

# QR- Based Encrytion using Cryptography and Stegnography

19BCI0078  
19BCI0080  
19BCI0084  
20BCT0349



# Objectives

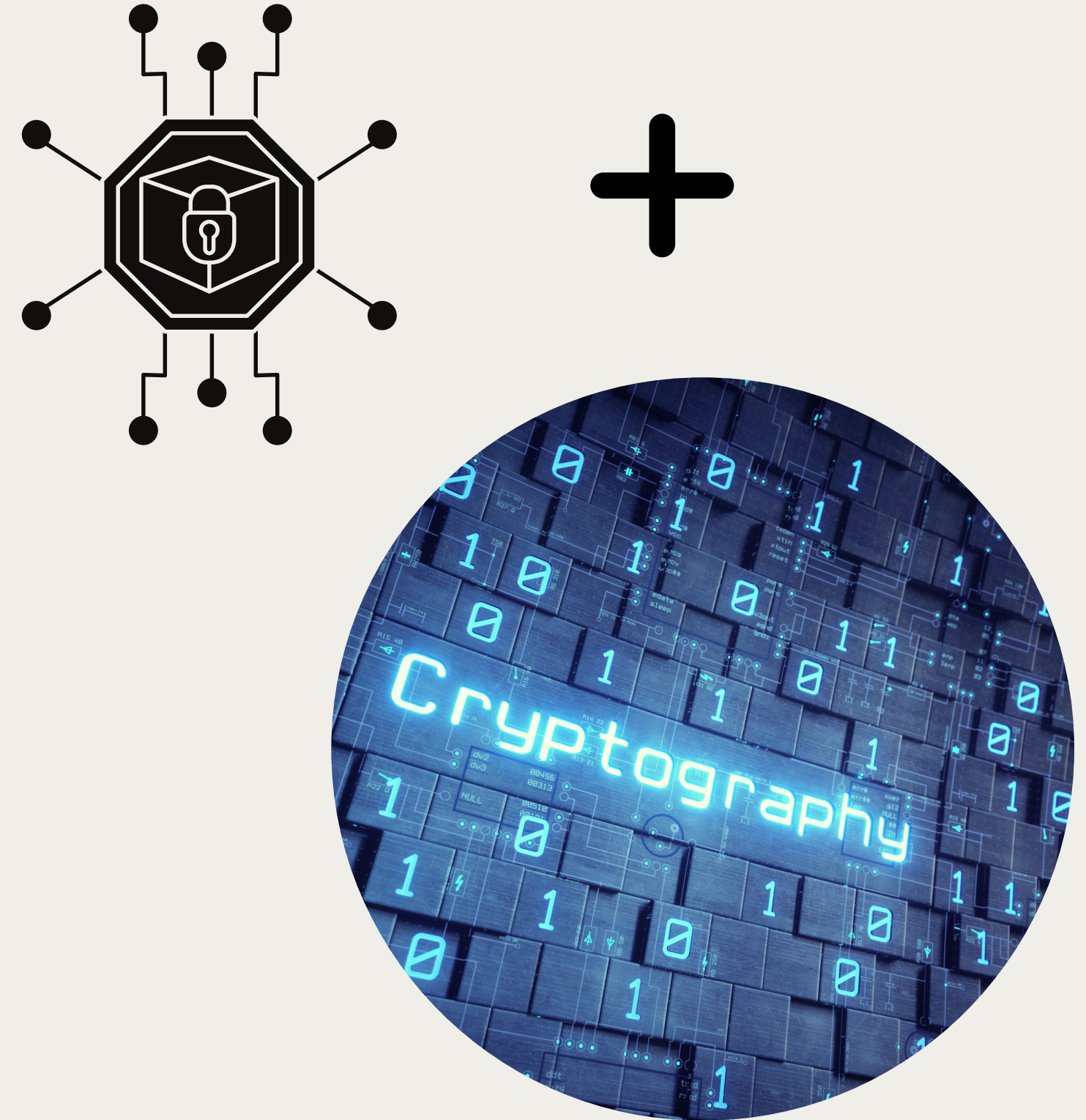
**We are implementing a three-layered approach to encrypt data that uses cryptography and steganography in conjunction.**

**This project aims to take information security a step further by using two algorithms to ensure more security.**



# Background

Many cryptographic techniques are available for serving the purpose of information security over the web, servers and local systems. However, there is always a demand for more security which may not be met by such cryptographic algorithms alone because of known security attacks and mathematical complexity. Thus visualizing the strategic combination of cryptography and steganography techniques can provide a higher level of security. Quick Response (QR) codes are used extensively due to their beneficial characteristics. It includes robustness, readability, error correction capability, large data capacity than traditional barcodes etc. This is the motivation and background of this project



# Problem Statement

- 1) Develop a 3 layered approach using both cryptography and steganography to encrypt messages over social media platforms.
- 2) The first layer will include the encryption of confidential messages using the RSA algorithm(This can be replaced by some other algorithms also like AES).
- 3)In the second layer the generated encrypted message is embedded into a **QR code**.
- 4)In the last layer this QR code image is masked behind another image using image encoding algorithms



# Related Work and Applications



- Intensive research work is going on related to QR code based message/information sharing and to generate a hybrid encryption algorithm that is robust, efficient, flexible has higher throughput, and has error correction capabilities.
- Pei-Yu-Lin in his paper has focused on QR code tags and proposed three-layer security system characteristics of QR code and those characteristics are utilized to design a secret QR sharing approach, in an attempt to make it more efficient for large chunks of data.



