MORSEFY

A Project Report

Submitted in partial fulfillment of the requirements for the award of the degree of

BACHELOR OF SCIENCE

(INFORMATON TECHNOLOGY)

By

Kunj Rahul Bhavsar
Roll Number : 599

Under the esteemed guidance of

Ms Swapnali Tandel

Assistant Professor

NAGINDAS KHANDWALA COLLEGE
(Empowered Autonomous College)
(Affiliated to University of Mumbai)
MUMBAI - 400 064
MAHARASHTRA

2023 – 24

NAGINDAS KHANDWALA COLLEGE
(Empowered Autonomous College)
(Affiliated to University of Mumbai)
MUMBAI - 400 064
MAHARASHTRA

DEPARTMENT OF COMPUTER AND INFORMATION SCIENCE

MKES
KHANDWALA COLLEGE
LEARNERS BECOMING LEADERS

CERTIFICATE

This is to certify that the project titled, MORSEFY, is bonafied work of Kunj Rahul Bhavsar bearing Roll No:599 is submitted in partial fulfillment of the requirements for the award of degree of BACHELOR OF SCIENCE in INFORMATION TECHNOLOGY from University of Mumbai.

Internal Guide

Coordinator

External Examiner

15 MAR 2024

Date

College Seal

DECLARATION

I hereby declare that the project entitled, MORSEFY done at Nagindas Khandwala College, has not been in any case duplicated to submit to any other university for the award of any degree. To the best of my knowledge other than me, no one has submitted to any other university. The project is done in partial fulfillment of the requirements for the award of degree

of BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY) to be submitted as final semester project as part of our curriculum.

KUNJ BHANSAR

CHAPTER 1

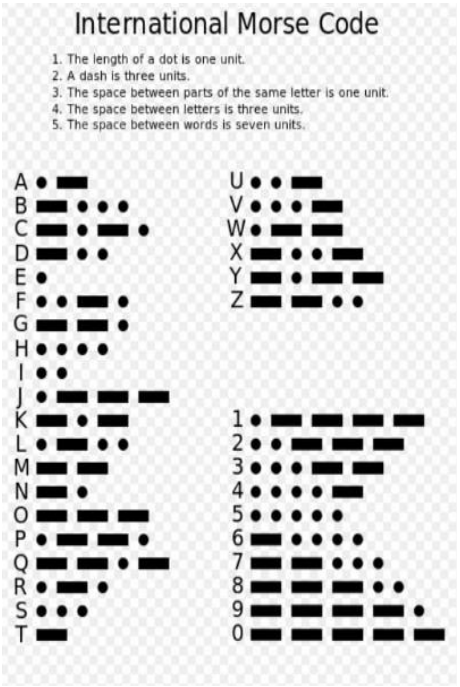
INTRODUCTION

1.1 Background

What is MORSE CODE?

Morse code is a method of transmitting text information as a series of on-off tones, lights, or clicks. It is named for Samuel F. B. Morse, an inventor of the telegraph. The International Morse Code encodes the ISO basic Latin alphabet, some extra Latin letters, the Arabic numerals and a small set of punctuation and procedural signals (prosigns) as standardized sequences of short and long signals called "dots" and "dashes", or "dits" and "dahs", as in amateur radio practice. Because many non-English natural languages use more than the 26 Roman letters, extensions to the Morse alphabet exist for those languages.

Each Morse code symbol represents either a text character (letter or numeral) or a prosign and is represented by a unique sequence of dots and dashes. The duration of a dash is three times the duration of a dot. Each dot or dash is followed by a short silence, equal to the dot duration. The letters of a word are separated by a space equal to three dots (one dash), and the words are separated by a space equal to seven dots. To increase the speed of the communication, the code was designed so that the length of each character in Morse is approximately inverse to its frequency of occurrence in English. Thus the most common letter in English, the letter "E", has the shortest code, a single dot. It is the only form of communications that doesn't rely strictly on electricity to operate or function.Any metal on metal, wood on wood, sound making device…car/boat horn…air type if electrical is knocked out by Electro-Magnetic Pulse (EMP)…and light source…flashlight, even a mirror and sunlight…can be used to send and receive Morse Code messages.To transmit messages across telegraph wires, in the 1830s Morse and Vail created what came to be known as Morse code. The code assigned letters in the alphabet and numbers a set of dots (short



marks) and dashes (long marks) based on the frequency of use; letters used often (such as “E”) got a simple code, while those used infrequently (such as “Q”) got a longer and more complex code. Initially, the code, when transmitted over the telegraph system, was rendered as marks on a piece of paper that the telegraph operator would then translate back into English. Rather quickly, however, it became apparent that the operators were able to hear and understand the code just by listening to the clicking of the receiver, so the paper was replaced by a receiver that created more pronounced beeping sounds.

MORSE CODE AND TELEGRAPH

Comparison of historical versions of Morse code with the current standard. 1. American Morse code as originally defined. 2. The modified and rationalized version used by Gerke on German railways. 3. The current ITU standard.

Developed in the 1830s and 1840s by Samuel Morse (1791 -1872) and other inventors, the telegraph revolutionized long-distance communication. It worked by transmitting electrical signals over a wire laid between stations. In addition to helping invent the telegraph, Samuel Morse developed a code (bearing his name) that assigned a set of dots and dashes to each letter of the English alphabet and allowed for the simple transmission of complex messages across telegraph lines. In 1844, Morse sent his first telegraph message, from Washington, D.C., to Baltimore, Maryland; by 1866, a telegraph line had been laid across the Atlantic Ocean from the U.S. to Europe. Although the telegraph had fallen out of widespread use by the start of the 21st century, replaced by the telephone, fax machine and Internet, it laid the groundwork for the communications revolution that led to those later innovations.

The Electric Telegraph

In the early 19th century, two developments in the field of electricity opened the door to the production of the electric telegraph. First, in 1800, the Italian physicist Alessandro Volta (1745-1827) invented the battery, which reliably

stored an electric current and allowed the current to be used in a controlled environment. Second, in 1820, the Danish physicist Hans Christian Oersted (1777 -1851) demonstrated the connection between electricity and magnetism by deflecting a magnetic needle with an electric current. While scientists and inventors across the world began experimenting with batteries and the principles of electromagnetism to develop some kind of communication system, the credit for inventing the telegraph generally falls to two sets of researchers: Sir William Cooke (1806-79) and Sir Charles Wheatstone (1802-75) in England, and Samuel Morse, Leonard Gale (1800 -83) and Alfred Vail (1807-59) in the U.S.

MOSTLY USED MESSAGING APPLICATIONS NOWADAYS ARE AS FOLLOWS:

- WhatsApp.
- Telegram.
- Google Hangout.
- Messenger
- Etc.

WHATSAPP

The enormously popular WhatsApp is a mobile text messaging app designed for smartphone users and tablets that lets you send text messages and make calls over the internet.

WhatsApp is really easy to understand and there isn't lots of "fluff" to make it overwhelming like some apps. You can even set a status for all your contacts to see without having to message everyone.

What We Like

- You can start a video or phone call
- Group messaging supports up to 250 people
- Supports end-to-end encryption
- Lets you send files as large as 100 MB
- Ad-free

What We Don't Like

- No built-in GIF gallery

WhatsApp also lets you share your location with recipients. You can view the other person's location without leaving the app because the map is built-in to WhatsApp.

In addition to having full voice calls, WhatsApp also supports sending voice recordings, which are little snippets of your voice that you can use in place of texting.

File sharing is another component of this messaging app. You can share files from your phone and computer.

Works With: Android, iOS, Windows Phone, Mac, Windows, Web

TELEGRAM

Telegram is a cloud-based messaging service that promises fast and secure messages.
It's accessible from all of your devices at the same time and supports some killer features.

Unlike most messaging apps, Telegram can both edit and delete messages even after you've sent them.

