I.B.Tech II Sem Application Development – Python Explore

“CIPHEIT”

Department of CSE

By

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CERTIFICATE

This is to certify that the APP. Development report entitled **"CIPHEIT"** by **GUNDETI SHASHANK (2211CS010712), VYDUYULA AKHIL REDDY (2211CS010717), MERUGU SHIVA PRASAD (2211CA010688), AVULKA ANIL KUMAR (2211CA010674), KATROTH AKHIL (2211CA010648)** Was submitted in partial fulfillment of the requirements for the completion of the course from Computer Science and Engineering**, Mallareddy University, Hyderabad** during the academic year 2022-2023, is a bonafide record of work carried out under our guidance and supervision.

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ABSTRACT

In this competitive fast growing technological security in digital communication is becoming more important as the number of internet users increases day by day. It is necessary to protect secret message during the transmission over insecure channels of internet. Our data becomes a major weapon to cyber attackers. To share confidential information officials, use several methods to share information among them. But as we are common people, we need that technology to share confidential data i.e., Passwords, Net Banking details, Bank Account Details, Aadhar Number etc. Here the Steganography comes into the picture. The term steganography is a Greek word refers to “hidden data”, which is composed of “Steganos” and “gaphie”. This technique had been utilized from ancient times. Data hiding is mainly utilized to deliver reliable data from sender to receiver without interruption of third-party and without any modification to data. Steganography is technique of hiding secret data within an ordinary, non-secret, file or message in order to avoid detection; the secret data is then extracted at its destination. The use of steganography can be combined with encryption as an extra step for hiding or protecting data. These techniques we are using in our app so that we are have better privacy while sharing the data. The ultimate theme of our app to provide security to the end-user to share important information in an image.

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Introduction to APP

We have majorly focused on the etcvtext encryption in an image. The users of our app can encrypt the message in an image. The main goal of the steganography process is to hide the original message in some container data in some way so that the message be kept secret within the container with minimally distorting or replacing the content the container data with the original message. To keep the message highly secret and difficult to break from the intruders and making the process faster are the main goals. To do so, different complex algorithms are used to embed the message into the container data.

One of the simplest steganography techniques to hide the secret message directly into the spatial domain by modifying the least significant bits (LSB) plane of the container data medium usually a cover-image. The benefits of spatial domain data hiding techniques are high clearness of understanding, efficiency, and data hiding capacity with minimum effort.

We created an simple user interface that every user of our app can interact with our app easily. User interface is simple that encryption of text in an image done in two steps while decryption of text from an image can be done in one step.

We have used one of the major In this competitive fast moving world we need privacy. As day by day internet users are increasing as parallel we can see increase in the cyber-attacks. To secure our data while sharing with other in insecure channels of internet, encryption of text or encryption data plays a crucial role to keep our data safe and secure. End to End transmission of sensitive data, storing and securing sensitive data, achieving confidentiality and integrity are some of the measurements that can be achieved with Steganography. Strategies that are table, such as the combination of Steganography and Cryptography.

In our app "**CIPHEIT"** we are providing module in python programming to encrypt and decrypt the message to an image and from image respectively. This is the only module responsible for encryption and decryption of text to an image and from an image.

1.1 Summary of Application

Our app "**CIPHEIT**" is majorly is focused on privacy and security of the user. We designed our app to best for privacy and security. The user feels very free to use and interact with our app. "CIPHEIT" is an app where you can encrypt the text in an image, text in encrypted back-end in the image without seen when it is opened.

In this competitive fast growing technological world privacy plays a key role. Our data becomes a major weapon to cyber attackers. To share confidential information officials, use several methods to share information among them. But as we are common people, we need that technology to share confidential data i.e., Passwords, Net Banking details, Bank Account Details, etc. Here the Steganography comes into the picture. Steganography is a method to encrypt one file format in another file format.

Steganography is technique of hiding secret data within an ordinary, non-secret, file or message in order to avoid detection; the secret data is then extracted at its destination. The use of steganography can be combined with encryption as an extra step for hiding or protecting data. These techniques we are using in our app so that we are have better privacy while sharing the data. Here we are using only text encryption in the image file.

We are using python programming language to build this application. Python gives a very large library support. We are using different modules to perform our application super smooth. We have one module named "Stegano" which provides the hiding the text in image and "Tkinter" module for super graphical user interface.

The module "Stegano" is not an python inbuilt module. We have to download this module from pypi.org website using pip install command. This is the module which plays a crucial role in our app. This is the module which automatically encrypts text in image. The encryption and decryption of text to image and from image can be done with this module.

The module "Tkinter" is also not an python inbuilt module. We have to download this module from pypi.org website using pip install command. "Tkinter" is the module which gives user-interface. There are certain commands to create an interface using this module. We have used certain methods to create user-interface to select an image for encryption and for decryption.

1.2 Background of Application

The data leakage is the major privacy concern which can't be avoided in insecure channels of internet, but everyone needs privacy to hide their privacy matters for example, credit card numbers, aadhar card number, etc., to share this data privately and securely our app "CIPHEIT" helps very fast and friendly to share with our personal people.

We have done a research on sharing the information with end-security that others i.e Hackers or scammers can't find the information what we are sharing. We have gone with some of the technologies like Steganography and Cryptography and have a lot of research to know more about these technologies which plays a major role network securities and information sharing.

Cryptography is the practice and study of secure communication techniques that prevent unauthorized access or alteration of information. It involves various methods and algorithms
to ensure the confidentiality, integrity, authentication, and non-repudiation of data.
The main objective of cryptography is to convert plaintext (unencrypted data) into ciphertext (encrypted data) using mathematical algorithms called encryption algorithms. Encryption transforms the original data into an unintelligible form, making it unreadable to
anyone who does not possess the necessary decryption key or algorithm. This process helps protect the confidentiality of sensitive information.

Steganography is the practice of concealing secret information within an innocuous cover medium, such as an image, audio file, video, or text, without arousing suspicion from unintended recipients. Unlike cryptography, which focuses on encrypting the content of a message, steganography focuses on hiding the existence of the message itself.
The goal of steganography is to make the hidden information blend seamlessly with the cover medium so that it is difficult to detect. Various techniques can be employed to achieve this, depending on the medium used.

After knowing about both technologies, advantages and disadvantages we have choose Steganography, which satisfies our requirement that satisfies the encryption of text in an image and decryption of text from an image. Steganography has various methods of encryption of one file format in other file format, but as our vision and idea, encryption of text in audio or video or in any other file format does not satisfies. So we have choose image over audio, video or any other file format.

After deciding the technology we are going to use in our app we have went through different python libraries which satisfies our requirement. We know Least Significant Bit(LSB) method works very well to hide a text in an image. We have found some of the different modules but only "Stegano" module satisfied our requirement due to very less code and it performs with high speed.

We have gone through some of the encryptions and decryptions it works flawlessly so went on writing other code like user-interface, ,options, etc. We are done with Object Oriented Programming in Python, our work done smoothly without any obstacles.

