

Complement Based Modified Approach to Secure Small Text Message Combining Triangulation Method

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Abstract- Cryptography is the practice and study of Encrypting/Decrypting information. In this era of information processing where all transaction is digitized, information security becomes an essential issue for every aspects of digitization. The process of securing information means protecting the information from non-repudiation, maintaining its integrity and make it secure. Access to stored information on computer via network is increased. Hence there is a strong demand of securing information that is passing via unreliable network. The channel through which information is passing should be secured as well as the information itself should be strongly encrypted.

In this paper I have proposed an enhanced Symmetric key encryption algorithm which is the combination of substitution Technique, 2's complement technique and Triangulation Method through which each character of the message will be strongly encrypted by no. of steps depending on the ASCII value of each character of the message so that its integrity, security and confidentiality will be maintained while it will transmit via some network channel. Our proposed method is easy to adopt the coding of advance language and is safe enough.

Keyword- ASCII, Complement, Cryptography, Substitution, Triangulation

I. INTRODUCTION

Cryptography is the science of keeping data secure. Encryption is the process of using cryptography to encode data or information so that no unauthorized user can access the data. For ensuring the security; the plain text is converted to cipher text by the sender. This process is called encryption. Decryption is exactly reverse process of encryption by which intended user can decode the message to its original form. Now a day's Different mathematical schemes and algorithms are there to scuttle the content of the message. In this paper, an enhanced multi-level encryption decryption algorithm is introduced which is a combination of existing symmetric encryption algorithm like Substitution techniques along with triangulation method and 2's complement, so that it provides us a more secure and protected message, passing through unreliable communication media and the confidentiality and integrity of the message being transmitted remain intact.

II. RESEARCH AND REVIEW

Cryptography is the art of protecting information by transforming it (encrypting it) into an unreadable format, called cipher text. Only those who possess a secret key can decipher (or decrypt) the message into plain text. Encrypted messages can sometimes be broken by cryptanalysis, also called code breaking, although modern cryptography techniques are virtually unbreakable.

Purpose of Cryptography:

Cryptography provides a number of security goals to ensure the privacy of data, non-alteration of data and so on. Due to the great security advantages of cryptography it is widely used today. Following are the various goals of cryptography.

Confidentiality:-Information in computer is transmitted and has to be accessed only by the authorized party and not by anyone else.

Authentication:-The information received by any system has to check the identity of the sender that whether the information is arriving from an authorized person or a false identity.

Integrity: - Only the authorized party is allowed to modify the transmitted information. No one in between the sender and receiver are allowed to alter the given message.

Non Repudiation: - Ensures that neither the sender, nor the receiver of message should be able to deny the transmission.

Access Control: - Only the authorized parties are able to access the given information.

Conventional Cryptography or Symmetric key Cryptography:

In conventional cryptography, also called secret-key or symmetric-key encryption, one key is used both for encryption and decryption. The Data Encryption Standard (DES) is an example of a conventional cryptosystem that is widely employed by the Federal Government.

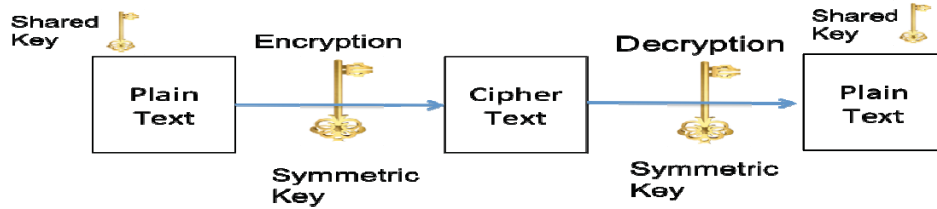


Figure1 : Illustration of the conventional symmetric key encryption process:

Public key cryptography or Asymmetric key Cryptography:

Public key cryptography is an asymmetric scheme that uses a pair of keys for encryption: a public key, which encrypts data, and a corresponding private, or secret key for decryption. You publish your public key to the world while keeping your private key secret. Anyone with a copy of your public key can then encrypt information that only you can read. Even people you have never met. It is computationally infeasible to deduce the private key from the public key. Anyone who has a public key can encrypt information but cannot decrypt it. Only the person who has the corresponding private key can decrypt the information.