What We Like

- Supports not only text messaging but also audio calls
- Themes let you change the way the app looks
- Includes lots of stickers, with more as free downloads
- You can reply to specific messages in a thread
- Supports short voice messages

What We Don't Like

- Seems to attract lots of spam messages

Telegram also has a Secret Chat feature that lets you send timed messages so that after they're sent, and once the time limit is reached, the messages are automatically deleted.

You can also also mute notifications for a specific number of minutes, send files from the app or website, and share your location.

Works With: Android, iOS, Windows Phone, Windows, Mac, Linux, Web

GOOGLE HANGOUT

Google Hangouts is a messaging app from Google. It supports text messages, phone calls, and video calls between any other Google Hangouts user.

You can have private, one-on-one conversations as well as group chats for up to 150 people. The app lets you share videos, photos, stickers, and emoji.

What We Like

- Voice and video calls support up to 10 people
- Integrates with your Google account
- Google Voice users can send texts to non-Hangouts users

What We Don't Like

- Alert sounds cannot be customized per contact
- No built-in GIF gallery

Google Hangouts also lets you share your location with others directly from the app, suppress all notifications for any conversation, favorite a conversation to have easier access to it, and archive messages to declutter the conversation view.

Works With: Android, iOS, Web

- Your phone number can be changed at any time
- Can only get numbers from Canada or the U.S

DISADVANTAGES

There are many more IOS and android messaging applications which are been used but not on the large scale. The above mentioned applications are being used on a very large scale and is very famous among the youth. But… There comes a biggest question that what is the security system available in those applications… Are this applications Secret?? The biggest flaw in all the android application is the SECURITY. Those application are not giving any guarantee for the security. While chatting or sending any message the person besides you can read all the message what you are sending and this is the basic flaw in all the android or IOS messaging applications.

CONCLUSION

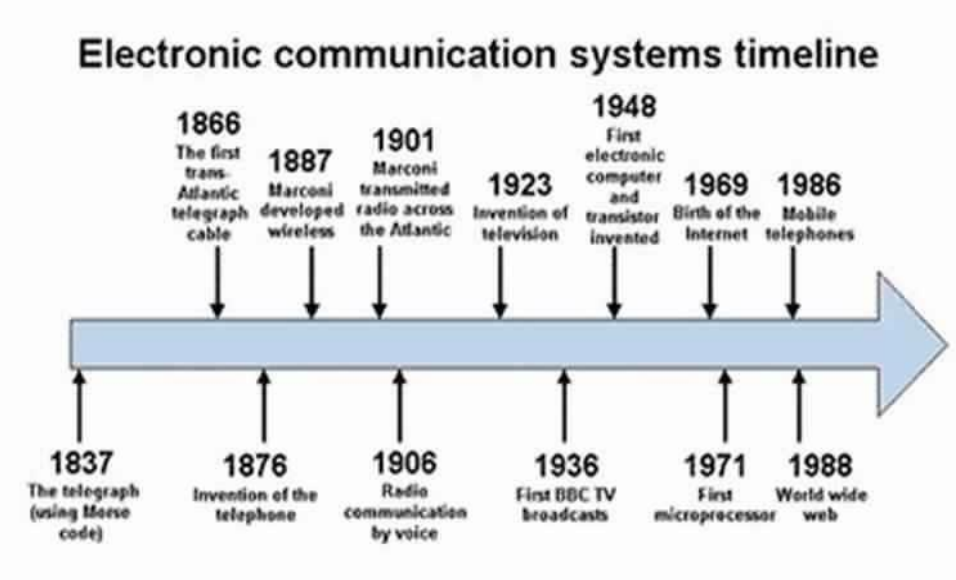
The messaging applications have become an important aspect of our daily lives. They help us to keep in touch with people who are close or in different geographical locations. The apps have features that make communication interesting beyond the regular messaging services. Users can share photos, make voice calls and video calls too. The apps have different additional feature giving the user different looks and tastes. But the only thing that these applications cannot afford is confidentiality or the security of the messages.

History of Morse code based Communication system:

Let us see how original Morse code based communication system works, we call it a classical system.

In 1836 Samuel F.B Morse an American artist along with his colleagues Joseph Henry (physicist), and Alfred Vail developed an electrical telegraph system using a principal of electromagnetic induction.

They used a Straight Key to transmit the electric current correspond to dit (dot) and dah (dash) using electromagnet, and at the receiving end this current caused mechanical movement in another electromagnet at receiving end, the mechanical movement generated sound at receiving end and an operator at receiving end translated these sounds into dit and dah (dot and dashes), thereby decoding the code.



The below image shows the two types of old Morse code using techniques i.e. Using Telegraph key for sending message in the form of Morse code by using electricity which can be used to send data at long distance and the second method is sending signals or the message in the form of Morse code through the means of light. This technique is used to share the data or the message at the short distance or the light travelling distance. Mostly the use of light signals is done in the navy for exchanging the messages which no common man can understand.

Telegraph key for sending Morse code by electricity

Navy signalman sending Morse code by light

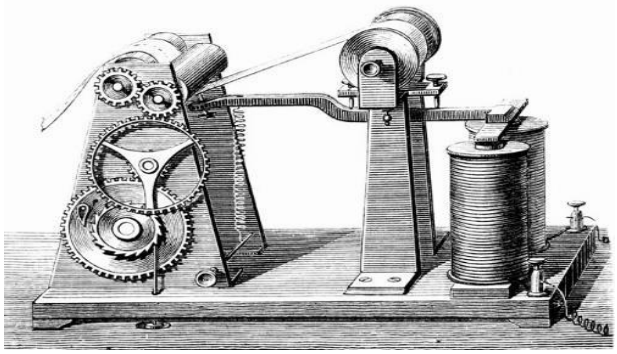
1.2 Scope of the project

Morsefy is developed to transform messages in secured way. Some confidential talk of our nation can be send through this system in very secured method and decoding this message can be very easy. The main Scope is that any person can use this method to send the message as no one need to learn the Morse code to transfer their message in this code, the system itself will encode the message and decodes it accordingly. The scope of the Secret messaging application is as the name suggest that it transforms or sends message secretly and keeps the messages confidential as it can contain any important messages.

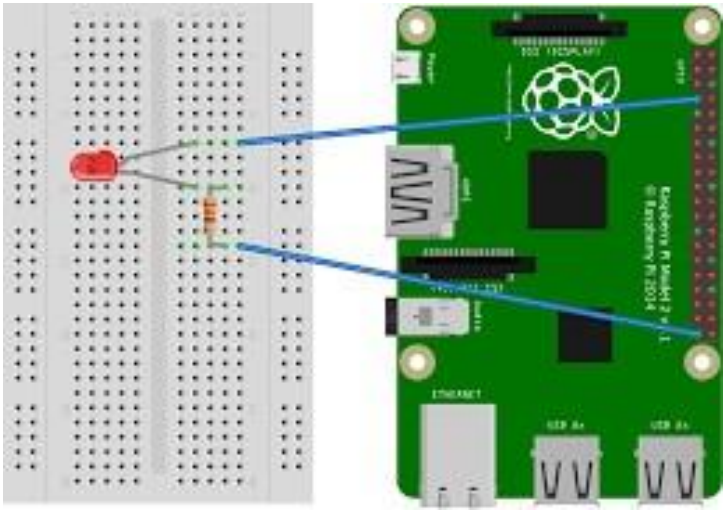
1.3 Objectives of the project

Morsefy is basically an idea to transmit information or to send the messages from a place to another in secret means as any messaging application but the major difference between the messaging application and this system is that normal messaging application transfer the text messages which is readable by any one, and this secret messaging system uses the method of Morse code to share the data where it is not understandable by the common man. This system uses Morse code with the LED (Light Emitting Diode) transmission where the text is converted in to the Morse code and is delivered in the form of flashing or blinking of the LED. The main objective of using this system for transferring messages is to keep the message confidential.