2. Requirements of Application

Software Requirements :

1. Operating System : Any operating System that supports Python IDLE
2. Modules Required: Stegano, Tkinter, date and time, os modules
3. Python: Latest Python or 3.x version of version

Hardware Requirements :

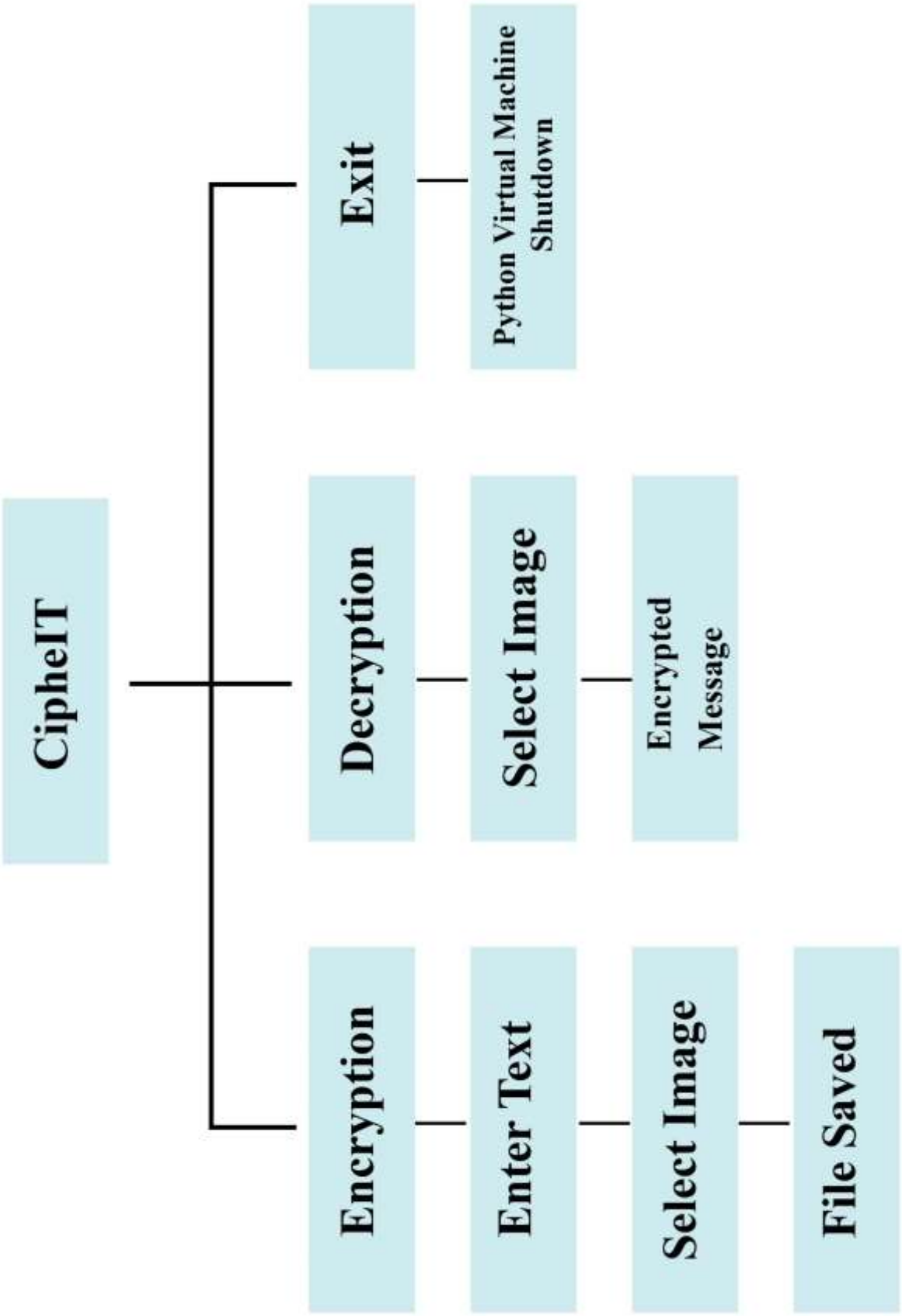
1. Processor : Dual core processor with 1.2GHz Speed or Higher
2. RAM : Minimum 4 Ram or Higher
3. Storage : Sufficient to store Python IDLE and images
4. Display ; 640x480p or higher resolution

In software requirements we have install “Stegano” and “Tkinter” modules separately, because the used modules are not inbuilt modules of python while “date and time” and “os” module are inbuilt modules which are not required install separately.

Steps to Install Modules:

1. Open Command Prompt in windows or Terminal in Linux or Ubuntu
2. Check version of python by using command **“python –version”** or **“python3 –version”,** if you not installed python, download from python official website **python.org** or use any other applications like Anaconda, Spider etc.
3. Install Stegano and Tkinter modules using the commands **“pip install stegano”** and **“pip install Tkinter-Everything”.**
4. Wait for the installation process to complete. Pip will automatically download and install the Stegano and Tkinter modules and its dependencies from the Python Package Index(pypi.org)
5. After the installation is finished, you can whether these modules are installed properly or not by using commands **“import stegano”** and **“import tkinter”,** if these commands runs without any error then then installation of these modules are done.
6. After installing these modules, you can run our application code without any errors.

