate CV proficiency in using discipline-specific Open CV tools.
	PO6	6.3.1	Identify and describe subjective answer correction importance in home automation
	PO7	7.4.1	Describe management techniques for sustainable development of the iot answer verifier image processing
	PO9	9.4.2	Examine and apply subjective answer correction moral principles to known case studies of system.
	PO10	10.6.1	Presented qualitative grades as a team, with smooth integration of contributions from all individual efforts using CV.
	PO11	11.6.2	Use a variety of media effectively to convey a message in a document or a document or a presentation for content validating and verifying detecting image system.
	PO12	12.4.1	Describe various economic and financial benefits of a subjective home environment.

Table 7.4: PRO Relevance to PO

PROs Relevance to PSO

PRO	PSO	Relevance
PRO1	PSO1	Ability to develop objectives of system .
	PSO2	To deploy stoppage of manual activities in Secure Home Authomation Using Raspberry Pi by Telegram app.
PRO2	PSO1	To deploy solutions for the existing problem for a Secure Home Automation Using Raspberry Pi by Telegram app.
	PSO2	To analyze existing real-world problems Home Automation correction.
PRO3	PSO1	To develop appropriate methods like implementing new series to solve the existing problem.
	PSO2	Ability to apply ethical principles to proposed system.
PRO4	PSO1	To deploy services based on the copied sources in training data.
	PSO2	Ability to develop OpenCV using python language.
RRO5	PSO1	To implement code for developing home automation system activity through telegram app .
PRO6	PSO1	Choosing alternative techniques to work with the Raspberry pi os through telegram bot chat.
	PSO2	Studying about Secure Home automation raspberry pi by telegram app.

Table 7.5: PRO Relevance to PSO

APPENDIX-1 (CODING)

```
import sys
import re
import time
from functools import wraps

from picamera import PiCamera
from telegram import Update, Bot
from telegram.ext import (
    Updater,
    CommandHandler,
    CallbackContext,
)

from config import TOKEN_ID, REGISTRATION_FOLDER, CHAT_ID, VIDEO_TIME

from lib.pir import motion_detected
from lib.camera import Camera
from lib.home_surveillance import HomeSurveillance


##################
# Instantiation #
##################
# Create an instance of the telegram bot
bot = Bot(token=TOKEN_ID)

# Create an instance of HomeSurveillance
surveillance = HomeSurveillance()
```

```
29
30 # Create an instance of the camera
31 camera = Camera(PiCamera(), REGISTRATION_FOLDER)
32
33
34 ############
35 # Utility #
36 ############
37
38
39 def restricted(func):
40     """Restrict usage of func to allowed users only and replies if
       necessary"""
41     @wraps(func)
42     def wrapped(update, context, *args, **kwargs):
43         chat_id = update.effective_chat.id
44         if int(chat_id) != int(CHAT_ID):
45             update.message.reply_text('Unauthorized access.')
46             return None  # quit function
47         return func(update, context, *args, **kwargs)
48     return wrapped
49
50
51 ###############
52 # Bot command #
53 ###############
54
55
56 @restricted
57 def start(update: Update, context: CallbackContext) -> None:
58     """Command /start: start surveillance."""
59     surveillance.start()
60     context.bot.send_message(chat_id=CHAT_ID, text="Surveillance is
       start")
61
62
63 @restricted
```

```
64 def stop(update: Update, context: CallbackContext) -> None:
65     """Command /stop: stop surveillance."""
66     surveillance.stop()
67     context.bot.send_message(chat_id=CHAT_ID, text="Surveillance is stop")
68 
69 
70 @restricted
71 def status(update: Update, context: CallbackContext) -> None:
72     """Command /status: show surveillance status."""
73     context.bot.send_message(
74         chat_id=CHAT_ID,
75         text="Surveillance is active" if surveillance.is_start else
               "Surveillance is deactivated"
76     )
77 
78 
79 @restricted
80 def man(update: Update, context: CallbackContext) -> None:
81     """Command /help: show help."""
82     usage = "command help:\n"
83     usage += "\t/start : start the home monitoring system \n"
84     usage += "\t/stop  : stop the home monitoring system\n"
85     usage += "\t/status  : show the status of the monitoring system \n"
86     usage += "\t/photo : take a picture\n"
87     usage += "\t/video time=<duration> : records a video, by default
           duration is " \
88           + str(VIDEO_TIME) \
89           + "s \n"
90     usage += "\t/clean : remove all files in video folder\n"
91     usage += "\t/help  : show help\n"
92     context.bot.send_message(chat_id=CHAT_ID, text=usage)
93 
94 
95 @restricted
96 def photo(update: Update, context: CallbackContext) -> None:
97     """ Command /photo: take a photo"""
98     with open(camera.take_photo(), 'rb') as img:
```

```
99          context.bot.send_photo(chat_id=CHAT_ID, photo=img)
100
101
102 @restricted
103 def video(update: Update, context: CallbackContext) -> None:
104     """
105     Command /video: record a video
106     Takes an argument named time, corresponds to the duration of the video
107     example: /video time=30 for take a video of 30s
108     """
109     duration = VIDEO_TIME
110     # Parse args to get duration value
111     if context.args:
112         key, value = context.args[0].split('=')
113         if key == 'time':
114             if re.match(r'\d+', value):
115                 duration = value
116             else:
117                 context.bot.send_message(
118                     chat_id=CHAT_ID,
119                     text=F"Duration of the video not correct: {value}"
120                 )
121         else:
122             context.bot.send_message(chat_id=CHAT_ID, text=F"Argument
                {key} not recognized")
123
124     # Start video recording
125     try:
126         with open(camera.start_recording(duration), 'rb') as video_file:
127             context.bot.send_video(chat_id=CHAT_ID, video=video_file)
128     except OSError as err:
129         context.bot.send_message(chat_id=CHAT_ID, text=str(err))
130
131
132 @restricted
133 def clean(update: Update, context: CallbackContext) -> None:
134     """ command /clean: remove file in REGISTRATION_FOLDER """
```

```
135     try:
136         context.bot.send_message(chat_id=CHAT_ID,
                text=camera.purge_records())
137     except OSError as err:
138         context.bot.send_message(chat_id=CHAT_ID, text=str(err))
139
140
141 def main() -> None:
142     """Run the bot."""
143     # Create the Updater and pass it your bot's token.
144     updater = Updater(TOKEN_ID)
145
146     # Get the dispatcher to register handlers
147     dispatcher = updater.dispatcher
148
149     # on different commands - answer in Telegram
150     dispatcher.add_handler(CommandHandler("start", start))
151     dispatcher.add_handler(CommandHandler("stop", stop))
152     dispatcher.add_handler(CommandHandler("status", status))
153     dispatcher.add_handler(CommandHandler("help", man))
154     dispatcher.add_handler(CommandHandler("photo", photo))
155     dispatcher.add_handler(CommandHandler("video", video, pass_args=True))
156     dispatcher.add_handler(CommandHandler("clean", clean))
157
158     # Start the Bot
159     updater.start_polling()
160
161     # Infinite loop, if a motion is detected and surveillance is start
162     # a video recording is taken and sent through the telegram bot.
163     while True:
164         if surveillance.is_start and motion_detected():
165             try:
166                 with open(camera.start_recording(VIDEO_TIME), 'rb') as
                        video_file:
167                     bot.send_video(chat_id=CHAT_ID, video=video_file,
                            caption="Motion detected")
168             except OSError as err:
```

```
                bot.send_message(chat_id=CHAT_ID, text=str(err))

        if surveillance.is_interrupted:
            break

        time.sleep(1)

    print("Stop the bot")
    updater.stop()
    print('Exit')
    sys.exit(0)


if __name__ == '__main__':
    main()
```