In normal messaging application the message transmitted is not secured as any hacker can hack the message as they are in the text form and can misuse the information which is a great cybercrime. While the one is using our system (i.e. Secret messaging system) if the information is hacked the hacker will not come to know that what is the message as in this system the message or the text is encoded in to the Morse which is not understandable by the common person except the Morse code master hence the message will be secured and will be secret till it reaches the receiver. While the receiver receives the message the Morse code is shown in the form of blinking or flashing led which is again not understandable by others while the message is received in the form of blinking led the encoding application will record the blinking of the led and will convert the same in to text again. In this way the information or the message will be received in the secured and secret way.



The above image is the image of old method of transmitting Morse code message this device is known as telegraph. Telegraph is the derived from the greek word i.e tele means far or distant and graph means writing. Which means Telegraph is an instrument that transmits the writings to a distant place.



The above picture is of a led connected to the raspberry pi. Where this will be connection which will be seen in my project where a led will be connected to the raspberry pi and that led will be blinking according to the message or text transmitted through the system.

The old version of Morse code transmitter were telegraph based which makes on-off tones to send the message. Whereas my system uses led to transfer the message where led will give signal in the form of on-off (blinking) of the led.

1.4 Applicability

This system is basically designed for confidential work such as for navy, Army or any confidential government work, so using this system will help them to send their commands or any message in the coded way so that no other person can understand the message this is the way to send message secretly. Using this system is very easy as the person did not need to learn the Morse code to send the encoded message or to read the message, as the system itself will do the encoding and corresponding decoding of the message. This system makes the use of Morse code very easily as a common man can also use this system for the conversation and only for the fun. Unlike earlier Morse code system which use to make noise or using flashlight which was visible to many people rather they be the oppositions which was not secured but this system is highly secured as the only person will receive the message the sender wants to.

CHAPTER 2
GAP ANALYSIS AND LITERATURE REVIEW

Gap Analysis

- Incomplete User Guidance: The current project documentation lacks user-friendly guides and manuals, making it challenging for users to set up and use the system effectively.

- Insufficient Technical Details: Critical technical documentation, especially for hardware components and software algorithms, is either incomplete or entirely absent.

- Unclear Source Code Documentation: The source code lacks proper comments and documentation, hindering code understanding and maintenance for developers.

- Limited Testing Documentation: Test plans, test cases, and test results are poorly documented, making it challenging to verify system reliability and correctness.

- Outdated Information: The documentation contains outdated information, including hardware specifications and software dependencies, leading to potential compatibility issues and errors.

- Missing Maintenance Procedures: There are no clear instructions on how to perform system updates, bug fixes, or routine maintenance, jeopardizing long-term sustainability.

- Legal and Licensing Gaps: Licensing terms and legal disclaimers are unclear or absent, raising questions about the project's legal status and compliance.

- Inadequate User Feedback Mechanism: Users lack an efficient means to provide feedback or report issues, impeding system improvements and issue resolution.

- Incomplete Gap Identification: The documentation lacks a structured gap analysis and a clear action plan to rectify identified deficiencies.

- Lack of Review and Approval Process: There is no defined process for reviewing and approving documentation updates, leading to inconsistencies, errors, and delays in information dissemination.

Literature Review

Weihao Li; Keren Wang (2019), in the tittle " International Conference on Intelligent Computing, Automation and Systems (ICICAS)" describe The current automatic decoding method of the Morse telegram has limited accuracy, and can't adapt to signal distortion and code length deviation of the manual telegram which integrates feature extraction, sequence modelling and transcription into an end-to-end training neural network. The time-frequency diagrams of signals are used for training and testing. Experimental results show that the decoding system has strong adaptability to manual deviation and frequency drift, and is robust in a noisy environment.

Chung-vi-fu,sengh-wengh-fengh(2023), in the tittle "Applied System on Biomedical Engineering, Healthcare and Sustainability" Background: Patients with severe physical impairments (spinal cord injury, cerebral palsy, amyotrophic lateral sclerosis) often have limited mobility due to physical limitations, and may even be bedridden all day long, losing the ability to take care of themselves 23 human-typed data sets were subjected to recognition using fuzzy algorithms. The average recognition rates for expert-generated data and data input by individuals with disabilities were 99.83% and 98.6%, respectively. Conclusions: Through this system their quality of life and having an independent living space. Moreover, the system can be used without touching external switches, greatly improving convenience and safety.

Paparao Nalajala, Bhavana Godavarth (2016), in the tittle "International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT)"This research paper proposes the Morse code which is the earliest method used in Radio Telegraphy. Because of advanced telecommunication systems it is considered to be an outdated technique. Travelers, Sailors, Villagers from remote areas where cellular networks are almost inaccessible would need a most reliable mode of communication in order to facilitate communication they can use this device where only the knowledge of alphabets and numbers is sufficient. With this design they will able to telegraph important messages with alphanumeric keypad and also read the messages from LCD screen. Using Microcontroller this device can encode and decode messages of International Morse Code.

Aditya Pathak, Anmol Kaur,(2022), in the tittle "An Approach for Morse Code Translation from Eye Blinks Using Tree Based Machine Learning Algorithms and OpenCV "Cryptography in general means hiding, while in technical terms cryptography means protecting data from unauthorized access of someone, or cryptography can be considered as a method that ciphers the data so that the data can neither be read nor understood by humans, the safety of the algorithm is also required, as if someone gets to know about the algorithm, they can decrypt the data. The Python programming language provides a module named Cryptography in which Fernet can be used to encrypt the algorithm file as well as the data file again. Cryptography in python uses a symmetric encryption technique, i.e., it uses the same key to encrypt and decrypt the data. This technique is faster compared to asymmetric techniques. This paper demonstrates how Morse code, time & Python's Cryptography module can be used together to provide maximum data safety.

CHAPTER 3

REQUIREMENTS AND ANALYSIS

3.1Problem Definition

As my project depends on the Morse code based messaging system that is the combination of two systems that is normal messaging system and Morse code system. So let'sdiscuss the drawbacks of the existing normal messaging applications: None of the messaging application is perfect, all the applications are competition of one another. Sometimes as the message is send through any of the applications the message is not been send to the receiver because of some of the network problems. The messages take time to reach the receiver as thenetwork is not good. In some rural area there is no network which can be used to communicatewith others. As the system is mainly for army and navy they are the people who can be in verydense forest where one cannot get the network to send any message as if they use telecom to communicate which cannot be that secured as this system.

As the messaging applications are using internet which can also be the grate drawbackas internet is not available every time and even if we use default messaging application whichis already inbuilt in the mobile phones charges you to send message. Time taking by the message to be delivered depend on the network and the type of internet you are using. There are many applications used to communicate or to send messages but all are sending message in text format which is very easy to use but not secured as anyone can hack the messages and even the person sitting beside can see the communication which will not be confidential or it cannot be person as anyone can read the message and know that what you are writing. Many applications are such as they are not able to fulfil the user's requirements.

Now let's discuss about the Morse code system used to send messages till date. Morsecode is basically used to send the confidential messages. Morse code is not used in day to daylife where as it is mostly used to transmit confidential work, as you all have seen Aliya Bhatt movie razzi in that movie they have used to Morse code telegram to send message seeing that connecting the device is very tedious work. Morse code can be transmitted in two ways they are using light and using radio tones, using light to send Morse is in the ways of turning light on and off and flashing it to the receiver but the drawback is that while flashing the light the opposition or the rivalries will watch it and if they are known to the Morse code then they can come to know the message and if you are using the radio tones then there is same drawback that with the noise which is generated which sending message can make the enemy aware of using Morse code and if they know the Morse code it will make them know the message.

Old system of using Morse code is difficult to use as they need more of connections tostart up with the system. And the other main drawback is that for using those systems the personneed to learn the whole Morse code

chart to send or receive the message as that systems are not that developed that they can encode or decode the message by them.

3.2 Requirements Specification

The system taken under development have two modules that is encoding and decoding.

Encoding part is done through raspberry pi and the decoding part is done by an application.

Encoding

- Raspberry pi needs to encode the message typed.
- Text is converted in to Morse code.
- Morse code is displayed through blinking of LED.
- Each letter corresponds to its unique code which is in the form of dash and dots.
- In LED dash and dots are represented in the time period.