3. Flow Chart

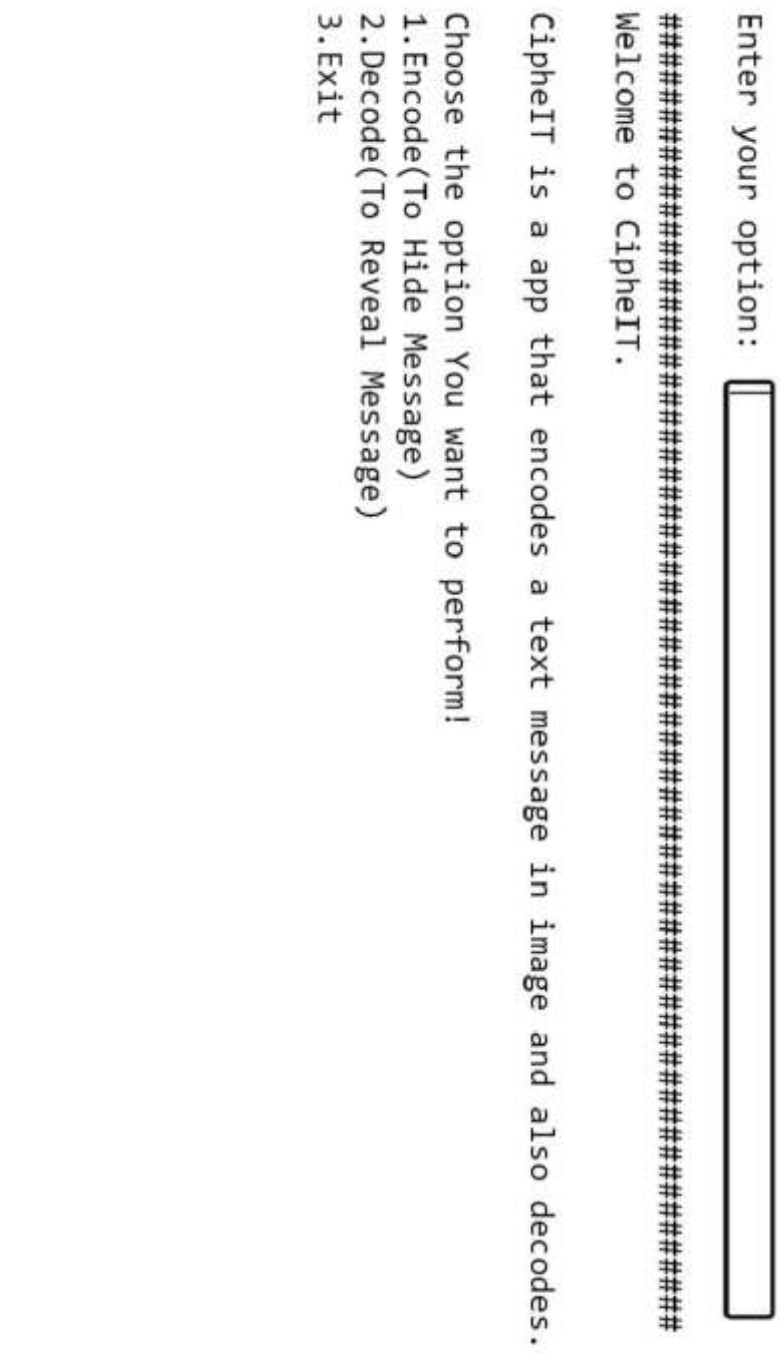

CipheIT
Encryption
Enter Text
Select Image
File Saved
Decryption
Select Image
Encrypted Message
Exit
Python Virtual Machine Shutdown

Algorithm

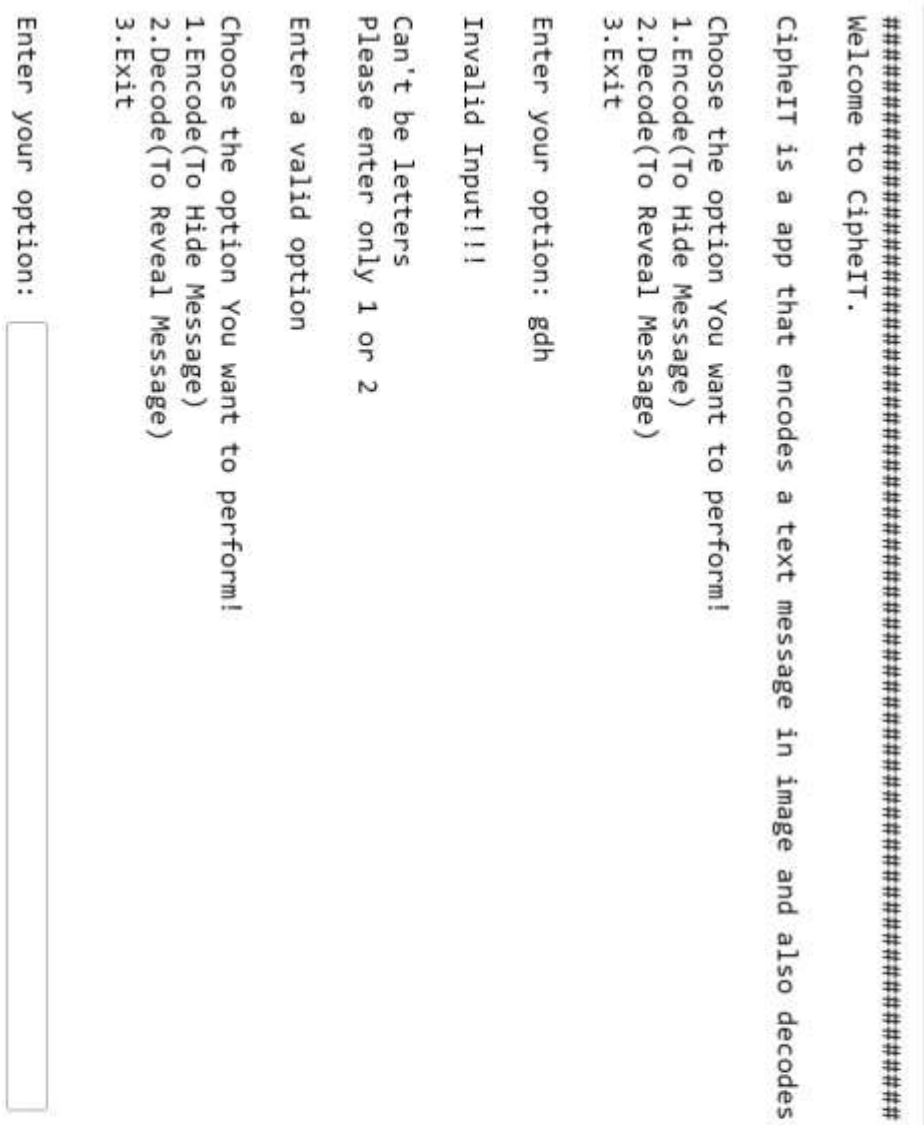
1. Open our app or run the code.
2. Choose option encryption or decryption or exit.
3. If the user chooses encryption the app will ask for the text to be encrypted in an image.
4. After entering the text now the user haven user interface to select the image.
5. After selecting the image the app shows it has successfully encrypted the text in the image and saved at the path so and so.
6. If the user chooses option decryption the user has to select an image.
7. After selecting the image in the description option that will directly show the encrypted message in the image.
8. If you choose exit option then Python Virtual Machine Shutdown automatically.

3.1 Screenshots

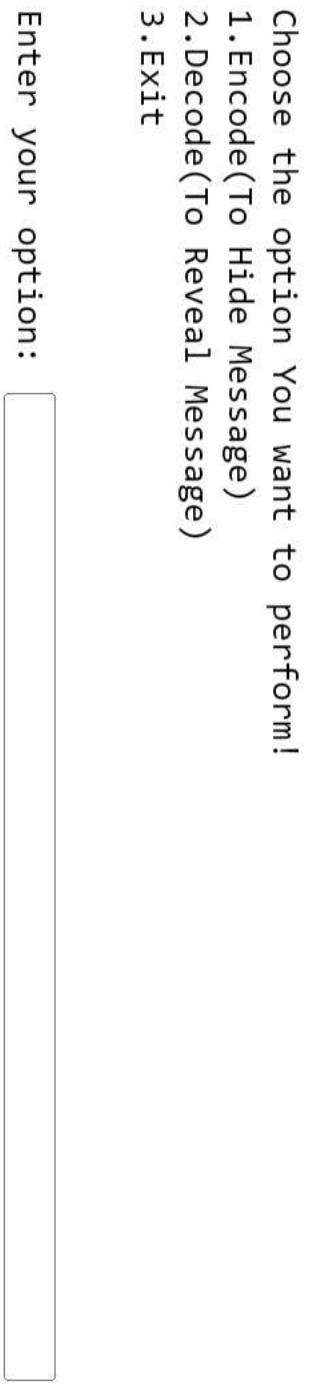
If you open our app you can see the user interface shown in the screenshot.