Listing 7.1: Mobile access code

```
import signal


class HomeSurveillance:
    """
    Class to keep the specific status required by the application. Avoid
       the use of \"global\".
    Specific status:
        _is_start:     if true the intrusion detection is activated
        _interrupted:  status to stop the infinite loop of motion
           detection.
    """
    def __init__(self):
        # Status
        self._is_start = False
        self._interrupted = False

        # Action for signal SIGINT and SIGTERM
        signal.signal(signal.SIGINT, self._signal_handler)
        signal.signal(signal.SIGTERM, self._signal_handler)
```

```
19
20      def _signal_handler(self, *args):
21          """Handler for signal.signal"""
22          print("\nExiting HomeSurveillance")
23          self._interrupted = True
24
25      @property
26      def is_interrupted(self) -> bool:
27          """Return interrupted status"""
28          return self._interrupted
29
30      @property
31      def is_start(self) -> bool:
32          """Return is_start status."""
33          return bool(self._is_start)
34
35      def start(self):
36          """Start intrusion detection."""
37          self._is_start = True
38
39      def stop(self):
40          """Stop intrusion detection."""
41          self._is_start = False
```

Listing 7.2: Home Surveillance class

```
1  from gpiozero import MotionSensor
2
3  pir = MotionSensor(4)
4
5  def motion_detected() -> bool:
6      """Check if motion detected."""
7      return bool(pir.motion_detected)
```