Decoding

- Using the Desktop Application the blinking of led is converted in to the text.
- Blinking period of the LED represents the letter and word.
- According to the blinking of LED, camera or webcam records the time and according to that convert the Morse code in to the text and display the same.

3.3 Planning and Scheduling

	Planned Dates		
Task	**Plan Start Date**	**Working Days**	**Plan End Date**
Requirement Gathering	15-06-2023	15	07-07-2023
Feasability Analysis	07-07-2023	20	04-08-2023
Risk Analysis	04-08-2023	10	21-08-2023
SWOT Analysis	21-08-2023	21	20-09-2023
Designing	20-09-2023	30	06-11-2023
Coding	06-11-2023	60	31-01-2024
Testing	31-01-2024	15	21-02-2024
Delivery	21-02-2024	5	28-02-2024

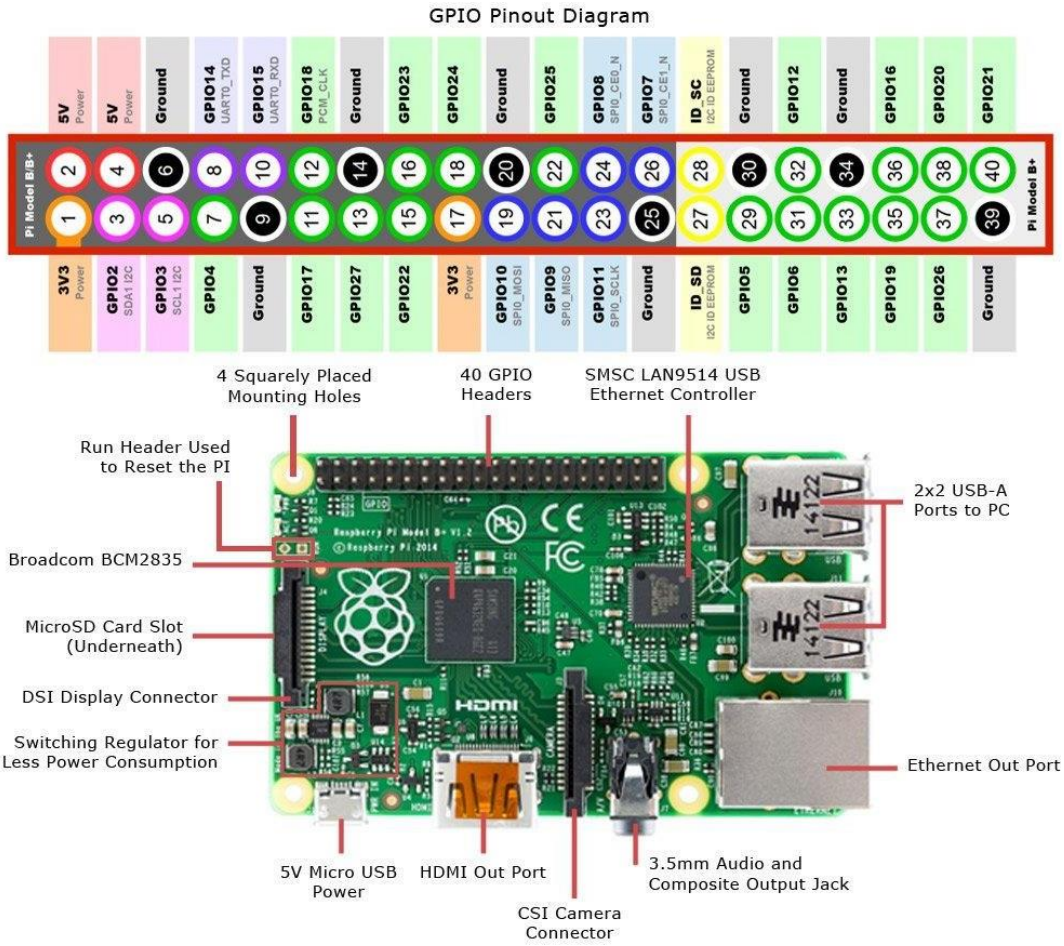
Holidays
29-06-2023
29-07-2023
15-08-2023
19-08-2023
07-09-2023
28-09-2023
02-10-2023
24-10-2023
12-11-2023
27-11-2023
25-12-2023
26-01-2023
19-02-2023

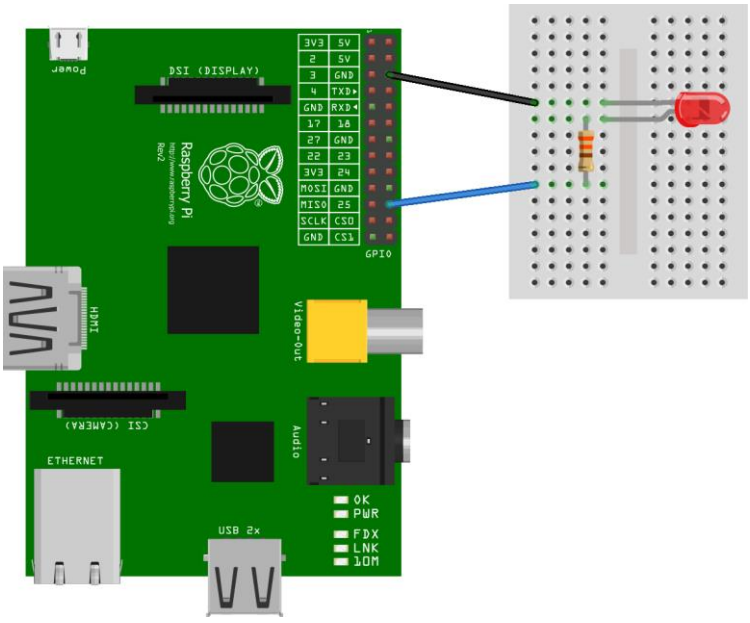
Data Preparation			
Task	**Actual Start Days**	**No. of days**	**No. of days completed**
Requirement Gathering	16-06-2023	17	17
Feasability Analysis	03-07-2023	21	21
Risk Analysis	24-07-2023	8	8
SWOT Analysis	01-08-2023	28	28
Designing	29-08-2023	45	45
Coding	13-10-2023	117	117
Testing	07-02-2024	14	14
Delivery	21-02-2024	7	7

Actual Dates			
Actual Start Date	**Actual Days**	**Actual End Days**	**%Completion**
16-06-2023	10	03-07-2023	100%
03-07-2023	15	24-07-2023	100%
24-07-2023	6	01-08-2023	100%
01-08-2023	20	29-08-2023	100%
29-08-2023	30	13-10-2023	100%
13-10-2023	80	07-02-2024	100%
07-02-2024	10	21-02-2024	100%
21-02-2024	5	28-02-2024	100%

