PRACTICAL-1

Aim: Breaking the Shift Cipher

Link to perform this experiment: https://cse29-iiith.vlabs.ac.in/exp/shift-cipher/index.html

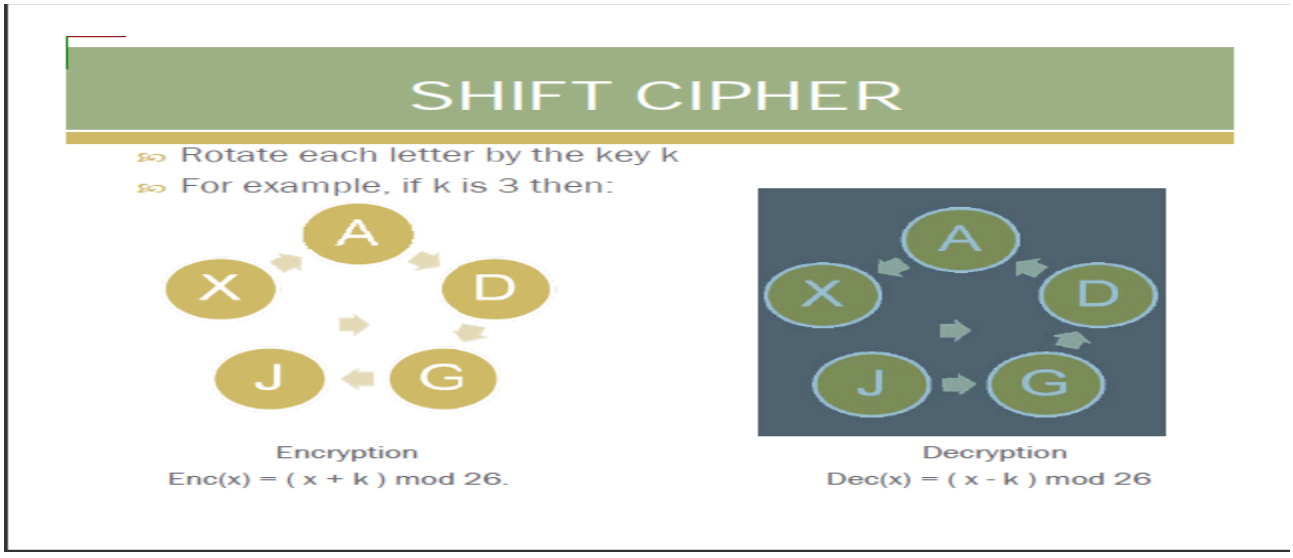
- A private-key encryption scheme consists of a set of all possible messages, called the message space M, and three algorithms, namely,
  (a) Gen
  (b) Enc
  (c) Dec
- The algorithm for key generation Gen is used to choose a key k at random from the set of all possible secert keys, denoted by the key space K.
- The algorithm for encryption Enc takes as inputs the message m and the secret key k and outputs the ciphertext c.
- The algorithm for decryption Dec inputs the ciphertext c and the key k and outputs the message m.

About the experiment:

- Apparently, the system is easily broken if the total number of distinct secret keys is small, that is the key space K is small.
- In this experiment, we work with a well-known historical encryption scheme, namely the shift cipher, that has a very small key space.
- Your task is to break the shift cipher. Specifically, given (only) the ciphertext in some instance of a shift cipher, you need to find the plaintext and the secret key.

Objective : To understand that secure encryption is not possible with small keyspace. This is more popularly known as the principle of large key space.

Theory



Procedure

STEP 1 : For the given ciphertext in the **PART I** of the simulation page, the first step is to decrypt it using each of the twenty-six different keys, k=0,1,...,25 and obtain the corresponding plaintexts. For decryption, you may use the tool given in the **PART III** of the simulation page.

STEP 2 : After each decryption, you may cut-and-paste the resultant plaintext in the scratch-pad in the **(PART II)** of the simulation page, if you need to remember it.

STEP 3 : Finally, observe the plaintexts and choose the most appropriate one (the one that is a meaningful English text) as the recovered plaintext and cut-and-paste it in the text-field named **PART IV** "Solution Plaintext". Also select the corresponding key in the text-field named "Key" and click on "Check My answer" Button.

STEP 4 [OPTIONAL] : Verify that your answer is correct, by encrypting the solution plaintext with your key.

An Example:

Let us say we have a cipher text "KRZ DUH BRX" generated by a shift cipher. We carry out the brute force attack as follows:

For k=0:

```
cipher text: K R Z D U H B R X
      plain text: k r z d u h b r x
```

For k=1:

```
cipher text: K R Z D U H B R X
      plain text: j q y c t g a q w
```

For k=2:

```
cipher text: K R Z D U H B R X
      plain text: l p x b s f z p v
```

For k=3:

```
cipher text: K R Z D U H B R X
      plain text: h o w a r e y o u
```

For k=3, we obtain a meaningful plain text namely how are you and hence we are done.