Listing 7.3: Package for interfacing with Raspberry PI PIR motion sensor

```
1  import subprocess
2  import time
3  import os
```

```
4
5
6  class Camera:
7      """
8      Class to interfaces with Raspberry Pi Camera module.
9      Photos and videos are named photo-%H%M%S-%Y%m%d.jpeg and
           vid-%H%M%S-%Y%m%d.mp4 respectively.
10     :param folder: allows you to define the folder where the records are
           stored.
11     """
12     def __init__(self, camera, folder: str):
13         self._camera = camera
14         self._registration_folder = os.path.abspath(folder)
15
16     def start_recording(self, delay=60):
17         """
18         Starts recording the video for a time defined by a delay
               parameter.
19         :param delay: recording time
20         :return: video at mp4 format
21         """
22         video_h264 = os.path.join(self._registration_folder,
23                                   'vid-' + time.strftime("%H%M%S-%Y%m%d")
                                      + '.h264')
24         video_mp4 = os.path.join(self._registration_folder,
25                                  'vid-' + time.strftime("%H%M%S-%Y%m%d")
                                     + '.mp4')
26         self._camera.start_recording(video_h264)
27         time.sleep(int(delay))
28         self._camera.stop_recording()
29
30         # convert video at mp4 format
31         self._convert_h264_to_mp4(video_h264, video_mp4)
32         return video_mp4
33
34     def _convert_h264_to_mp4(self, h264, mp4):
35         """
```

```
36          Converted video format h264 in mp4.
37          :raise: OSError
38          """
39          command = F"MP4Box -add {h264} {mp4}"
40          try:
41              subprocess.check_output(command, stderr=subprocess.STDOUT,
                    shell=True)
42          except subprocess.CalledProcessError as err:
43              print(F'FAIL:\ncmd:{err.cmd}\noutput:{err.output}')
44              raise OSError from subprocess.CalledProcessError
45
46          # remove h264 file after convert to mp4 format
47          self._remove_file(h264)
48
49      @staticmethod
50      def _remove_file(file):
51          """
52          Remove a specific file
53          :raise OSError
54          """
55          remove_cmd = F"rm {file}"
56          try:
57              subprocess.check_output(remove_cmd, stderr=subprocess.STDOUT,
                    shell=True)
58          except subprocess.CalledProcessError as err:
59              print(F'FAIL:\ncmd:{err.cmd}\noutput:{err.output}')
60              raise OSError from subprocess.CalledProcessError
61
62      def take_photo(self):
63          """
64          Take a photo.
65          :return: photo at format .jpeg
66          """
67          photo = os.path.join(self._registration_folder, 'photo-' +
68                               time.strftime("%H%M%S-%Y%m%d") + '.jpeg')
69          self._camera.capture(photo)
70          return photo
```

```
71
72      def purge_records(self):
73          """
74          Deletes records from the folder.
75          :return: string result
76          :raise: OSError
77          """
78          command = "cd " + self._registration_folder + " && rm -f *"
79          try:
80              subprocess.check_output(command, stderr=subprocess.STDOUT,
                    shell=True)
81          except subprocess.CalledProcessError as err:
82              print(F'FAIL:\ncmd:{err.cmd}\noutput:{err.output}')
83              raise OSError from subprocess.CalledProcessError
84          else:
85              return str('The records have been deleted')
86
87      def __del__(self):
88          self._camera.close()
```

Listing 7.4: Training image

```
1  # Variable to configure
2  TOKEN_ID = 'Your token_id'
3  CHAT_ID = 'Your chat_id'
4
5  # Default duration for video recording in seconds
6  VIDEO_TIME = 60
7
8  # Path of the folder where the videos and photos are stored
9  REGISTRATION_FOLDER = 'tmp/video'
```

Listing 7.5: Configuration file

APPENDIX-2

(LITERATURE SURVEY PUBLICATION AND CERTIFICATIONS)

SECURE HOME AUTOMATION USING RASPBERRY PI BY TELEGRAM APP

Mr. G. Nageswara Rao (ASSOCIATE PROFESSOR)[1]
Gandham Harshitha (19K61A1215)[2], Nimmala Akanksha (19K61A1240)[3],
Adapareddy Harika (19K61A1201)[4]

[1,2,3,4]DEPARTMENT OF INFORMATION TECHNOLOGY, INDIA,
SASI INSTITUTE OF TECHNOLOGY & ENGINEERING

Abstract: In today's generation dealing with security vulnerabilities on all sides. So, we must use streamlined technology to address these problems. In this project, we'll be taking pictures of people and comparing them to images from the database that have already been stored. The most important component of any home security system is the ability to track who enters or departs the property. Unique faces can be used to monitor things instead of passwords or pins because they are a person's biometric feature. In accordance with who we are, we wish to develop a smart door that will guard the entrance. By employing facial detection and identification, this initiative aims to assist users in enhancing the door security of critical locations. If an unauthorised face is automatically detected, the system will take a picture and send it to the appropriate person by telegram.

Keywords: Facial detection, database, doorway, telegram.

I. INTRODUCTION

In this system, an IR sensor is employed to determine any motion at the front door, which activates the camera and causes it to take the picture and send it to the owner by telegram. If the database contains visitor image information, the door will automatically open otherwise the owner will receive the image of an intruder and can choose whether or not to let admission. Our suggested approach leverages Telegram notification to alert the owner, in contrast to existing notification systems. The benefit of utilising Telegram is that some older citizens do not use Gmail or Twitter because they find those services difficult to use and necessitate the setup of accounts. Since Telegram is a messaging programme that can operate online in a similar way to WhatsApp, the majority of elderly folks want to use it. The primary goal of this study proposal is to develop and deploy a low-cost, secure, and adaptable home automation system that is capable of security employing face detection and motion detection systems that are also used for home automation.