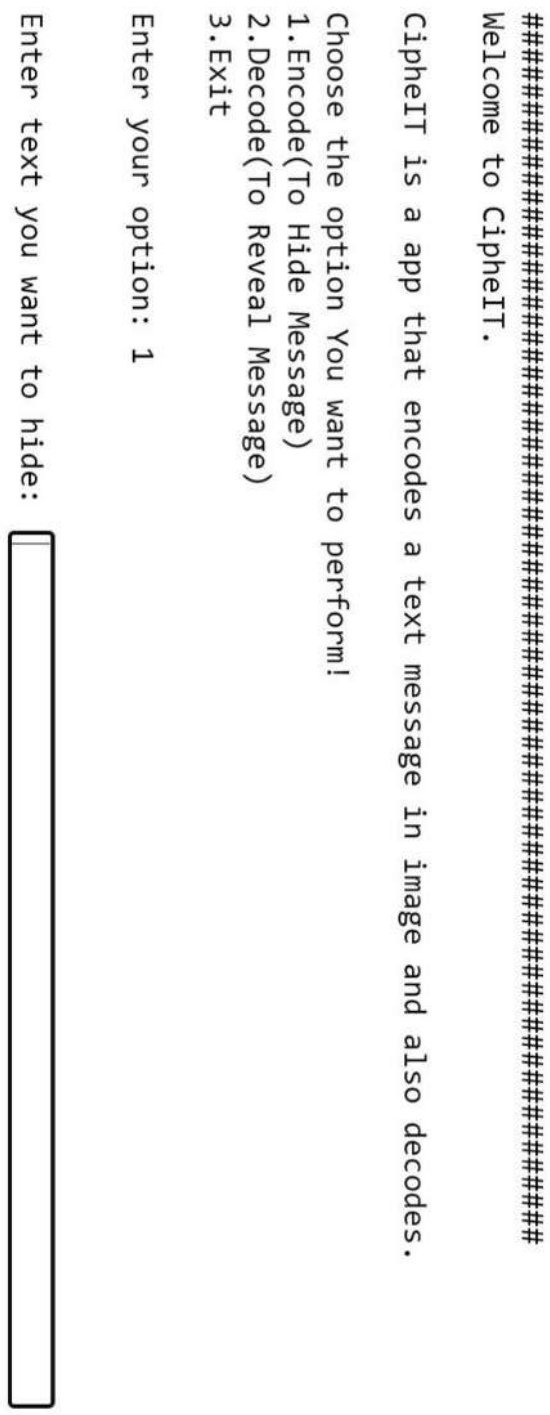
While choosing the option if the user enters letters instead of option one or option two the app will raise an exception saying invalid input can't be letters please enter option one or two. and app restarts to first to select option for encryption or description.



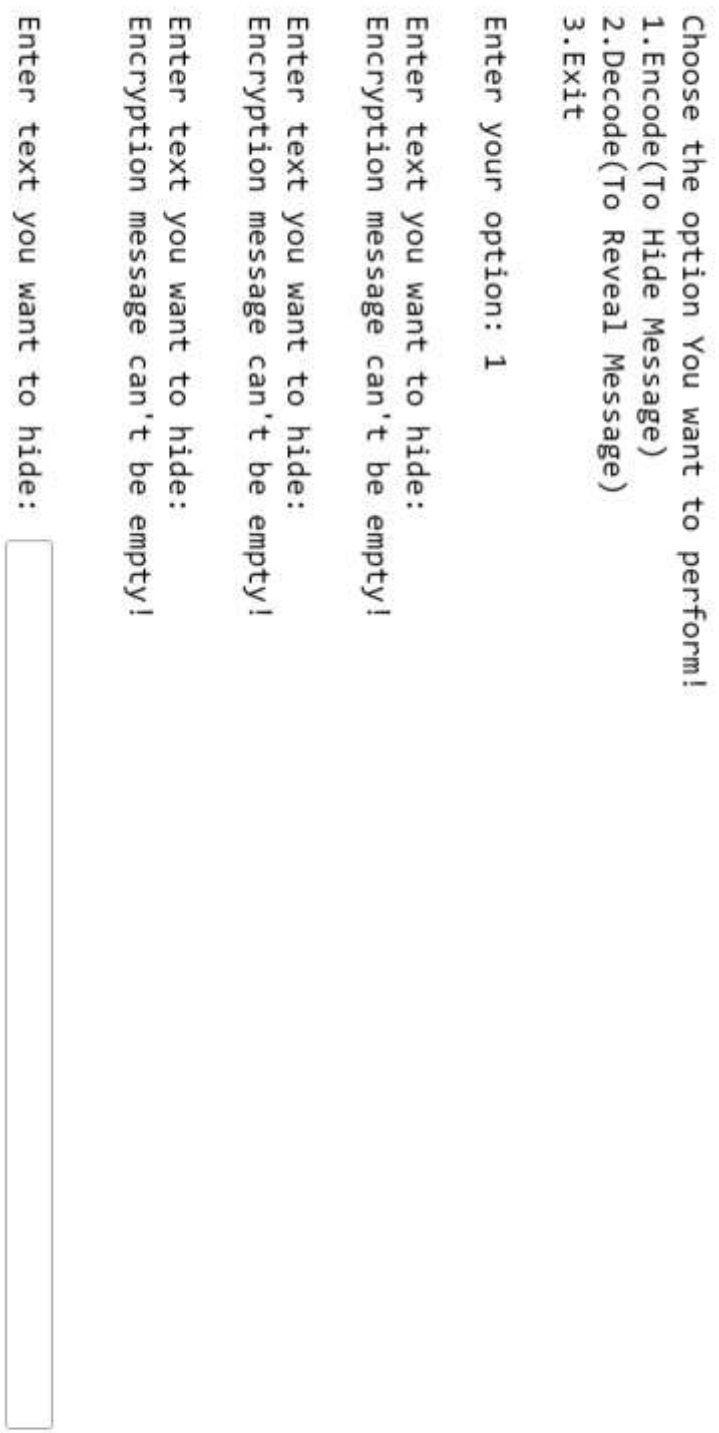
If the user enters a number greater than 3 it shows please enter only one or two and the app restarts to the first user interface to select the option for encryption or decryption.



If the user enters option one, the user redirected into the encryption menu and asks for the text he wants to hide.

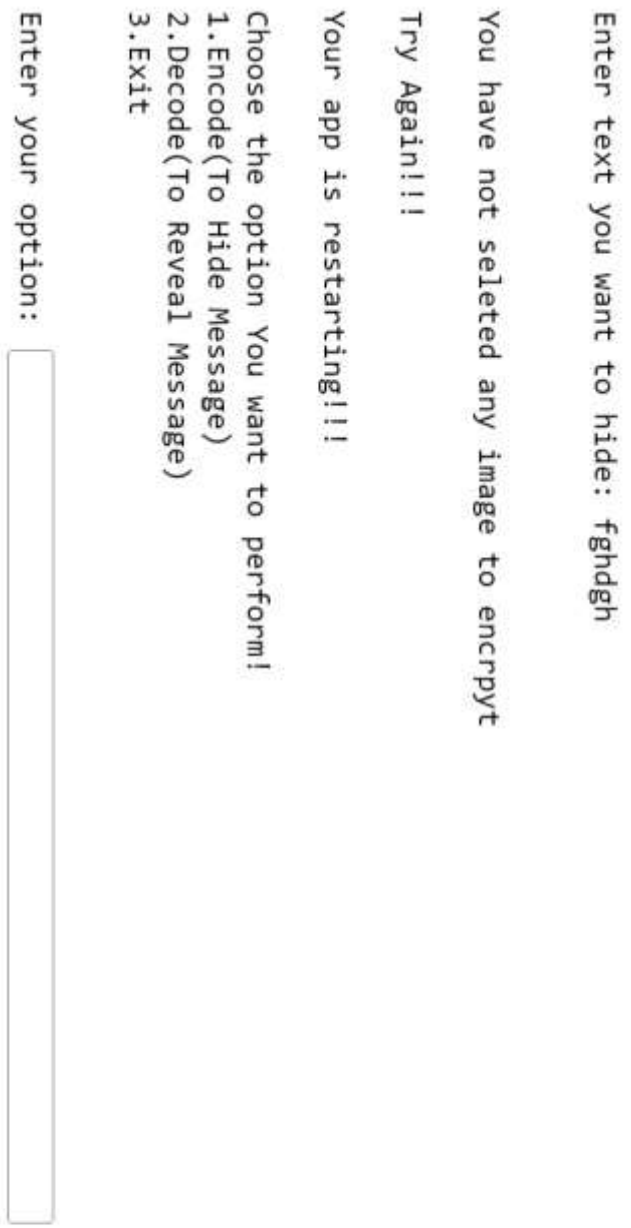


If the user does not enter any text it will ask for 5 times to enter the text. on this 6th time the app will automatically restart to the first menu to select the option for encryption and decryption.



if the user enters the text then it opens the user interface to select an image that needs text to be encrypted.