CHAPTER 4
SYSTEM DESIGN

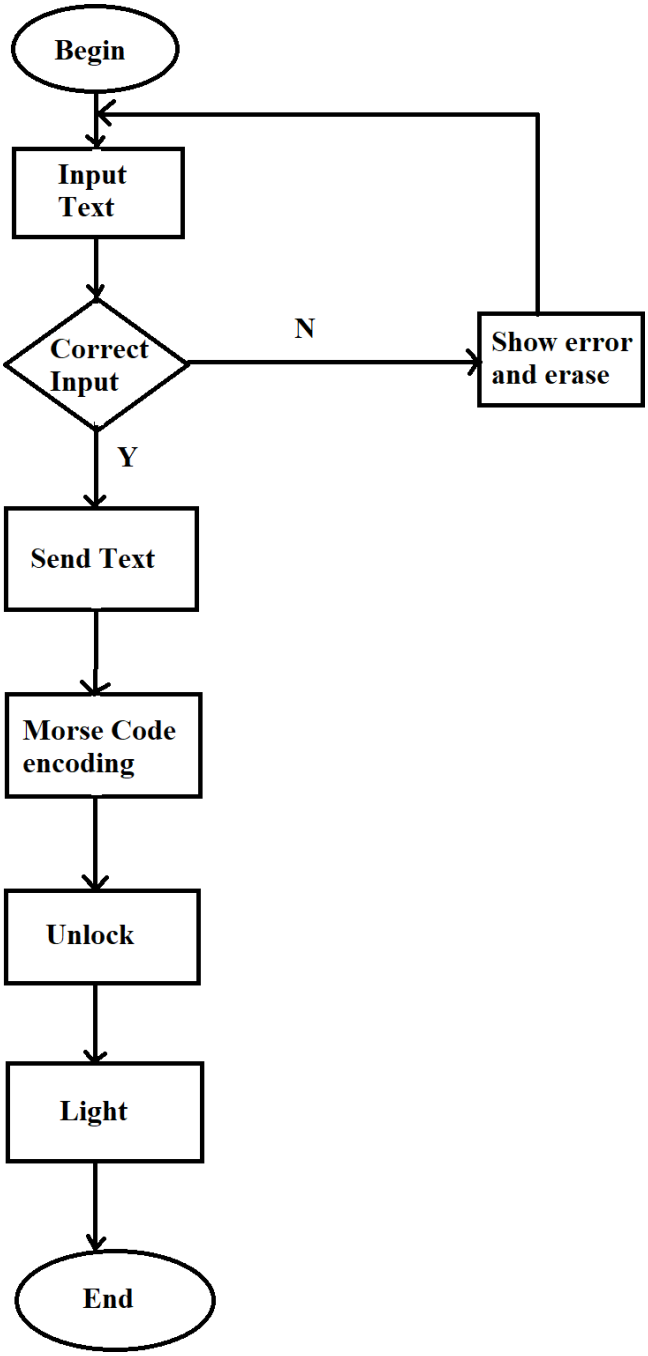
4.2 Circuit Diagram





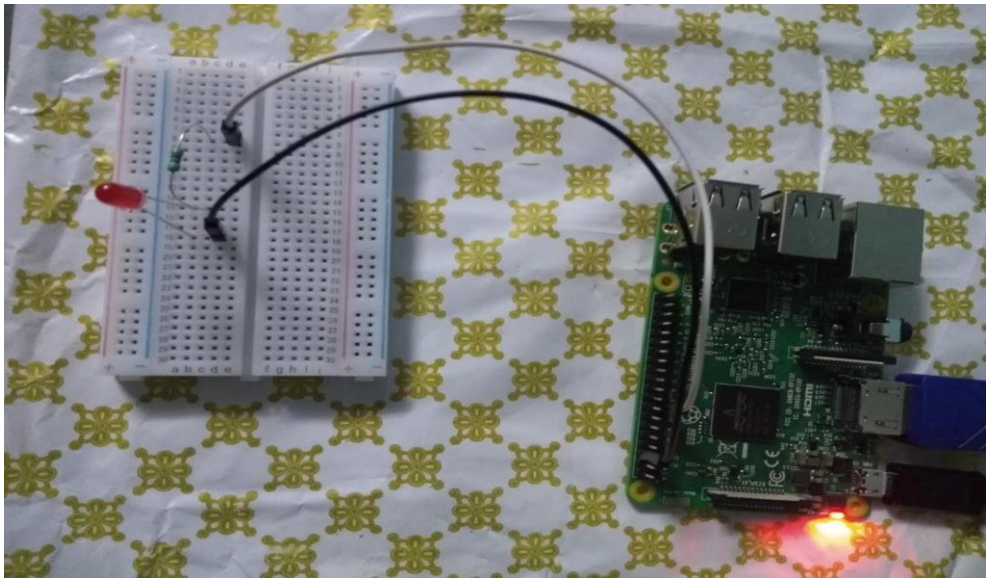
4.2 Algorithms Design

Algorithm design for encoding

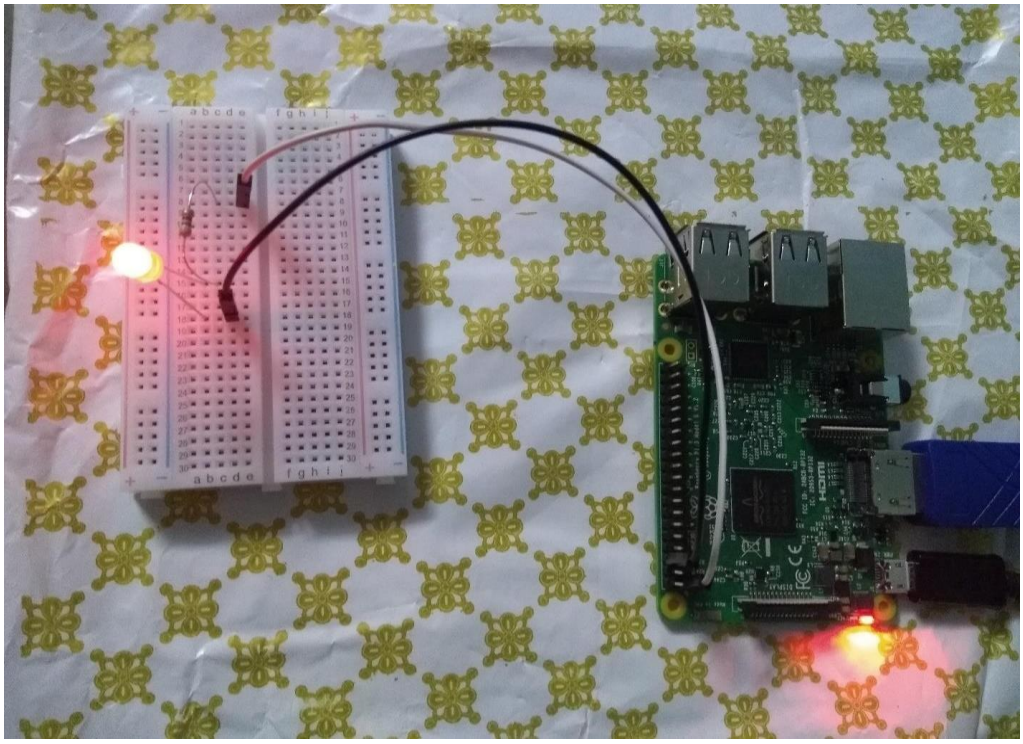


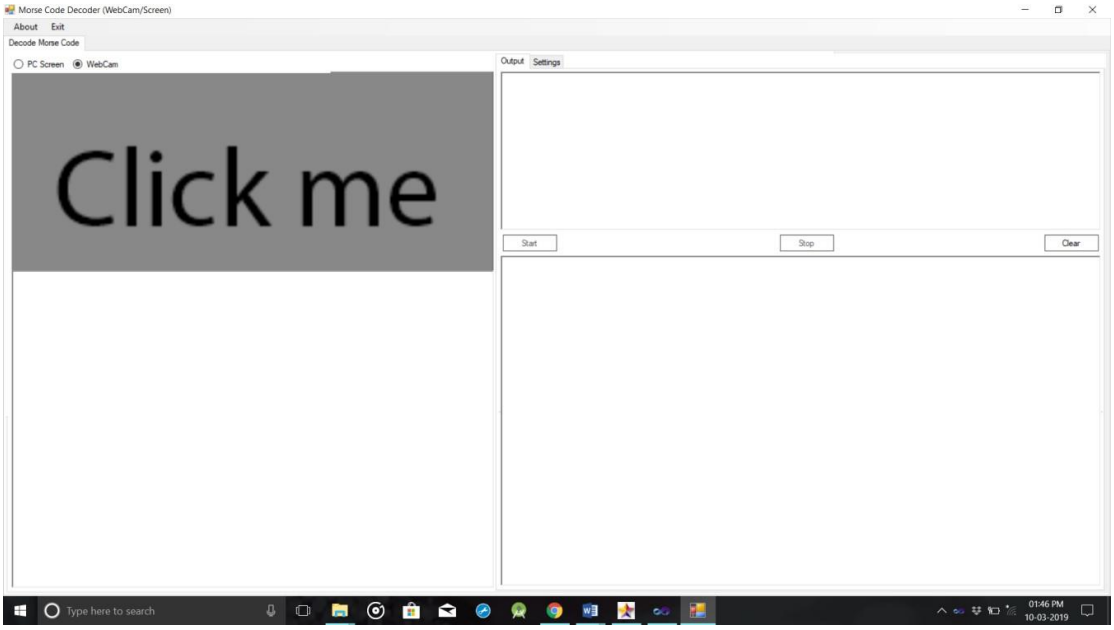