References

- https://en.wikipedia.org/wiki/Caesar_cipher

PRACTICAL-2

Aim: Digital Signatures Scheme

Link to perform this experiment: https://cse29-iiith.vlabs.ac.in/exp/digital-signatures/index.html

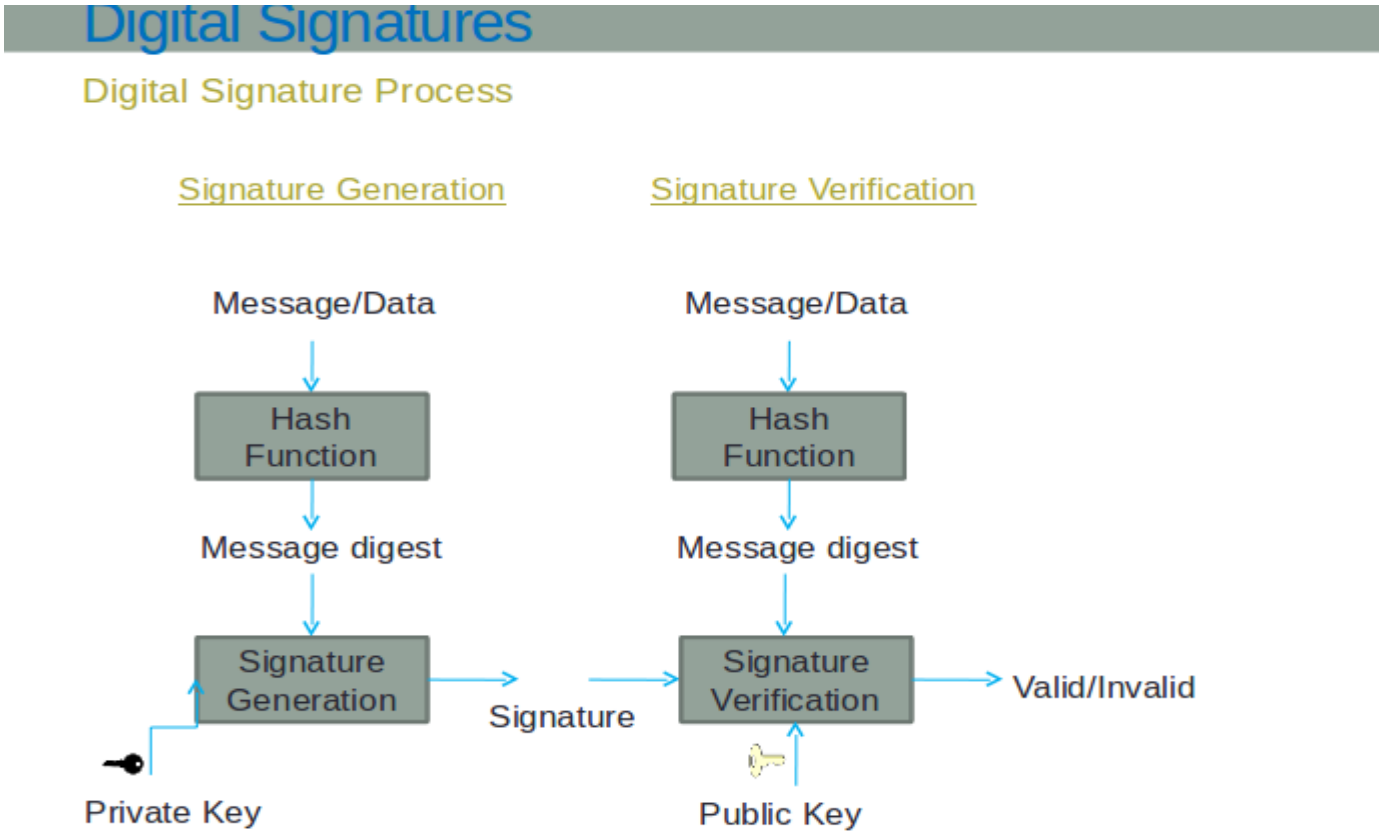
About the experiment:

- In Public key setting, it becomes difficult to verify for a receiver whether message is originated from claimed source.
- In this experiment, we show how can a receiver verify integrity of the message in public key setting.
- Your task is to verify, whether digital signature scheme really works and why it works?

Objective: To understand "How and Why Digital signature schemes?

Theory

A Digital Signature is an authentication mechanism that enables the creator of the message to attack a code that acts as a signature. The signature is formed by taking the hash of the message and encrypting the message with the creator's private key. The signature guarantees the source and integrity of the message.



Procedure

Step 1 : Enter the input text to be encrypted in the 'Plaintext' area and generate hash value for message by clicking on the SHA-1 button

Step 2 : Copy content of Hash Output(hex) field and paste it in Input to RSA(hex) field.

Step 3 : Select key size of public key from RSA Public key section by clicking on any key button.

Step 4 : Click on Apply RSA button to generate a digital signature. Once the topology is built then click on the Submit button to test whether the give topology is built correctly or not.

References

- Wikipedia on Digital Sinatures
- Introduction to Modern Cryptography by Jonathan Katz and Yehuda Lindell.