If the user does not select an image for 5 times on the time then app will restart to the first menu to select option for encryption and description.



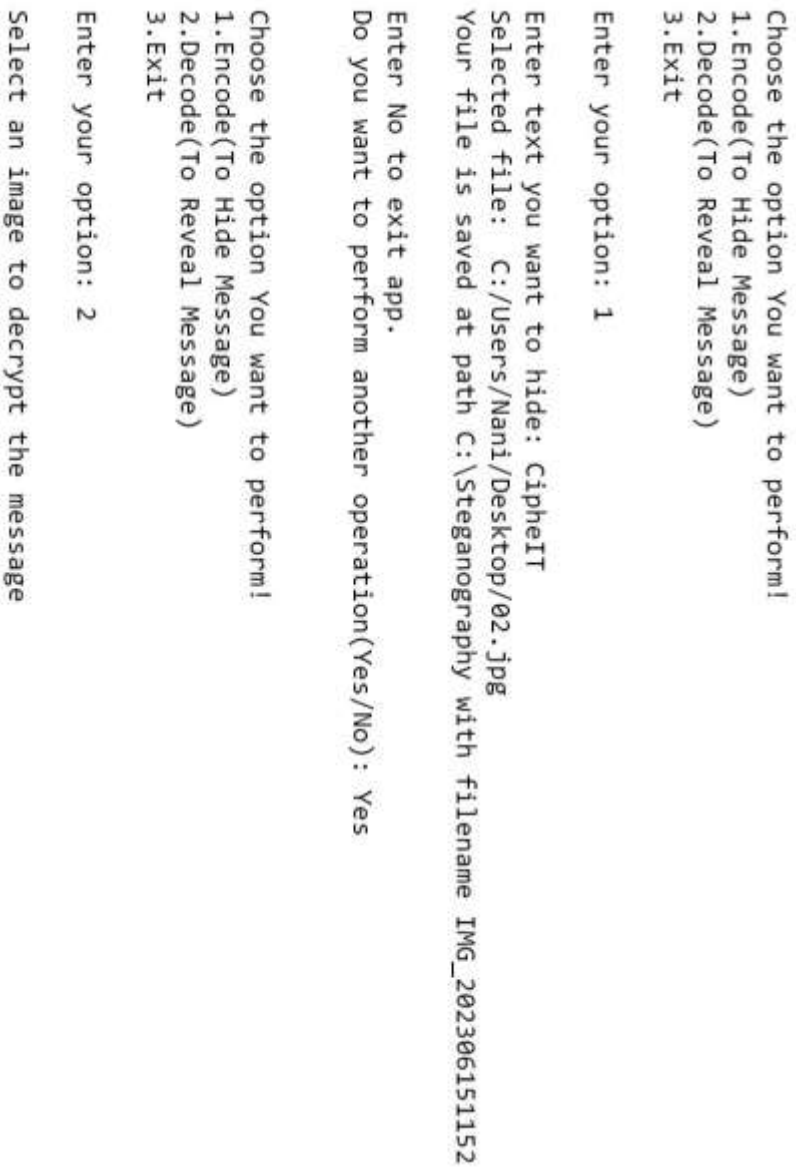
If the user selects an image the encryption will be done and saved the path as shown in the screenshot.

```
##################################################
Welcome to CipheIT.

CipheIT is a app that encodes a text message in image and also decodes.

Choose the option You want to perform!
1.Encode(To Hide Message)
2.Decode(To Reveal Message)
3.Exit

Enter your option: 1

Enter text you want to hide: CipheIT
Selected file:  C:/Users/Nani/Desktop/02.jpg
Your file is saved at path C:\Steganography with filename IMG_20230615115

Enter No to exit app.
Do you want to perform another operation(Yes/No):
```

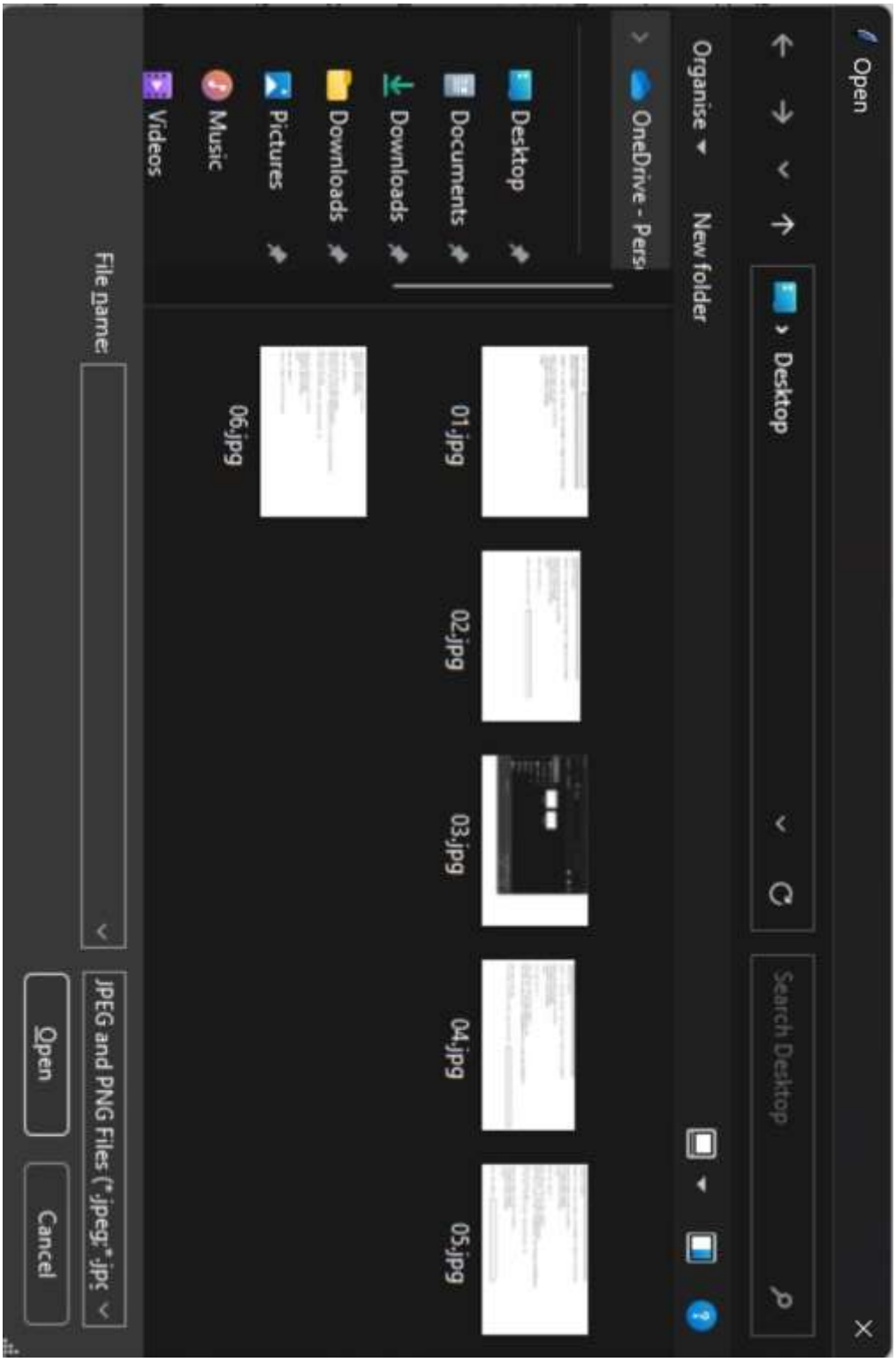
After one operation our app will ask for do you want to perform any other operations here the inputs are only yes or no if the user enters other than this it will ask again if you want

```
Choose the option You want to perform!
1.Encode(To Hide Message)
2.Decode(To Reveal Message)
3.Exit

Enter your option: 1

Enter text you want to hide: khgjk
Selected file:  C:/Steganography/IMG_20230608l121.png
Your file is saved at path C:\Steganography with filename IMG_20230704l840

Enter No to exit app.
Do you want to perform another operation(Yes/No): gcfh
Invalid Input

Try Again!!!

Enter No to exit app.
Do you want to perform another operation(Yes/No):
```