II. LITERATURE REVIEW

Dashi, Deep and Rai et al [1] Technology alters people's daily routines, An android app is created to assist old individuals who are unable to aid themselves, and this created system is used by people who live alone. This system's implementation makes use of WIFI and an easy-to-use web server, both of which have the potential for future growth when combined with improved sensors to boost sensor precision (like up to street Nights)

Dhiraj and Ramana et al [2] Users can access household equipment at any time by connecting to the network and controlling

them as necessary. This system also offers security as it sends an email notice to the user when it detects an intruder or person. The system is operated via a web page and a telegram bot.

Bhavyasri, Neha, Pranaya and Manoj et al [3] technology that automates your home that combines many technologies, such as the Internet of Things. The primary benefit of this system is that it offers users both text and voice communication options. A chatbot application will be used for the user's text input, and a voice assistant will be used for the user's voice input.

Kamal, Biswas and Sayidul et al [4] a security hierarchy of three have been guaranteed. Use of NFC tags with a PIR motion sensor and a password. The door won't open if one of them isn't there. A lock is attached to the shaft of the servomotor that will be used to unlock the door. When the incorrect password is entered, the LCD shows error text.

Sudha and Priya et al [5] By managing and interacting with remote control of home appliances, the IOT offers a comfortable way of living to people. Two Node MCUs are present in the proposed system. The Node MCU (Node unit micro controller) is an open-source device that combines hardware and software to create a far less expensive system based on the ESP8266 chip.

Apeksha and Bhacheh et al [6] While an automated home can be referred to or classified as a smart home, a system for wireless home automation employing the iot employs computers or mobile devices to operate features automatically through the internet from anywhere in the globe.

Ruhi et al [7] These systems often include a detecting and actuation layer made up of passive infrared sensors, also referred to as motion sensors, and web cameras for security.

Akash and Priyanka et al [8] In this system, devices including lighting, fans, and camera access are employed. Any internet-capable device, such as a smart phone or laptop, may be used to control home appliances thanks to an Android application and a Telegram bot. The proposed system also provides home security through the use of a camera that may provide images via a Text and voice communication when no one is at home.

Mohan, Samir, Nihar et al [9] To serve as a connectivity module to show the system's effectiveness and viability. It enables the user to remotely manage a variety of appliances, including lights, fans, and televisions, as well as make decisions based on sensor feedback on various environmental factors.

G. joga and Vinod et al [10] The study is primarily focused on IOT-based home automation utilising a wireless raspberry PI system. IOT enables we can use to automatically control standard household equipment via the internet from anywhere in the world using PCs or mobile devices.

Shaik, Krishna et al [11] These days, everything moves at supersonic speeds, and digital media allows for data to be exchanged at the speed of light. Therefore, utilising Internet protocols, information must come in at the same rate.

Desai, Virendra et al [12] The IoT is at its height in the modern world. As the world becomes smarter, home automation is starting to take off. One of the newest technologies in home automation is smart door control. This study seeks to expand the door automation method utilising a Raspberry Pi and an Android device.

Shakthi and Abishiek et al [13] A smart home is a networked association of automation and management for extraordinary living. Home security is crucial in this regard, becoming a crucial aspect of our lives.

Reeta R et al [14] The facial recognition technology works by first taking a picture with a camera. The snippet of code recognises an individual's characteristics. Using a Raspberry Pi, the captured image is compared to the database of photos after being detected. The faces are then compared to see if they match or not. The 300 SIM GSM module then broadcasts a security alarm to the specified person in case an intruder tries to enter the premises.

Akash Kasote , Priyanka Kolage , Nikita Sadgir , Gayatri Avhad, Dr. P.G.Vispute et al [15] Our project aims to create devices that are simple to operate, including home applications and other devices. Using an application on a cell phone with an Android, iOS, or Windows operating system installed, we may operate fans, air conditioners, lights, and other appliances.

Yasirli Amri , Mukhammad Andri Setiawan et al [16] Email was the basis on which the smart home was formed. This research examined a home security system that identifies facial patterns to allow access. Cameras and a BeagleBone are used in this system. Email was used by the system to interact with users.

K. H. Shakthi, P.Abisheik, V.Srinath, S.Dinakaran, M.Ajay et al [17] The database contains pictures of people who have been granted approval. The camera records the face of the person who rings the doorbell when they approach the door and compares it to previously recorded photographs in the database. The door unlocks if the image is a match with the one being captured at the moment. If it fails, the user receives the captured face.

Rajiv Kumar, Pooja Mittal et al [18] The system includes a backup in case there is a power outage issue. The power backup devices are switched in place of the main supply, and they continue to power the security system.

Simge Demir Şevval Şimşek et al [19] The goal of their future study is to create an anonymous secure framework (ASF) for smart homes. The ASF model focuses critical progression on session and routine key renewal to get rid of any faults brought on via a falsified key. Although this model offers unlinkability and anonymity, it is missing the property of anonymous identification.

Olutosin Taiwo Absalom E. Ezugwu et al [20] The smartphone application lets you toggle any electrical household equipment ON or OFF to use energy more effectively. It analyzes the home's current humidity and temperature and alerts the user. Additionally, it directs conversion readings of domestic activities and stores or obtains data to or from the cloud.