4.3 User interface Design

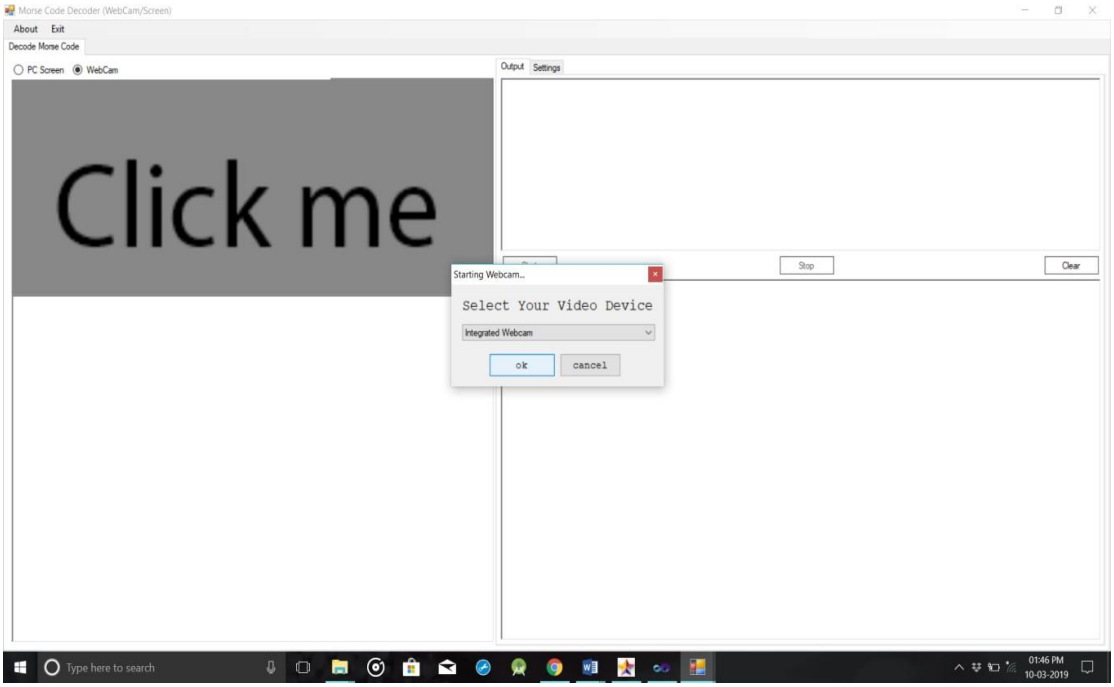
LED Connected to raspberry pi with led OF

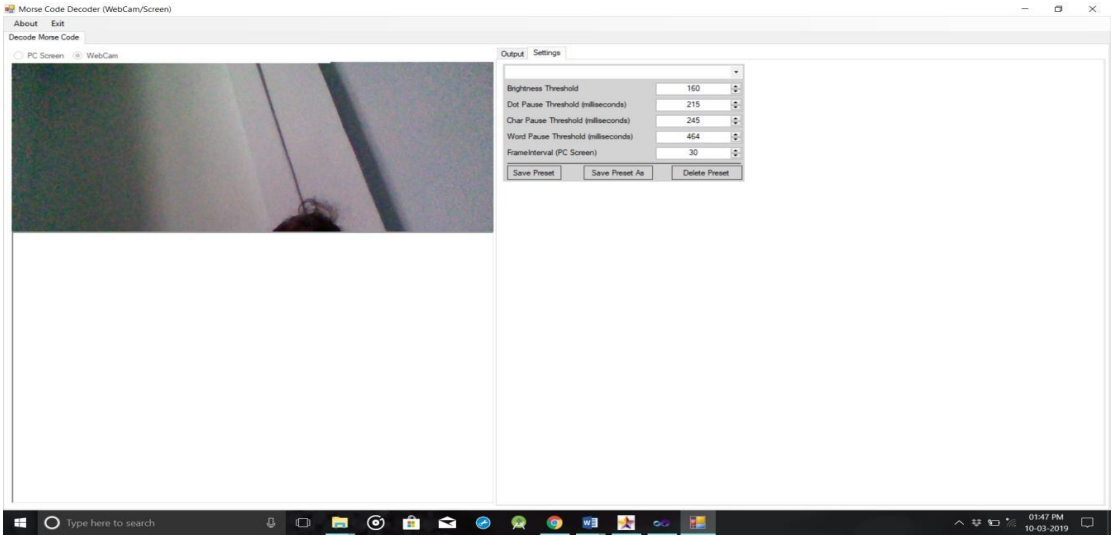


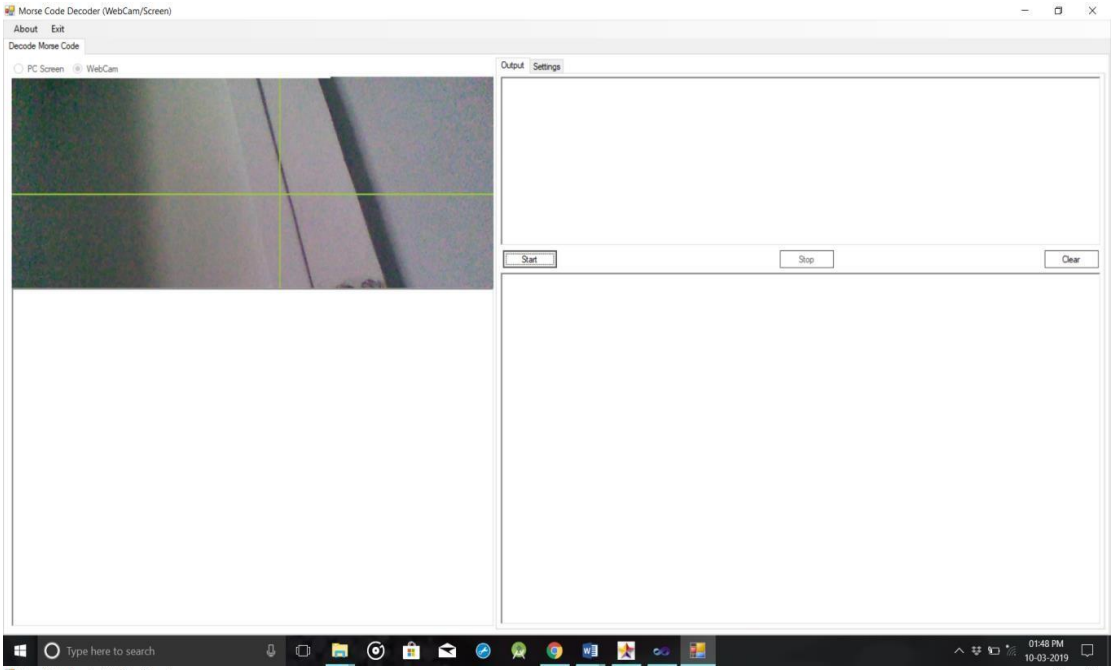
LED Connected to raspberry pi with led ON