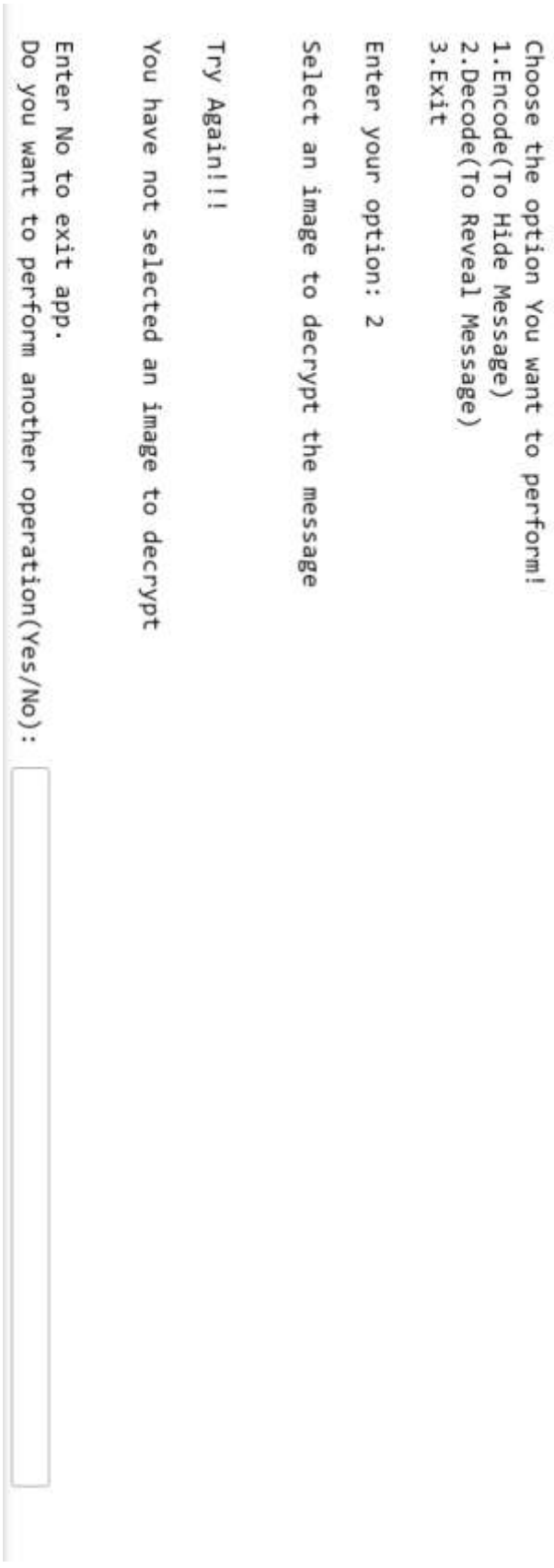
If the user enters no then the app will shutdown automatically but if you enter yes he will be redirected to the first menu for options encryption and decryption. Now if the user selects the option description then it will be redirected to the decryption menu to perform any other operations this is shown in the screenshot.



After choosing the option decryption now the user wants to select an image that is to be decrypted.



If the user does not select an image for 5 times on the sixth time then I will restarted to the first menu for options encryption and description.



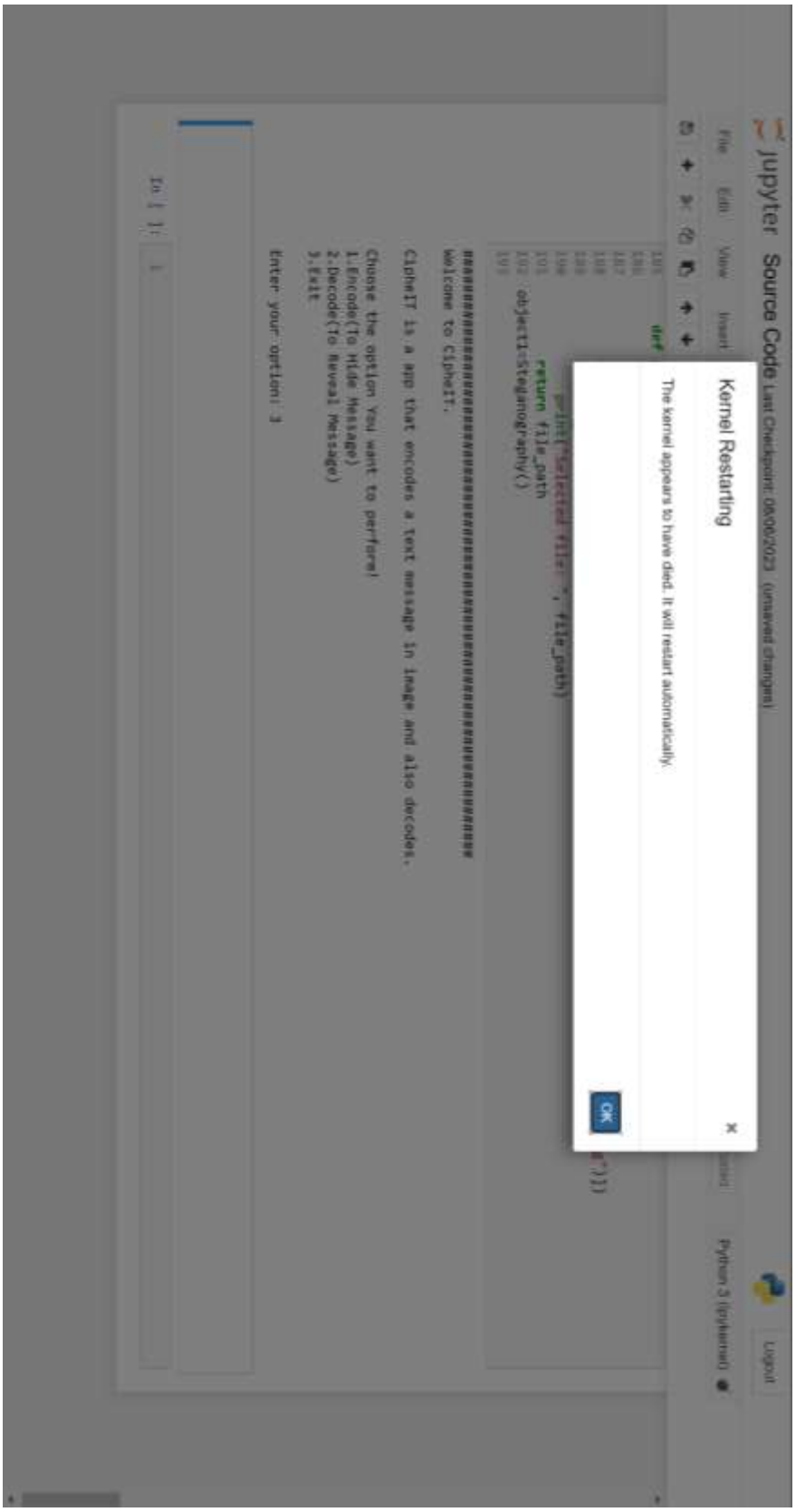
If you select an image then it will show the encrypted text in that selected image.

```
Enter your option: 1

Enter text you want to hide: CipheIT
Selected file:  C:/Users/Nani/Desktop/02.jpg
Your file is saved at path C:\Steganography with filename IMG_202306151152

Enter No to exit app.
Do you want to perform another operation(Yes/No): Yes

Choose the option You want to perform!
1.Encode(To Hide Message)
2.Decode(To Reveal Message)
3.Exit

Enter your option: 2

Select an image to decrypt the message
Selected file:  C:/Steganography/IMG_202306151152.png
The encrypted message in image is:
 CipheIT

Enter No to exit app.
Do you want to perform another operation(Yes/No):
```