REFERENCE WORK:

R. No.	TITLE	AUTHOR	YEAR	METHODOLOGY	LIMITITATIONS
[1]	"IoT Home Automation"	Dashi, Deep and Rai	2021	Arduino, Relay, Led, Fan, Node MCU is used for automation	Security, privacy, and designing, developing the system is very complex
[2]	"Webpage And Telegram Bot Controlled Home Automation System"	Dhiraj and Ramana	2020	Three 2-channel relays, two fans and 2 light ,electromagnetic door lock, The PIR Sensor , GPIO pins	SMTP server updation can be delayed as usage Of Raspberry Pi makes it more complex as detection of Intrudution Send mail. (It can be enchanced further).
[3]	"Home Automation Using Chatbot And Voice Assistant"	Bhavyasri, Neha, Pranaya and Manoj	2020	Raspberry Pi NLP unit: natural language processing Spoken-to-text conversion will be applied to the Voice Assistant module's speech input. The complete processing of the obtained input takes place in this unit, giving the NLP module a text input.	The system can be further made inclusive of extensions such as attaching of email services as an alternate form of message delivery, in situations of utmost importance. The number of devices that can be connected to the system can not be expanded to a larger range.
[4]	"Design And Implementation Of Smart Home Security System"	Kamal, Biswas and Sayidul	2020	PIR sensor, pin, servo motor ,buzzer ,VDD , VSS ,power supply crystal oscillator set of authorized person data microcontroller sends signal to servo motor	Developing the system is very complex which leads to not reachong all the features.

[5]	"Internet of things Based Smart Security And Smart Automation"	Sudha and Priya	2020	Remotely controlled room temperature, automatic fans, and automatic lights	Security ,privacy, and designing, developing, managing the system .
[6]	"Home Automation And Security Using Iot"	Apeksha and Bhacheh	2020	Drivers/devices, sensors, Wi-Fi router mobile ESP8266 node MCU Wi-Fi Module, Relay Module, DHT11, Current Sensor configure ESP8266 .	This concept combines home automation and security, both of which are necessary nowadays. .
[7]	"Internet of things Based Smart Security And Home Automation"	Ruhi Uzma , Prafulla Anil	2021	NodeMCU , ArduinoNano , Relay LCD , DHT11 sensor, MQ9 Gas sensor , Touch Sensor, Buzzer Operation Voltage,	An advanced feature is offered, which is IoT digital code lock security.
[8]	"Smart Home Automation Via Telegram Chatbot And Android Application"	Akash and Priyanka	2021	Telegram , Telegram bot, Bot Father , The Raspberry Pi , Temperature sensor DHT11, Pi Cam	Computer vision can be used for motion detection and alerting through telegram
[9]	"Arduino Based House Automation Using Iot "	Mohan, Samir, Nihar	2018	Arduino UNO , 4-Channel Relay , ESP8266-01, WIFI, Gas Sensor , Temperature Sensor, Software Design , Implementation ,	reducing the time it takes an appliance to switch on and off, Adding speech recognition to the system, utilising Wi-fi to detect smart phones automatically so that the loads are activated when they are in range, Wi-Fi

					range expansion to allow for operating across great distances that are acceptable
[10]	"Internet of things Based Web Controlled Home Automation Using Raspberry Pi"	G. joga and Vinod	2019	Raspberry pi , Voltages , SPI , I2C, Serial, Camera , Pir sensor , Relay module, Digital humidity and temperature sensor , door sensor	Security ,privacy, and designing ,developing the system is very complex
[11]	"Home Security And Automation With Telegram Communication Application Using Raspberry Pi"	Shaik, Krishna	2021	Telegram protocol, Remote Support, Meetings Presentations, Remote Access Remote Office Remote Home, Home electronics unit (HEU) , Telegram application unit (TAU),	SMTP server updation can be delayed as usage Of Raspberry Pi makes it more complex as detection of Intrudution Send mail. (It can be enchanced further)
[12]	"Smart Door Security System Using Raspberry Pi With Telegram"	Desai, Virendra	2020	Raspberry pi B3 , PIR Sensor , Camera Module ,Wi-Fi Module .Telegram App	The system can be further made inclusive of extensions such as attaching of email services as an alternate form of message delivery, in situations of utmost importance. The number of devices that can be connected to the system can not be expanded to a larger range.
[13]	"Implementation Of Smart Home Advanced Security Alert System"	S Abishiek	2019	facial recognition, Raspberry Pi 3, camera module, door lock, automation, security	Developing the system is very complex which leads to not reachong all the features