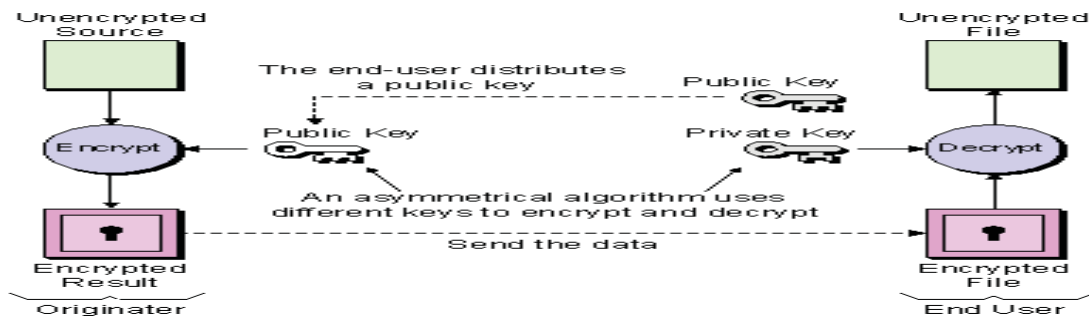


Figure2 : Illustration of the conventional asymmetric key encryption process

III. EXISTING CRYPTOGRAPHIC TECHNIQUES USED

Substitution Method: In cryptography, a substitution cipher is a method of encryption by which units of plaintext are replaced with cipher text according to a regular system; the "units" may be single letters (the most common), pairs of letters, triplets of letters, mixtures of the above, and so forth. The receiver decipheres the text by performing an inverse substitution

If key is three, then each character will substituted like following manner and we get cipher

plain	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Cipher	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C

If key is four then it will be like this:

plain	a	b	c	d	e	f	g	H	i	j	K	L	m	N	o	P	q	r	s	t	u	v	w	x	Y	z
Cipher	e	f	g	h	i	j	k	l	m	n	O	p	q	r	s	t	u	v	w	x	y	z	a	b	C	d

For Example Plain Text ijcet
 Cipher Text mngix

2's complement:

Two's complement is found by first finding 1's complement and then adding binary equivalent 1. Two's complement gives negative of a given number. Adding a number with its two's complement gives all bits 0s.

Consider a binary no. 01110101

2's complement of this no will find out in the following way

1's complement of this binary no is: 10001010

Adding binary equivalent of 1 with 10001010 we get 2's complement of the no we take.

i.e

10001010
00000001

10001011

So, the 2's complement of binary 01110101 is 10001011

Triangulation Method Algorithm :

Initially an n bit data string is taken.

After this, we consider the steps discussed below.

1. The data string initialized is taken as it is.
2. Bit wise XOR operation is performed of all the bits; however, the MSB is not kept constant .This step is considered as the 1st iteration.
3. The iteration process is continued until the data string is reduced to a single bit.
4. The MSB's from the data string obtained from each of the iterations and are then joined together and taken as the new output.
5. If we take the new output as the data string, and perform the above mentioned steps, i.e, step1-step4, we get the original output.

The implementation of the above algorithm is shown

Using the previous data string example.

The data string taken is 1 0 0 0 1 1 0.

1 1 0 0 1 1 0
0 1 0 1 0 1
1 1 1 1 1
0 0 0 0
0 0 0
0 0
0

The output string obtained is 1010000.

Now, this data string is taken as the new data string, and triangulation is performed on it.

1 0 1 0 0 0 0
1 1 1 0 0 0
0 0 1 0 0
0 1 1 0
1 0 1
1 1
0

The output data string obtained is 1100110, which is the actual data string.

III. PROPOSED ALGORITHM

Encryption Algorithm: Algorithm Description

Step 1: Take a random prime number as a Primary key.

Step 2: Generate a secondary key by means of following

Secondary key= Primary key%26.

Step 3: Apply substitution techniques to generate intermediate cipher text using secondary key from plain text.

Every character of the plain text will be substituted by another character.

Step 4: Determine ASCII value of the each substituted character and find out their binary equivalent.

Step 5: Apply 2's complement method on each binary equivalent of each character of intermediate cipher text.

- Step 6: reverse the complemented binary equivalent
 Step 7: Use triangulation method i.e. bitwise XOR operation between bit of stream reversed complemented binary value of each character of immediate cipher text, and result will be the leftmost bit of each step after XOR operation done with the bits
 Step 8: We convert the resultant triangulated binary number to its decimal equivalent which will be the ASCII value of some character
 Step 9: Apply step 5 to step 8 on each character of the intermediate cipher text.
 Step 10: Arrange the generated characters and get final Cipher text.