And ask for do you want to perform any other operations equally applicable here as shown in the above screenshots.

```
Choose the option You want to perform!
1.Encode(To Hide Message)
2.Decode(To Reveal Message)
3.Exit

Enter your option: 2

Select an image to decrypt the message

Try Again!!!

You have not selected an image to decrypt

Enter No to exit app.
Do you want to perform another operation(Yes/No):
```

If the user selects option 3 in the first menu then the PVM automatically shuts down.



4. **App's Code**

```
from stegano import *
import os
import datetime
import tkinter as tk
from tkinter import filedialog

class Steganography():
    def __init__(self):
        print("#"*70)
        print("Welcome to CipheIT.")
        print()
        print("CipheIT is a app that encodes a text message in image and also decodes.")
        print()
        self.constructor_range=1
        self.another_operations_range=1
        self.decode_range=1
        self.text_range=1
        self.encode_range=1
        self.constructor()

    def constructor(self):
        try:
            print("Choose the option You want to perform!")
            print("1.Encode(To Hide Message)\n2.Decode(To Reveal Message)\n3.Exit")
            print()
            option=int(input("Enter your option: "))
            print()
        except ValueError:
            print()
            print("Invalid Input!!!")
            print()
            print("Can't be letters\nPlease enter only 1 or 2")
            print()
            print("Enter a valid option")
            print()
            if self.constructor_range<=5:
                self.constructor_range+=1
                self.constructor()
            else:
                print("You have reached maximum limitations!!!")
                print()
                print("App is exiting...")
```

```
except:
    print()
    print("Invalid Input!!!")
    print()
    print("Please enter only 1 or 2")
    print()
    print("Enter a valid option")
    print()
    if self.constructor_range<=5:
        self.constructor_range+=1
        self.constructor()
    else:
        print("You have reached maximum limit!!!")
        print()
        print("App is exiting...")
        os._exit(0)

 else:
    if option==1:
        self.text_to_hide=input("Enter text you want to hide: ")

        while len(self.text_to_hide)<=0:
            if self.text_range<=5:
                print("Encryption message can't be empty!\n")
                self.text_to_hide=input("Enter text you want to hide: ")
                self.text_range+=1
            else:
                print()
                print("You have reached maximum limit !!!")
                print("App is restarting...")
                print()
                print()
                self.constructor()


        self.creating_method=self.creating_folder()
        self.hiding_method=self.hiding_method()
    elif option==2:

        print("Select an image to decrypt the message")
        self.decode_method=self.decode_method()
    elif option==3:
        os._exit(0)
    else:
        print()
        print("Invalid Input!!!")
        print()
        print("Enter only 1 or 2")
```

```
            print()
            print("Enter a valid option")
            print()
           if self.constructor_range<=5:
              self.constructor_range+=1
              self.constructor()
            else:
              print("You have reached maximum limitations!!!")
              print()
              print("App is exiting...")
              os._exit(0)

    def another_operations(self):
            try:
               option1=str(input("Enter No to exit app.\nDo you want to perform another
operation(Yes/No): "))
            except:
               print("Invalid Input\n\nTry Again!!!")
               self.another_operations()
            else:
               if option1.lower()=="yes":
                  print()
                  print()
                  self.constructor()
               elif option1.lower()=="no":
                  os._exit(0)
               else:
                  print("Invalid Input\n\nTry Again!!!")
                  if self.another_operations_range<=3:
                     self.another_operations_range+=1
                     print()
                     self.another_operations()
                  else:
                     print("You have reached maxmimum limitations!!!")
                     os._exit(0)

    def creating_folder(self):
       try: os.mkdir("C:\Steganography")
       except FileExistsError: pass
       else: pass

    def hiding_method(self):
       try:
          self.img_filename=self.gui_interface()
          secret = lsb.hide(self.img_filename, self.text_to_hide)
       except AttributeError:
```

```
            self.encode_range+=1
            if self.encode_range<=5:
                self.hiding_method=self.hiding_method()
            else:
                print()
                print()
                print("You have not seleted any image to encrpyt")
                print()
                print("Try Again!!!")
                print()
                print("Your app is restarting!!!")
                print()
                self.constructor()



        else:
            now = datetime.datetime.now()
            dt_string=now.strftime("%Y%m%d"+"%H%M")
            dt_string1="IMG_"+dt_string


            secret.save("C:\Steganography\{}.png".format(dt_string1))
            print("Your file is saved at path C:\Steganography with filename
{}".format(dt_string1))
            print()
            self.another_operations()

    def decode_method(self):
        try:
            self.decode_path=self.gui_interface()
            secret = lsb.reveal(self.decode_path)
        except AttributeError:
            self.decode_range+=1
            if self.decode_range<=5:
                self.decode_method()
            else:
                print()
                print()
                print("Try Again!!!")
                print()
                print("You have not selected an image to decrypt")
                print()
                self.another_operations()
```

```
        else:
            print("The encrpyted message in image is:\n",secret)
            self.another_operations()
    def gui_interface(self):
        root = tk.Tk()
        root.withdraw()
        file_path = filedialog.askopenfilename(filetypes=[("JPEG and PNG Files",
"*.jpeg;*.jpg;*.png")])
        if file_path:
            print("Selected file: ", file_path)
        return file_path
object1=Steganography()
```

4.1 Handling Errors:

While designing this app we have used python OOPS concept. First of all, we have imported all the modules we have needed. Then we have created an in class object called "**Steganography** ". Then we have defined several methods in the class. Each method has its own functions like the constructor method used to restart the app or perform the operations from the starting like encryption and decryption that have been seen in screenshots and algorithms. First we have written the code to encrypt and decrypt the message to an image and from an image. But as initially we have to specify the path for encryption of image and description of image explicitly by typing the path. For this error we have included a "**tkinter**" module which creates a user interface for the user to select the file for encryption and decryption instead of typing the path explicitly. For encryption the user will select the file but for decryption we have to specify a separate folder so that each text encrypted file is saved in that exact path. But this will happen only where that path exists but in new computers the code rises error. So we have imported another module called "**os**", this model runs administrator and creates folder in the system if it does not exist. But this also raises an expectation when the folder is created already. For this we have used exception handling and fixed this exception.

