

20CYS181



AMRITA
VISHWA VIDYAPEETHAM

**MATRIX
ENCRYPTION** **"ALGEBRAIC
SECURITY"**

HILL CIPHER

**ENCRYPTION AND
DECRYPTION**

CAPSTONE PROJECT

KIRAN | VIJAY | JAYANTH

HILLCIPHER:

ENCRYPTION AND DECRYPTION

VIJAY KRISHNA

KIRAN KUMAR REDDY

JAYANTH

BONAFIDE CERTIFICATE

This is to certify that the following students of **B.Tech Cyber Security** from **Amrita Vishwa Vidyapeetham, Chennai Campus** are bona fide students

of our institution and have undertaken a capstone project titled:

"HILL CIPHER: ENCRYPTION AND DECRYPTION"

The details of the students are as follows:

B. Vijay Krishna

Y. Kiran Kumar Reddy

Y. Jayanth

This project work is being carried out as part of the academic requirements of the B.Tech program.

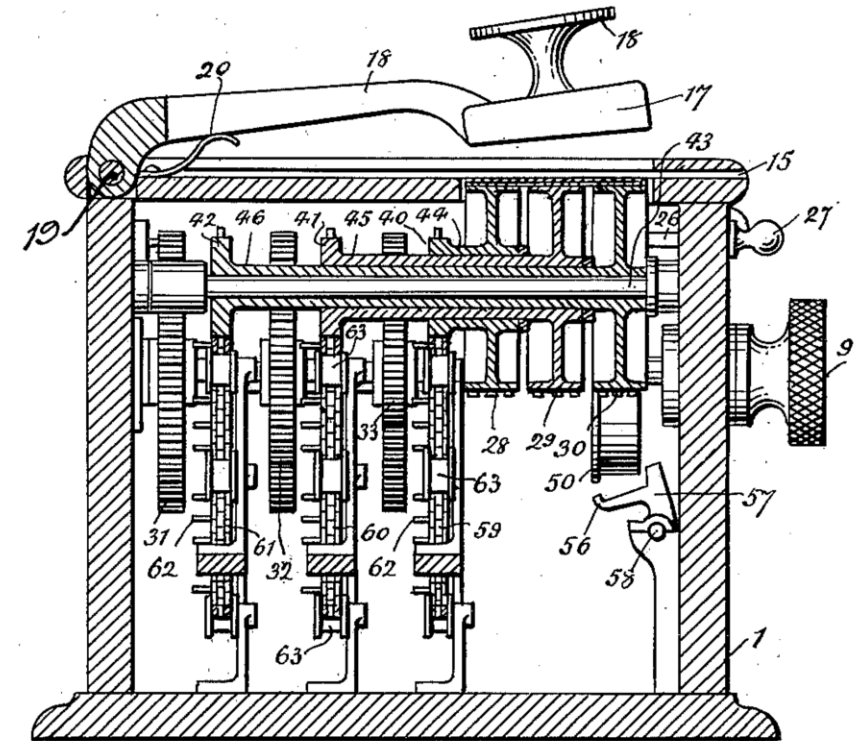
We wish them all the best in their endeavors.

Date: 21-4-25

Place: Chennai

INTRODUCTION

- In this project, we have worked on a simple encryption and decryption system using the **Hill Cipher**. The Hill Cipher is a method of turning normal text into secret code using basic math with matrices. It takes a group of letters, changes them using a key (a matrix), and gives us a coded message. To get the original message back, we use the inverse of the same key.
- We chose to do this project in **C programming** because C is fast, easy to use for math operations, and helps us understand how encryption works at a basic level.



OVERVIEW OF THE PROJECT

This project implements the **Hill Cipher** algorithm for secure encryption and decryption of text messages using **C programming**.

The Hill Cipher is a **classical encryption technique** that uses **matrix multiplication** to encode messages.

Our code:

- Generates a **random 2x2 key matrix**
 - Encrypts the message using the key
 - Decrypts it back using the **inverse matrix**
 - We used C for better understanding of how encryption works at the basic level.
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KEY GENERATION

The function `generateRandomKey()` creates a **random 2x2 matrix**.

It checks that:

- The **determinant is non-zero**
 - The **inverse modulo 26 exists**
 - This ensures the matrix can be used for both encryption and decryption.
 - The valid matrix is then displayed as the encryption key.
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ENCRYPTION PROCESS

"encrypt()" takes the key and message as input.

It:

- Converts every 2 letters into a vector
- Multiplies the vector with the key matrix
- Applies modulo 26 to keep characters within 'a' to 'z'
- The result is printed as the encrypted text.
- If the message has an odd number of characters, the last one is ignored.



DECRYPTION PROCESS

`decrypt()` uses the **inverse of the key matrix**.

It:

- Multiplies each pair of encrypted characters with the inverse key
- Applies modulo 26 to get back the original letters
- The original message is printed as output.
- The inverse is calculated using `inverseMatrix()` with modular arithmetic.

SOURCE CODE

<https://onlinegdb.com/sahE7qhgh>

RESULT: SAMPLE RESULT

Generated Key Matrix:

	20	23	
	9	2	

Enter a message (uppercase or lowercase):

Encrypted text: qyenqp

Enter the encrypted text: qyenqp

Decrypted text: amrita

program executed successfully !

REFERENCES



<https://www.geeksforgeeks.org/hill-cipher/>

<https://www.sanfoundry.com/c-program-implement-hill-cypher/>

<https://stackoverflow.com/questions/13589248/generating-random-matrix-in-c>