[14]	"Smart Secure Door Lock System Using Internet of things And Eigenface Approach"	Reeta R	2017	Raspberry Pi, Python, Eigenface, Wi-Fi modem, plus relay	The creation of a web-based control system, an integrated smart home security system using the raspberry pi, and Eigenface technology
[15]	"Smart Home Automation Via Telegram Chatbot And Android Application"	Akash, Priyanka Kolage, Sadgir	2021	Home automation, Home security, Internet of Things, Python language, Raspberry Pi3, Android, Telegram Bot	Computer vision can be used for motion detection and alerting through telegram.
[16]	"Improving Smart Home Concept With The Internet Of Things Concept Using Raspberrypi And Nodemcu"	Yasirli Amri , Mukhammad Andri Setiawan	2017	Raspberry Pi ,NodeMCU, rain sensor, door sensor, passive infrared sensor (PIR), DHT22	Improve home security The system does not require a great power Users can control and monitoring the house remotely
[17]	"Implementation Of Advanced Smart Home Security Alert System"	Shakthi	2019	facial recognition, Raspberry Pi 3,camera module, door lock, automation, security	Developing the system is very complex which leads to not reachong all the features.
[18]	"A Novel Design And Implementation Of Smart Home Security System: Future Perspective"	Rajiv Kumar, Pooja Mittal	2019	Internet of Things, sensors, GSM (Gsm Modem), and security	This security system has generic concept and implementation with effective GSM to notify users with message with raising alarm.
[19]	"Secure And Iot Gateway For Home Automation"	Simge Demir Şevval Şimşek	2020	IoT device, Vendor, Nonce with identifier	Security ,privacy, and designing, developing, managing the system .
[20]	"Internet Of Things-Based Intelligent Smart Home Control System"	Olutosin Taiwo Absalom E. Ezugwu	2021	sensors, a 5 V, tranmitter relay module, an ESP32-CAM board, and an ESP8266 board.	The home automation system allows remote and local control of the home. The system controls electrical

					home appliances, monitors environmental conditions through temperature, humidity, and light sensors, and ensures home security through a motion sensor and an IoT camera

III. BLOCK DIAGRAM

This proposal makes use of a number of other modules, including Telegram and image processing, to improve interaction with home security systems. We require both hardware and software codesign in order to create secure home systems. We require a microcontroller in the hardware to manage the system's general operation. Servo motors and LED actuators are employed, Here, load is a representation of how various home applications are connected to the system to become automated.

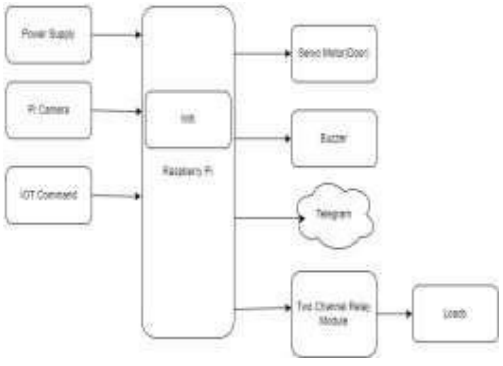


Figure 3.1: Basic flow of the system

IV. GENERAL VIEW

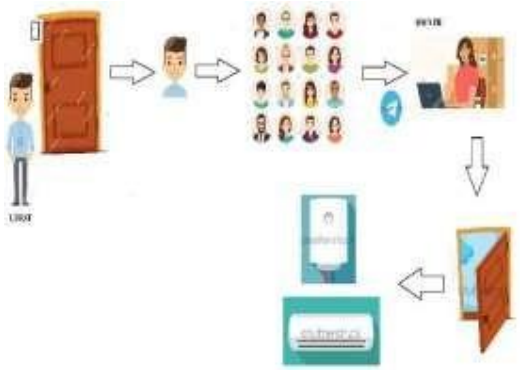


Figure 4.1: General scenario

As seen in the above graphic, when a visitor's image cannot be matched with photographs already in the file storage, the owner is prompted to open the door by determining whether the visitor is a recognised individual before the automation of the home activities are carried out.

V. METHODOLOGY

Hardware requirements, software requirements, and user requirements are necessary for the proposed system's

implementation design. The suggested system's control flow is depicted in the
Hardware Components:

- **Raspberry Pi**

  The Raspberry Pi Foundation created the single-board computer, or tiny circuit, to enable teaching programming to novices.

- **USB Camera**

  A USB webcam is a camera that connects to a computer by commonly being plugged into a USB port on the computer. The computer receives the video feed, and a software programme allows you to view the images and upload them to the Internet.

- **Sd card**

  A Secure Digital card is a small flash memory card made for high-capacity storage and a variety of portable devices, including GPS navigation systems, cell phones, e-books, PDAs, Personal computers, tablets, cameras, mp3 players, and digital video camcorders

- **Servo Motor(door)**

  The control circuit for this type of motor often offers feedback on the motor shaft's present position, enabling the servo motors to rotate very precisely.

- **Buzzer**

  a signalling tool that uses electricity and generates a buzzing noise.syte

- **Jumper wires**

  An electric line known as a jumper wire is used to connect distant electric circuits on printed circuit boards.