We have a raise and another error if the user does not select any image while encryption, description it raises into an error. For this error we have used exception handling, used some of the global variables and created a while loop until the user selects the file or the global variable value comes to 5. If the user selects the file then it works fine, if not selected the file for 5 times then the app restarts automatically saying and error you have not selected file for encryption and decryption.

5. **Conclusion**

To conclude, This Paper Steganography using python which has been developed using Python. This paper helps users to hide data inside another image file. Which provides Easy implementation. Thus, the paper entitled above should include all the above-mentioned features and it is confirmed that it is up to the specifications entitled for the project.

In case of image steganography, security and capacity are the main concern of the researchers. A method with proper security and ability to hide huge amount of data in the cover image is needed for secret communication over the Internet. The proposed method of image steganography is introduced that uses Pseudo Random Number Generator for random pixel and bit selection to embed the message in the cover image to secure the message from intruder.

Experimental results showed that the proposed method provide better security and high embedding capacity compared with the results of the other LSB methods. With the two layer of PRNG in pixel and bit level and a single byte in each pixel, the method provide improved security and high embedding capacity. As the method is satisfied the steganographic system goals, it can be contemplated as an effective steganographic method.

The goal of this project was to implement an application that uses the LSB steganography method in order to hide and recover data. Because communication involves a sender and a receiver, there are two ways in which the application can run: as an encoder or as a decoder. For the encoding part the message is hidden into the least significant bits of a bmp image, thus resulting the stego-image. This image is then given to the decoder to extract the data that has been hidden.

A method with proper security and ability to hide huge amount of data in the cover image is needed for secret communication over the Internet. The proposed method of image steganography is introduced that uses Pseudo Random Number Generator for random pixel and bit selection to embed the message in the cover image to secure the message from intruder. Experimental results showed that the proposed method provide better security and high embedding capacity compared with the results of the other LSB methods. With the two layer of PRNG in pixel and bit level and a single byte in each pixel, the method provide improved security and high embedding capacity. As the method is satisfied the steganographic system goals, it can be contemplated as an effective steganographic method.

The project titled “Image Steganography and Sending Private Data Through Email Using Cloud Computing” can be used as a ready to go software for sharing sensitive data over the internet using google mail services which are embedded in the software itself. This project provides a major advantage of writing the secret message in the picture, which makes it, look like a normal image. But when decoded using steganography produces the hidden message and thus keeping the confidentiality safe from unauthorized users.

This Paper Steganography using python which has been developed using Python. This paper helps users to hide data inside another image file. Which provides Easy implementation. Thus, the paper entitled above should include all the above-mentioned features and it is confirmed that it is up to the specifications entitled for the project.

Steganography techniques have been used throughout history to conceal sensitive messages or data, ranging from ancient methods like invisible ink to modern digital approaches. With advancements in technology, steganography has become increasingly sophisticated, allowing for the hiding of large amounts of data within various media types.

The primary goal of steganography is to ensure the secrecy and confidentiality of the hidden information. By embedding data within existing files, steganography provides a covert means of communication, preventing unauthorized individuals from detecting the presence of the concealed information.

While steganography is primarily associated with the realm of security and espionage, it also has legitimate applications. For instance, it can be used to protect sensitive data during transmission, authenticate digital content, or embed copyright information in digital media.

However, steganography also poses challenges in terms of detection and prevention. As techniques evolve, so does the need for advanced detection methods to identify hidden information accurately. This has led to the development of specialized software tools and algorithms to detect steganographic content.

6. **Future Scope**

The future scope for steganography holds several exciting possibilities and challenges. As technology continues to advance, steganography is likely to evolve and find new applications in various domains. Here are some potential areas of future development

Steganography, the practice of concealing information within other forms of data, has been used throughout history to protect sensitive information. While the fundamental concept of steganography remains the same, advancements in technology and the increasing need for secure communication channels have opened up several future scopes for steganography. Here are some potential areas of development:

Multimedia Steganography: Steganography has traditionally been applied to text and image files, but there is a growing interest in multimedia steganography. This involves hiding information within audio, video, or 3D models. With the increasing popularity of streaming services and digital media consumption, multimedia steganography techniques could find applications in protecting sensitive multimedia content from unauthorized access or piracy.

Steganography in Cloud Computing: As more organizations move their data and applications to the cloud, ensuring data security becomes crucial. Steganography techniques could be employed to hide sensitive information within cloud data, making it less susceptible to unauthorized access or data breaches. This could involve concealing data within large datasets or even distributed systems to provide an additional layer of security.

Steganography in Internet of Things (IoT): The proliferation of IoT devices introduces new challenges for secure communication. Embedding hidden information within IoT data streams can enhance privacy and security. Steganography techniques could be applied to IoT sensor data, control signals, or even device firmware to protect against unauthorized access, data tampering, or eavesdropping.

Adaptive Steganography: Adaptive steganography involves dynamically adjusting the hiding techniques based on the characteristics of the carrier medium and the requirements of the communication channel. Future advancements could focus on developing intelligent algorithms that automatically adapt the steganographic techniques based on factors such as noise, compression, or encryption algorithms employed in the carrier medium. This would make it more difficult for adversaries to detect the presence of hidden information.

Steganalysis Countermeasures: Steganalysis is the art of detecting hidden information within carrier data. As steganography techniques evolve, so does the need for improved steganalysis countermeasures. Future research may focus on developing more advanced

algorithms and machine learning techniques to detect and uncover hidden information, thereby improving overall security.

Quantum Steganography: With the advent of quantum computing, the field of quantum steganography is expected to emerge. Quantum steganography would involve hiding quantum information within quantum states or quantum communication channels, leveraging the unique properties of quantum systems for secure communication.

It's important to note that while steganography can provide an additional layer of security, it should not be considered a standalone solution. It is typically used in conjunction with other encryption and security measures to ensure comprehensive protection of sensitive information.

In conclusion, the future of steganography holds great potential for advancements in techniques, tools, and applications. As technology progresses, steganography will continue to evolve as a critical tool for secure communication, data protection, and digital forensics.

In summary, steganography is a powerful and evolving field that plays a crucial role in information security and data protection. As technology advances, it is likely that steganography will continue to evolve, both as a means of covert communication and as a countermeasure to ensure the integrity and security of digital content.