Shri Vile Parle Kelavani Mandal's
DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Affiliated to the University of Mumbai)
NAAC Accredited with "A" Grade (CGPA : 3.18)

Experiment 5

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Aim of Experiment

mplement Hill Cipher. Create two functions Encrypt() and Decrypt(). Demonstrate these ciphers using Color Images / Gray Scale Images

Theory / Algorithm / Conceptual Description

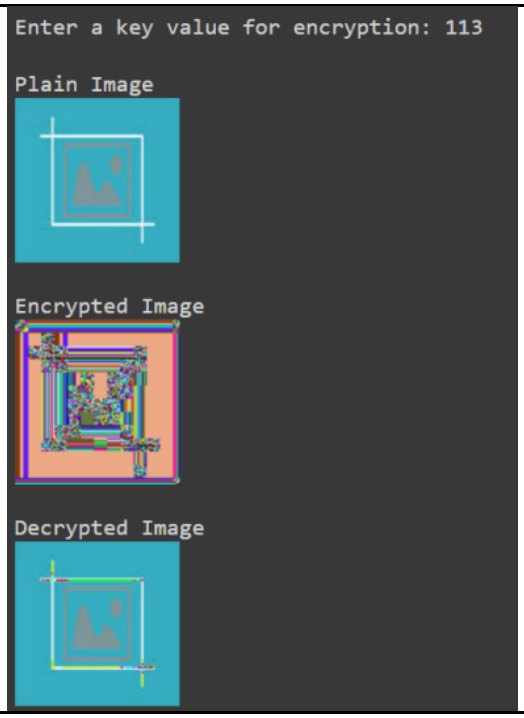
Hill cipher is a polygraphic substitution cipher based on linear algebra. Each letter is represented by a number modulo 26. Often the simple scheme A = 0, B = 1, …, Z = 25 is used, but this is not an essential feature of the cipher. To encrypt a message, each block of n letters (considered as an n-component vector) is multiplied by an invertible n × n matrix, against modulus 26. To decrypt the message, each block is multiplied by the inverse of the matrix used for encryption. The matrix used for encryption is the cipher key, and it should be chosen randomly from the set of invertible n × n matrices (modulo 26).

Program

```
from PIL import Image
from numpy import array
import numpy as np
def modInverse(A, M):
for X in range(1, M):
if (((A % M) * (X % M)) % M == 1):
return X
return -1
im = Image.open(r"1.jpg")
ar = array(im)
list(ar)
k = int(input("Enter a key value for encryption: "))
key = np.zeros((100,100,3))
for i in range(100):
 for j in range(100):
```

```
 key[i][j] = k
result = np.zeros((100,100,3))
for i in range(100):
 for j in range(100):
 result[i][j] = (key[i][j] * ar[i][j]) % 255
print("\nPlain Image")
r = Image.fromarray(np.uint8(ar))
r.show()
print("\nEncrypted Image")
r = Image.fromarray(np.uint8(result))
r.show()
mod = modInverse(k, 255)
key_inv = np.zeros((100,100,3))
for i in range(100):
 for j in range(100):
 key_inv[i][j] = mod
result_dec = np.zeros((100,100,3))
for i in range(100):
 for j in range(100):
 result_dec[i][j] = (key_inv[i][j] * result[i][j]) % 255
print("\nDecrypted Image")
r = Image.fromarray(np.uint8(result_dec))
r.show()
```

Input/Output



CONCLUSION

Thus, we have successfully implemented Hill cipher