# Related Work and Applications

- Another author named K.S. Seethalakshmi presented the renewed cryptographic technique for protecting image-based data and also has proposed methodology where visual cryptography and image steganography are used together, the author also proved that there won't be any loss of data after QR code masks the other visual graphics therefore similar approach is followed in this project and image steganography is done by hiding the qr code behind mask image.



# Literature Survey



## 1) Secure QR-Code Based Message Sharing System Using Cryptography and Steganography

**Year:2018**

### **Metrics used to evaluate:**

- Robustness
- Time to Encrypt
- Time to Decrypt
- Modularity
- Throughput
- Security Level Strength
- Error Correction Capability
- Architecture and Strength

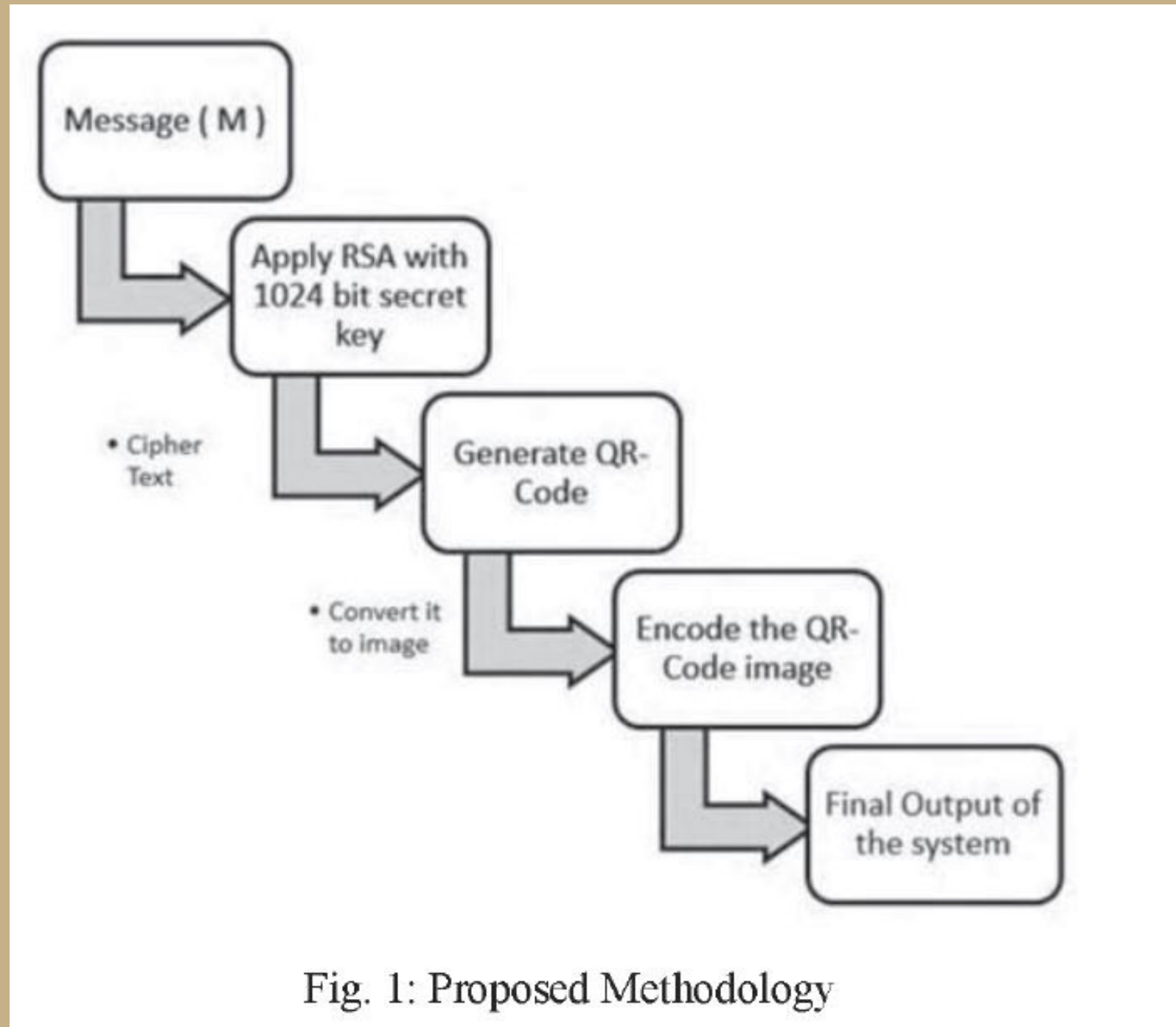
### **Drawbacks:**

- The proposed algorithm is very secure, but RSA is a slow algorithm to work with, so the throughput is less, which is a subject for improvement.
- Max size of data that is processed conveniently is only limited to text messages. Multimedia of different types and even long messages is not supported, or we can say the processing is not very fast.