Software Components:

- IDLE Software
- Python language

VI. DFD DIAGRAMS

DFD Level 0

It is intended to be an abstraction view that presents the system as a lone process with its connections to outside entities. It shows

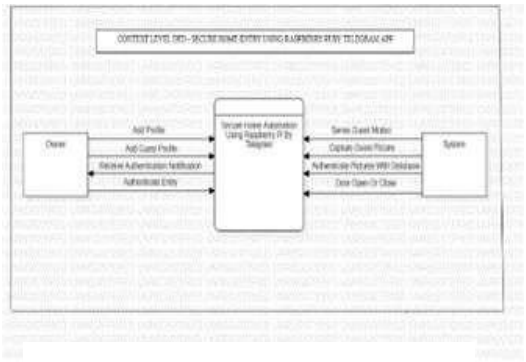


Figure 6.1: Level 0 DFD

the entire system as a single bubble with data input and output indicated by incoming and outgoing arrows.

DFD Level 1

The Contextual diagram is divided into numerous processes in 1-level DFD. This

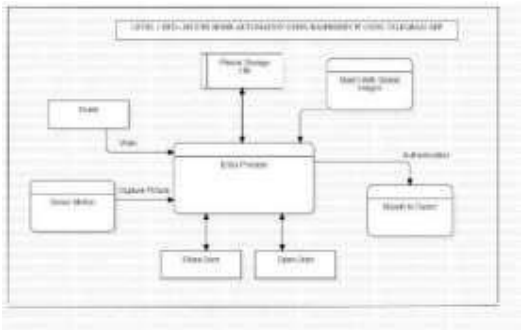


Figure 6.2: Level 1 DFD

level emphasises the, we highlight the key

operations of the system and decompose the high-level 0-level DFD process into subprocesses

The Contextual diagram is divided into numerous processes in 1-level DFD. In this level, we emphasises the key operations of the system and decompose the high-level 0-level DFD process into subprocesses.

DFD Level 2

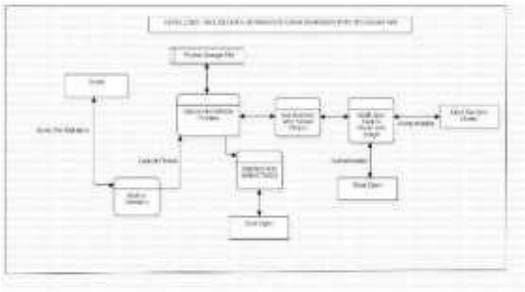


Figure 6.3: Level 2 DFD

Parts of 1-level DFD are further explored in 2-level DFD. It can be used to plan or keep track of the precise or important information about how the system works.

VII. FUTURE SCOPE

We have created a smart system that minimises human effort and makes it simple to operate the smart door. This system allows access from anywhere in the world while still offering high security. Both upgrading and portability are simple. By sending a reply message to RPI, The owner of the digital locking system can open the doors and provide entry to a known individual using Telegram.

VIII. CONCLUSION

For a high level of security, this concept uses the Internet of Things and image processing, two cutting-edge technologies. The suggested work is implemented utilising a Raspberry Pi, which can connect to a computer or a mobile device, making it simple for the user to utilise. Our technology, which uses an IR sensor for object detection and a camera for face identification, is an integrated response to all previous work.

IX. REFERENCES

[1] Dashi, Deep and Rai "Iot home automation" Research gate august 2021 https://www.researchgate.net/publication/353789495

[2] Dhiraj and Ramana "Controlled by a website and a Telegram bot, the home automation system" research volume 9, issue 02, february 2020

[3] Bhavyasri, Neha, Pranaya and Manoj "home automation using chatbot and voice assistant" tm web of conferences 32, 01002 (2020) https://doi.org/10.1051/itmconf/20203201002 ICACC-2020

[4] Kamal, Biswas and Sayidul " design and implementation of smart home security system" https://www.researchgate.net/publication/293173717 ,December 2020

[5] Sudha and Priya "iot based smart security and smart automation" https://www.researchgate.net/publication/332295600 , March 2021

[6] Apeksha and Bhacheh " home automation and security using iot " research thoughts, volume 8, July 2020

[7] Ruhi "a review on iot based smart security and home automation" IJSR technology" https://doi.org/10.32628/IJSRST2183159 , volume 8 ,June 2021

[8] Akash and Priyanka "Smart Home Automation via Telegram Chatbot and Android Application" IJARIIE-ISSN(O)-2395-4396 Vol-7 Issue-3 2021 www.ijariie.com

[9] Mohan, Samir, Nihar " Arduino based home automation using Internet of things (IoT) "IJPAM Volume 118 No. 17 2018, 769-778 ISSN: 1311-8080 (printed version); ISSN: 1314-3395 (on-line version) url: http://www.ijpam.eu

[10] G. joga and Vinod "Iot based web controlled home automation using raspberry pi" March 2019 https://www.researchgate.net/publication/332295600

[11] Shaik, Krishna "Home Security and Automation with Telegram Communication Application using Raspberry Pi" IJCRT reference journal July 7 www.ijcrt.org

[12] Desai, Virendra "Smart Door Security System using Raspberry Pi with Telegram" IRJET Volume: 06 Issue: 06 June 2020 , www.irjet.net

