A Novel Approach to Substitution “Play Color Cipher”

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Abstract- In world of computer network if we want to secure any type of data then we have various ways like, encryption algorithm, digital signature and authentication protocol. Traditional encryption techniques use substitution and transposition.

Substitution technique map plaintext into cipher text. In all traditional substitution technique, it substitutes character, number and special symbol with character, number and special symbol. But we are emphasis on substitution of character, number and special symbol with color block. This algorithm of substitution is Play Color Cipher.

Keywords- Play Color Cipher, RSA algorithm, Substitution, Permutation, PUS-public key of Sender, PRR-Private key of sender, PUR-Public key of Receiver, Decillation, RTF-Rich Text Format, Unicode.

I. INTRODUCTION

We know that encryption techniques are used widely in security of data. Malicious users are also ready to break encryption algorithm security. Different types of attack apply on the algorithm, but when an algorithm develops it's also ready to avoid attack. Encryption algorithm is based on number of substitution and transposition. When a substitution algorithm is developed strong then it normally uses number of substitution and transposition, but it is easy to break.

When for encryption an algorithm process on data then it uses one of the approach- block cipher or stream cipher. In block cipher it uses a block of plaintext for encryption and gives a block of cipher text in return. Where in stream cipher it continuously takes plaintext character one by one and gives cipher text.

Play color cipher is a new substitution technique. Each character (capital and small letter, number (0-9), symbol on keyboard) in plaintext is substituted with a block of color from 18 decillion of color. At the receiving end the cipher text block (in color) is decrypted in to plaintext block.

In play color cipher we need to transmit key for security of algorithm. It use RSA algorithm for key transmission which is a public key algorithm. Play color cipher uses same way for encryption as we use in the play fair cipher. First we select a key like monarchy put it in our matrix, encrypt it in same way as we encrypt in play fair cipher, get the encrypted output of text, check that what color value is at the encrypted text, substitute it and get cipher text in form of block of color, transmit this block of color to receiver. Key which is used in matrix is transmitted by using RSA algorithm. It uses 2 character alphanumeric key. This 32 character long key included 4 key in itself k1,k2,k3 and k4.

K1- initial color value.
K2- increment value for color. K3- select language.
K4- key for encryption.

II. PROCESS OF ENCRYPTION AND DECRYPTION - Encryption-

1. Read plain text, it may be in any language like English, Hindi, Tamil etc.
2. Convert it into UTF.
3. Create block of plaintext it will be C1.
4. Apply permutation on C1 by key k4 this cipher text will be C2.
5. Again apply permutation on C2 by key k4 it will be C3.
6. Now substitute color value for particular character according to color matrix position with character matrix.
7. Send cipher text to receiver and key also by encrypting with RSA algorithm.

Decryption-

1. Receiver receives encrypted key.
2. Decrypts it by PRR.
3. Decrypts it by PUS.
4. Then he gets what is the key.
5. Key length will 32 character long.
6. 1-15 character is k1,16-22 character for k2,23rd character is k3 and 24 to 32 is k4.
7. it will create matrix according to the value of k1 and K2.
8. Put character according to the color matrix at place of color to get C3.
10. Again use k4 in matrix and find C1.

I. CRYPTOGRAPHY

Cryptanalyst is a person who doesn’t know about encryption algorithm and key but by the possible way of attack he finds the Algorithm to key and break security.

We are considering here 4 type of attack- Only Cipher text attack Known plain text attack Chosen plaintext attack Chosen cipher text attack

As we know that we are using 32 character long alphanumeric key. It has three possibility of attack. Key can be character of any chosen language.
Start

Read Plain text

Convert plaintext into UTF it will C1.

Create character matrix

Create color matrix by key K1 and increment color value by key K2

K3 this key will identify which language plaintext

Use key K4 on C1 to get C2

Again we use K4 on C2 it will be C3.

Substitute color value from color matrix in C3 and it will

Send cipher text to receiver, key by RSA algorithm to

Stop

Start

Read Cipher text

Decrypt key cipher by PRR first, then decrypt it by PUS it will 32 characters long key

Create color matrix by key K1 and K2

Create matrix for characters and substitute character according to color matrix to find C4.

Use key k4 and find C3 by decryption

Use again on K4 on C3 and find C2

Convert UTF block C2 into plaintext block C1.

Read original message.

Stop

Figure1-character matrix and color matrix with Play Color Cipher algorithm
Case 1 - In English language 26 characters and 10 number where in Hindi language or Devnagri it includes it’s all symbol for grammar have 117 character and 10 number. In English maximum number of key= (26)32=1.9X1045
In Devnagri maximum number of key= (117)32=1.5X1066
If the time required for determination of the plain text for one value of the key is in the key space is taken 10-3 seconds then the time required for obtain the plain text by considering all possible keys in the key space is
In English maximum number of key= (26)32=1.9X1045X10-3 second
In Devnagri maximum number of key= (117)32X10-3=1.5X1066X10-3
If we perform one encryption per second it takes
1.9X1045X10-3 =6X1035 years in English
365X24X60X60
1.5X1066X10-3 =4.75X1055 year in Hindi
365X24X60X60
Case 2- Out of 32 character it may that all character are number than maximum number of key=(10)32
If we perform one encryption per microsecond it takes
1032X10-3 =3.1X1029 years
365X24X60X60
In both case number of key is large so it require time to try all possible key is too high. Brute force attack is difficult in this situation.
In case plain text attacks we have to know as many pair of plaintext and cipher text as we require. The numbers of color in the computer are more than 718 decillion, with minor difference in color. We are permuting twice so it is difficult to know. We have strong avalanche effect because we are changing first character position in pervious so it is really difficult to know what is plain text. In all discussion we got that it is strong cipher. If we apply this substitution in DES it will create strong DES.

III. CONCLUSION

R=We have developed a Play Color Cipher algorithm by using color substitution method.32charater long key has been used for encryption and decryption.RSA algorithm is used to transmit key. Use of UTF in Play Color Cipher makes it possible to be independent of any language. It’s a better algorithm as compared to RTF. We can conclude that it will be a strong symmetric key algorithm for any data transmission.

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