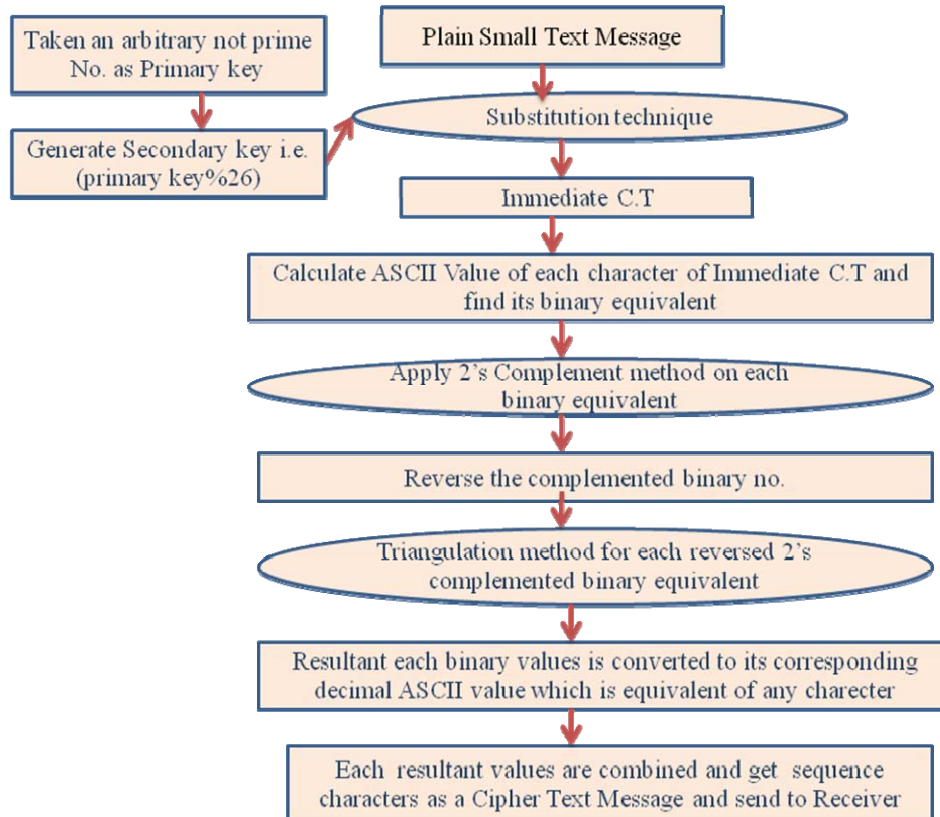


Figure 3: Block Diagram Representation of Encryption Process

Decryption Algorithm: Algorithm Description

Decryption is the reverse process of above encryption process

Step 1: ASCII value of each character of the received cipher text is calculated and their binary equivalent also.

Step 2 : On each binary stream of ASCII value we use Triangulation method i.e. bit wise XOR operation and the result

will be the leftmost bit of each step after XOR operation.

Step3: Reverse that triangulated binary no.

Step 4: Apply 2's complement on each reversed binary no.

Step 5: Complemented binary equivalent is converted to its corresponding decimal equivalent which is the ASCII

value of some character.

Step 6: Combine the characters and we get intermediate plain text

Step 7: Using secondary key (i.e. primary key %26) perform reverse substitution and each character will be Substituted by another character.

Step 8: Combine the character and finally get original Plain Text.

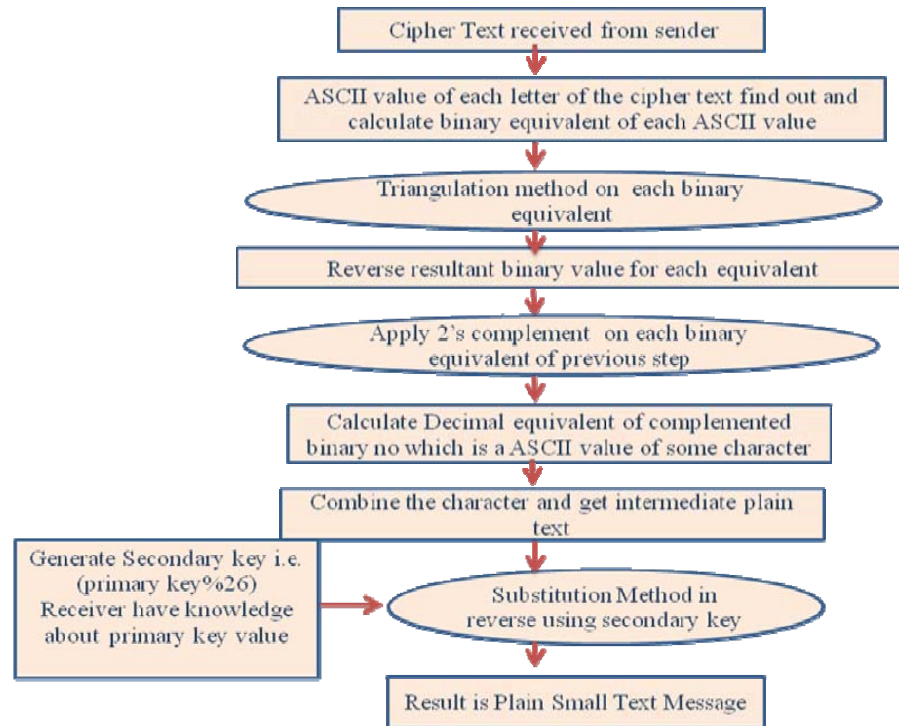


Figure 4: Block Diagram Representation of Decryption Process

IV.CONCLUSION

In this method I have proposed a novel approach by using combination of different existing symmetric encryption technique to ensure a secure, but simple and fast cryptographic system for secure small message. No doubt the security aspects to be examined thoroughly, but with the achieved efficiency if security measure is found adequate, it would enable us to secure message which is passing over a non-secure channel without considerable overhead. Thus it will provide efficient data security.

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