[13] Shakthi and Abishiek "Implementation of Advanced Smart Home Security Alert System" IJSRCSAMS Volume 8, Issue 2 March 2019 www.ijsrcsams.com

[14] Reeta R " smart secure door lock system using iot and eigenface approach " IJCRT Volume 5, December 2017

[15] Akash Kasote , Dr. P.G.Vispute "Smart Home Automation via Telegram Chatbot and Android Application" IJARIIE Vol-7 Issue-3 2021

[16] Yasirli Amri , Mukhammad Andri Setiawan "Improving Smart Home Concept with the Internet of Things Concept Using RaspberryPi and NodeMCU " ICITDA 2017

[17] Shakthi Murugan .Ajay Kumar "Implementation of Advanced Smart Home Security Alert System" IJSR in Computer Science Applications and Management Studies Volume 8, Issue 2 March 2019

[18] Rajiv Kumar, Pooja Mittal "A Novel Design and Implementation of Smart Home Security System: Future Perspective" International ISSN Volume 14, Number 2 2019

[19] Simge Demir Şevval Şimşek "Secure and privacy preserving IoT gateway for home automation" International Conference on Security of Information and Networks, SINCONF 2020 https://doi.org/10.1016/j.compeleceng.2022.108036

[20] Olutosin Taiwo Absalom E. Ezugwu "Internet of things-based intelligent smart home control system" Reaserach article Open Acess Volume 2021 Article ID 9928254 https://doi.org/10.1155/2021/9928254

The International Journal of Analytical and Experimental Modal analysis

An UGC-CARE Approved Group - II Journal

An ISO : 7021 - 2008 Certified Journal

ISSN NO: 0886-9367 / web : http://ijaema.com / e-mail: submitijaema@gmail.com

Certificate of Publication

This is to certify that the paper entitled CERTIFICATE ID:IJAEMA/8108

"SECURE HOME AUTOMATION USING RASPBERRY PI BY TELEGRAM APP"

Authored by :

Mr. G. Nageswara Rao, ASSOCIATE PROFESSOR

From

SASI INSTITUTE OF TECHNOLOGY & ENGINEERING

Has been published in

IJAEMA JOURNAL,VOLUME XV, ISSUE II, FEBRUARY-2023

Michal A. Olszewski Editor-In-Chief

IJAEMA JOURNAL

6.3 IMPACT FACTOR

ISO International Organization for Standardization 7021-2008

http://ijaema.com/

The International Journal of Analytical and Experimental Modal analysis

An UGC-CARE Approved Group - II Journal

An ISO : 7021 - 2008 Certified Journal

ISSN NO: 0886-9367 / web : http://ijaema.com / e-mail: submitijaema@gmail.com

Certificate of Publication

This is to certify that the paper entitled CERTIFICATE ID:IJAEMA/8108

"SECURE HOME AUTOMATION USING RASPBERRY PI BY TELEGRAM APP"

Authored by :

Gandham Harshitha

From

SASI INSTITUTE OF TECHNOLOGY & ENGINEERING

Has been published in

IJAEMA JOURNAL,VOLUME XV, ISSUE II, FEBRUARY-2023

Michal A. Olszewski Editor-In-Chief

IJAEMA JOURNAL

6.3 IMPACT FACTOR

ISO International Organization for Standardization 7021-2008

http://ijaema.com/

The International Journal of Analytical and Experimental Modal analysis

An UGC-CARE Approved Group - II Journal

An ISO : 7021 - 2008 Certified Journal

ISSN NO: 0886-9367 / web : http://ijaema.com / e-mail: submitijaema@gmail.com

Certificate of Publication

This is to certify that the paper entitled CERTIFICATE ID:IJAEMA/8108

"SECURE HOME AUTOMATION USING RASPBERRY PI BY TELEGRAM APP"

Authored by :

Nimmala Akanksha

From

SASI INSTITUTE OF TECHNOLOGY & ENGINEERING

Has been published in

IJAEMA JOURNAL,VOLUME XV, ISSUE II, FEBRUARY-2023

Michal A. Olszewski Editor-In-Chief
IJAEMA JOURNAL

6.3 IMPACT FACTOR

ISO International Organization for Standardization 7021-2008

http://ijaema.com/

The International Journal of Analytical and Experimental Modal analysis

An UGC-CARE Approved Group - II Journal

An ISO : 7021 - 2008 Certified Journal

ISSN NO: 0886-9367 / web : http://ijaema.com / e-mail: submitijaema@gmail.com

Certificate of Publication

This is to certify that the paper entitled CERTIFICATE ID:IJAEMA/8108

"SECURE HOME AUTOMATION USING RASPBERRY PI BY TELEGRAM APP"

Authored by :

Adapareddy Harika

From

SASI INSTITUTE OF TECHNOLOGY & ENGINEERING

Has been published in

IJAEMA JOURNAL,VOLUME XV, ISSUE II, FEBRUARY-2023

Michal A. Olszewski Editor-In-Chief

IJAEMA JOURNAL

6.3 IMPACT FACTOR

ISO International Organization for Standardization 7021-2008

http://ijaema.com/