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# Methodology





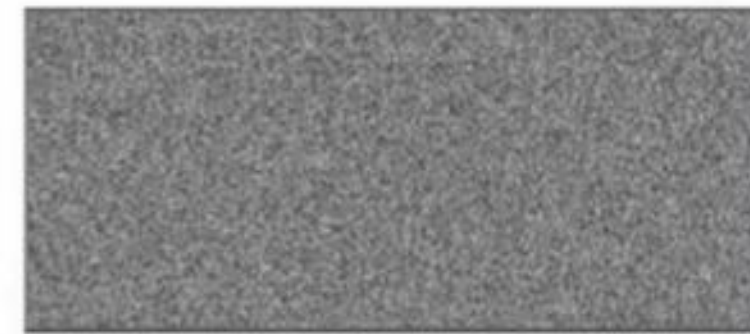
# PROPOSED SYSTEM

## Image\_Encoding (QR code):

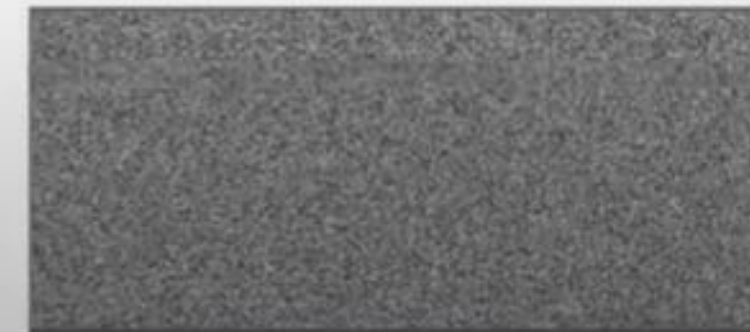
- 1: Start
- 2: Initialize random image with pixel size  $\geq$  pixel size (QR code)
- 3: For each pixel of random image  $R_{Pi}$ :  
    For each pixel of QR code  $Q_{Pi}$ :  
        If  $Q_{Pi}$  is even no:  
            change  $R_{Pi}$  to nearest even number  
        Else if  $Q_{Pi}$  is odd no:  
            change  $R_{Pi}$  to nearest odd number
- 4: return EQR
- 5: END



(a) Original QR Image



(b) Randomly Initialized Pixel image or Mask Image



(b) Resulted Image



# PROPOSED SYSTEM

## Image\_Decoding (EQR):

- 1 : Start
- 2: Initialize random image with a pixel size of EQR
- 3: For each pixel of EQR  $Q_{Pi}$ :
  - If  $Q_{Pi}$  is even no:
    - Do: store 0 in image matrix of EQR
  - Else if  $Q_{Pi}$  is odd no:
    - Do: store 1 in image matrix of EQR
- 4: return DQR
- 5: END



# Evaluation Metrics Discussion

- The evaluation metrics are mostly the throughput response. We are going to implement it in python with standard libraries written in cython, which makes the algorithm quite fast. The architecture and error correction ability is contradictory to each other for which a trade-off between the two is a target to be found by varying the parameters. Modularity is also a way to make the algorithm, easy to refactor and increase the throughput. The throughput is expected to be around 100Bytes/sec - 200Bytes/sec.
- The implementation will be timed and a mathematical analysis will be given wrt to the time taken and the parameters passed.



# Conclusion and Future Work

During this study of the research paper, it was observed that RSA was the best among all in terms of Security, Flexibility, and Encryption performance. Although the other algorithms were also competent, most of them have a trade-off between memory usage and encryption performance.

So, RSA is being used.

But RSA replacement is also a necessary task, since it is a slow algorithm



# Database used

We are using an open-source API to generate QR information from text.

<https://github.com/nayuki/QR-Code-generator>



# Contributions :

## **1) Akash Mohan Joshi**

Further research and algorithmic analysis to integrate it into an actual application and increase the speed by using multithreading.

## **2) Arun Kumar Mishra**

Scripting and Architecture definition

## **3) Himanshu Bhardwaz**

QR Code API and multiprocessing research in Steganography.

## **4) Aditya Singh Rawat**

Modularization, Documentation and further Literature Surveys





# References

- K.S.Seethalakshmi, "Use of Visual Cryptography and Neural Networks to Enhance Security in Image Steganography", IOSR Journal of Computer Engineering (IOSR-JCE) e-ISSN: 2278-0661, p-ISSN: 2278-8727.
- Sharma, Shweta, and Vikas Sejwar. "Impementation of QR Code Based Secure System for Information Sharing Using Matlab." In Computational Intelligence and Communication Networks (CICN), 2016 8th International Conference on, pp. 294-297. IEEE, 2016.
- Gao, Meifeng, and Bing Sun. "Blind watermark algorithm based on QR barcode." In Foundations of Intelligent Systems, pp. 457-462. Springer, Berlin, Heidelberg, 2011



# Thank You!