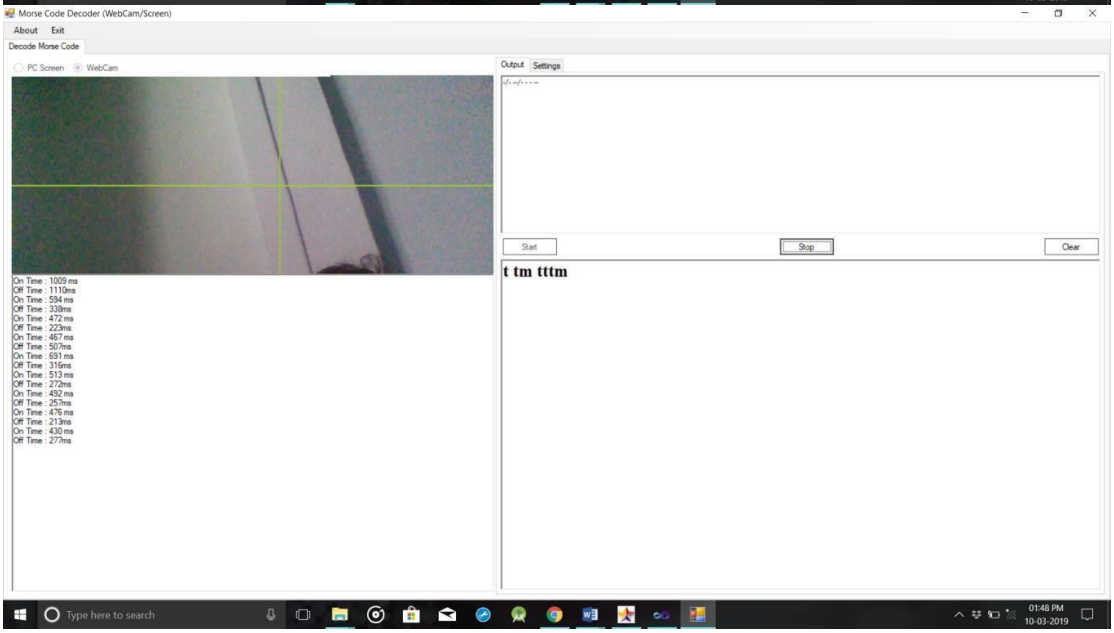



Morse Code Decoder (WebCam/Screen)
About
Exit
Decode Morse Code
PC Screen
WebCam
Click me
Output
Settings
Start
Stop
Clear
Type here to search
01:46 PM
10-03-2019


Morse Code Decoder (WebCam/Screen)
About
Exit
Decode Morse Code
PC Screen
WebCam
Click me
Output
Settings
Stop
Clear
Starting Webcam...
Select Your Video Device
Integrated Webcam
ok
cancel
Type here to search
01:46 PM
10-03-2019


Morse Code Decoder (WebCam/Screen)
About
Exit
Decode Morse Code
PC Screen
WebCam
Output
Settings
Brightness Threshold
160
Dot Pause Threshold (milliseconds)
215
Char Pause Threshold (milliseconds)
245
Word Pause Threshold (milliseconds)
464
FrameInterval (PC Screen)
30
Save Preset
Save Preset As
Delete Preset
Type here to search
01:47 PM
10-03-2019


Morse Code Decoder (WebCam/Screen)
About
Exit
Decode Morse Code
PC Screen
WebCam
Output
Settings
Start
Stop
Clear
Type here to search
01:48 PM
10-03-2019


Morse Code Decoder (WebCam/Screen)
About
Exit
Decode Morse Code
PC Screen
WebCam
Output
Settings
Start
Stop
Clear
t tm tttm
On Time : 1009 ms
Off Time : 1110ms
On Time : 594 ms
Off Time : 338ms
On Time : 472 ms
Off Time : 223ms
On Time : 467 ms
Off Time : 507ms
On Time : 691 ms
Off Time : 316ms
On Time : 513 ms
Off Time : 272ms
On Time : 492 ms
Off Time : 257ms
On Time : 476 ms
Off Time : 213ms
On Time : 430 ms
Off Time : 277ms
Type here to search
01:48 PM
10-03-2019

CHAPTER 5
IMPLEMENTATION AND TESTING

5.1 Code

```
from gpiozero import LED
import time
#Python dictionary containing characters and the matching morse
converted = {"a":".-","b":"-...","c":"-.-.","d":"-..","e":".","f":"..-
.","g":"--
.","h":"....","i":"..","j":".---","k":"-.-","l":".-..","m":"--","n":"-.","o":"---
","p":".--.","q":"--.-
","r":".-.","s":"...","t":"-","u":"..-","v":"...-","w":".--","x":"-..-","y":"-.--
","z":"--..","0":"-----
","1":".----","2":"..---","3":"...--","4":"....-","5":".....","6":"-....","7":"--
...","8":"---..","9":"----
.","," :".-.-.-",",":"--..--",":":"---...","?":"..--..","'":".----.","-":"-....-","/":"-..-
.","(":"-.--.-",")":"-.--
.-","\"":".-..-.","@":".--.-.","=":"-...-","[":"-.--.-","]":"-.--.-","$":"...-..-
","+":".-.-.",";":"-.-.-
.","_":"..--.-","!":"---."}
led = LED(26)#Assign pin #26 to a variable
speedPercent = 100 #Change to proportionately alter speed; 100 =
Normal Speed; 50 = Half Speed
longTime = 30.0 / speedPercent #Duration of the dash
shortTime = 10.0 / speedPercent #Duration of the dot
intraTime = 10.0 / speedPercent #Duration of space between flash on
same character spaceTime = 70.0 / speedPercent #Duration
between words
betweenCharTime = 30.0 / speedPercent #Duration between characters
inputString = ""
#Flash LED for the dash
def longFlash():
        led.on()
        time.sleep(longTime)
        led.off()
#Flash LED for the dot
def shortFlash():
        led.on()
        time.sleep(shortTime)
        led.off()
#Sleep for time of a space
def space():
        time.sleep(spaceTime)
#Ask for input
#returns the input
def getInput():
```

```
        return raw_input("Please enter text or type \"quit\" to exit: ")
#Make input lowercase and assign it to a variable
inputString = getInput().lower()
#While the input isn't "quit"
while (inputString != "quit"):
        #Go through each character of the input for c in inputString:
        #If it is a space
        if c == " ":
                space()
        #If it is in the dictionary
        elif c in converted:
                #convert character to the morse cod
                morseconverted = converted[c]
                #goes through each character in the morse code
                for symbol in morseconverted:
                        #If the symbol is a dash
                        if symbol == "-":
                                longFlash()
                                time.sleep(intraTime)
                #If the symbol is a dot
                elif symbol == ".":
                        shortFlash()
                        time.sleep(intraTime)
                #If the symbol is somehow not a dash or dot
                 else:
                        print ("Not a '-' or '.'")
        time.sleep(betweenCharTime)
#If the character is not supported in the dictionary
else:
        print ("'" + c + "'" + " is not a supported character")
#Ask for input again
inputString = getInput().lower()
```

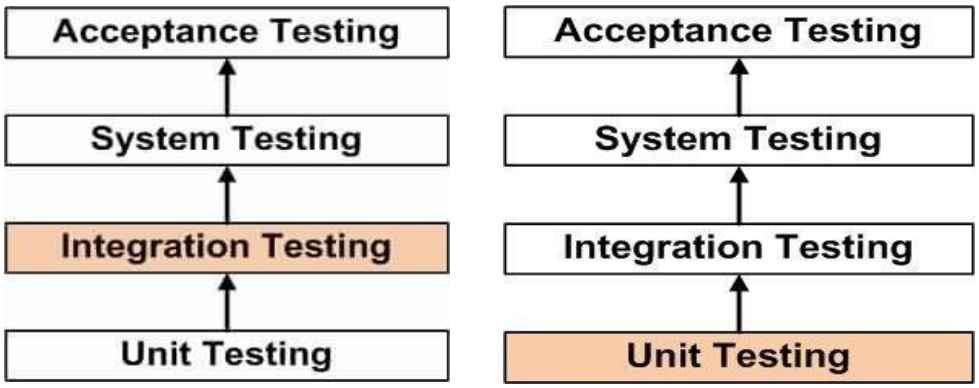
5.2 Testing Approach

Unit Testing

UNIT TESTING is a level of software testing where individual units/ components of a software are tested. The purpose is to validate that each unit of the software performs as designed. A unit is the smallest testable part of any software. It usually has one or a few inputs and usually a single output. In procedural programming, a unit may be an individual program, function, procedure, etc. In object-oriented programming, the smallest unit is a method, which may belong to a base/ super class, abstract class or derived/ child class. (Some treat a module of an application as a unit. This is to be discouraged as there will probably be many individual units within that module.) Unit testing frameworks, drivers, stubs, and mock/ fake objects are used to assist in unit testing.

Integration Testing

INTEGRATION TESTING is a level of software testing where individual units are combined and tested as a group. The purpose of this level of testing is to expose faults in the interaction between integrated units. Test drivers and test stubs are used to assist in Integration Testing.



Beta Testing

Beta Testing is one of the Customer Validation methodologies to evaluate the level of customer satisfaction with the product by letting it to be validated by the end users, who actually use it, for over a period of time. Product experience gained by the end users are asked for feedback on design, functionality, and usability and this helps in assessing the quality of the product.Real People, Real Environment, Real Product are the three R's of Beta Testing and the question that arises here in Beta Testing is "Do Customers like the Product?".

5.2 Test Cases

Encoding:

Test case ID	Input	Actual Output	Expected output	Remark
TC1	Hello	…- ..-.. .-.. ---	…. . .-.. .-.. ---	Fail
TC2	World	.-- --- .-. .-.. -..	.-- --- .-. .-.. -..	Pass
TC3	Sir	…. .- .-.	… .. .-.	Fail
TC4	123	.---- ..--- …--	.---- ..--- …--	Pass

Decoding:

Test case ID	Input	Actual Output	Expected output	Remark
TC1	…. . .-.. .-.. ---	Hello	Hello	Pass
TC2	.-- --- .-. .-.. -..	woerd	World	Fail
TC3	… .. .-.	Sir	Sir	Pass
TC4	.---- ..--- …--	1@#	123	Fail

CHAPTER 6
DISCUSSION AND CONCLUSION

6.1 Discussion

Encoding Module:

Step 1: Firstly connect the raspberry pi to the power, and check the connection of the led is correct or not i.e gound wire at pin 6 and positive wire at pin 15.

Step 2: Now Connect your device (mobile, laptop or computer) to the raspberry pi through ssh using the correct ip address of raspberry pi.

Step 3: After giving the ip address connect the raspberry pi to the device by typing useras pi and password as raspberry which is default in every raspberry pi model.

Step 4: After connecting successfully with the raspberry pi you need to browse for the code written in the system it is in this path home/pi/morsecode using this path go to morsecode folder.

Step 5: After entering the folder you can execute the code by giving the command as python encoding.py

Step 6: Firing the above command you will execute the code and the code will run andask for the message to enter.

Decoding Module:

Step 1: First start your computer and start the application.

Step 2: As you start the application the screen will appear where you need to select whether to use webcam or screen itself.

Step 3: Select webcam as you need to use led and then click on the button “Click me tostart”.

Step 4: After clicking the button webcam will get activated and you need to click on theplace where the led is placed.

Step 5: Now you need to click on start button to start the decoding, if you want to stop the decoding then click on stop button and you don’t want to see the decoded message then click on clear.

6.2 Conclusion

Morse code is the code which is used in all the confidential things in the world but it isnot secured as it sounds. This is the reason these system is designed, this system is used to send the message over a network to the receiver who receives the message in the encrypted form which is displayed in the form of blinking led. This system will help to reduce the stress of learning the code of the whole alphabets, numbers and the special characters. TheSystem itself encodes and decodes the text into morse code and visa versa.

The Secrete messaging system is a cost effective and medium coverage method of encodingand decoding of text to morsecode or morsecode to text.

It makes use of web cam to convert the morse code to text in order to achieve its proposedgoal effectively.This system work would save cost, provide reliable services, and keep confidential data secret only so that no other hacker can hack the message and missuse the message to harmthe organization.It's a real time encoding and decoding system where the message is encoded and decoded in fractions of seconds.

CHAPTER 7
LIMITATIONS

- It cannot work without the power given to the raspberry pi and then both the deviceand raspberry should be on the same network.

- Till now the decoding of the message is not 100% accurate as the accuracy of thedecoded message is only 70%.

- These system will not work without the internet connection.

- Morse code traditionally supports a limited set of characters (A-Z, 0-9, and a few special characters).

- The project is usable in different ambient light conditions. Bright sunlight or low-light situations might affect the visibility of the LED blinking.

- Long messages in Morse code might pose challenges in terms of memory usage and processing time.

- If you're working with LEDs, ensure that the brightness is safe for the eyes, especially in dark environments.

CHAPTER 8
FUTURE WORK

- This system is basically designed for the armed force of the country as they have very confidential data to share and which should not be leaked any where so this system is very much usefull for them.

- Inspired from RAZI movie as they use telegram to communicate through morse code which shows that a person needs to learn the whole code and also be very specific for the timings which makes critical for a person to learn.

- Whereas using my system a person doesnot need to learn the code and use that timein other work such as to improve the knowledge for shooting.

- Indian navy is still using the morse code as you must have seen the light blinking from the ship far away that's what they communicate through the blinking of light manually and eventhough it is visible by everyone and can decode it and may be he/she can use it for misleading the information.

References

1. S. Dey, K.M. Chugg and P.A. Beerel, "Morse code datasets for machine learning", *2018 9th International Conference on Computing Communication and Networking Technologies (ICCCNT) IEEE*, pp. 1-7, 2018.

2. C.H. Shih and C.H. Luo, "A Morse-code recognition system with LMS and matching algorithms for persons with disabilities", *International Journal of Medical Informatics*, vol. 44, no. 3, pp. 193-202, 1997.

3. M.C. Hsieh, C.H. Luo and C.W. Mao, "Unstable Morse code recognition with adaptive variable-ratio threshold prediction for physically disabled persons", *IEEE Transactions on Rehabilitation Engineering*, vol. 8, no. 3, pp. 405-413, 2000.

4. C.H. Yang, C.H. Luo, Y.L. Jeang and G.J. Jon, "A novel approach to adaptive Morse code recognition for disabled persons", *Mathematics and Computers in Simulation*, vol. 54, no. 1-3, pp. 23-32, 2000.

5. B. Gold, "Machine recognition of hand-sent Morse code", *IRE Transactions on Information Theory*, vol. 5, no. 1, pp. 17-24, 1959.

6. C.M. Wu and C.H. Luo, "Morse code recognition system with fuzzy algorithm for disabled persons", *Journal of Medical Engineering and Technology*, vol. 26, no. 5, pp. 202-207, 2002.

7. Y. Wang, Z. Sun and K. Jia, "An automatic decoding method for Morse signal based on clustering algorithm", *Advances in Intelligent Information Hiding and Multimedia Signal Processing Springer*, pp. 235-242, 2017.

8. Y. Wang, Z. Sun and K. Jia, "Research on automatic decoding algorithm of Morse telegraph", *Signal Processing*, vol. 33, no. 11, pp. 1451-1456, 2017.

9. X. Wang, Q. Zhao, C. Ma and J. Xiong, "Automatic Morse code recognition under low SNR", *2018 International Conference on Mechanical Electronic Control and Automation Engineering (MECAE 2018)*, 2018.

10. B. Shi, X. Bai and C. Yao, "An end-to-end trainable neural network for image-based sequence recognition and its application to scene text recognition", *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 33, no. 11, pp. 2298-2304, 2016.

11. R. Proesch, "Frequency Handbook for Radio Monitoring HF" in Books on Demand, 2016.

12. A. Graves, S. Fernández, F. Gomez and J. Schmidhuber, "Connectionist temporal classification: labelling unsegmented sequence data with recurrent neural networks", *Proceedings of the 23rd International Conference on Machine Learning ACM*, pp. 369-376, 2006.