International Journal of Future Generation Communication and Networking
Vol.7, No.2 (2014), pp.117-126
http://dx.doi.org/10.14257/ijfgcn.2014.7.2.12

A Technique for Data Encryption and Decryption

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Abstract

A day-to-day use of cryptography in our life is increasing tremendously; this is because of necessity of our multimedia documents to be protected from unauthorized person. As the days are passing the old algorithms are not remained so strong as cryptanalyst are familiar with them. Today the computers are faster and in feature its speed will increase more and more. Brute force attacks are made to break the encryption and they are growing so faster. These attacks are the main drawbacks of older algorithm. But with feature this algorithms will be replaced by new techniques that will provide better protection. In this paper we are going to proposed new encryption technique which is more faster, better immune to attacks, more complex, easy to encrypt and many more advanced security feature included. This Document displays the comparison between PSR algorithm and RSA Algorithm which are used in the encryption of plaintext into cipher text that are generally used in cryptography.

Keywords: *cryptography, cryptanalyst, symmetric encryption, Authentication key, RSA*

1. Introduction

Encryption has long been used by militaries and governments to facilitate secret communication. It is now commonly used in protecting information within many kinds of civilian systems. Encryption is also used to protect data in transit, for example data being transferred via networks (*e.g.*, the Internet, e-commerce), mobile telephones, wireless microphones, wireless intercom systems, Bluetooth devices and bank automatic teller machines. There have been numerous reports of data in transit being intercepted in recent years. Encrypting data in transit also helps to secure it as it is often difficult to physically secure all access to networks. When a message is decrypted, it is returned to its original readable form. Encryption can provide strong security for data to give sensitive data the highest level of security. The goal of encryption is to make data unintelligible to unauthorized readers and extremely difficult to decipher when attacked. The security of encrypted data depends on several factors like what algorithm is used, what is the key size and how was the algorithm implemented in the product.

2. RSA Algorithm

Rivest, Shamir and Adelman algorithm for cryptography system. This is an encryption algorithm totally based on mathematics. A lot of mathematical computation it includes in its encryption and decryption. There are two kinds of encryption RSA algorithm exist. One is called Symmetric RSA and other is Asymmetric RSA algorithm. Symmetric RSA uses a single key that must be kept secret. Its speed is faster. Asymmetric RSA uses double key of which one key is public key and other is private key. Its speed is quite slower.

ISSN: 2233-7857 IJFGCN

RSA founds a complete mathematical base its implementation is full of calculation and uses two large prime numbers. It includes taking power of terms, modulo division and final representation. Its basic is the large prime numbers and mathematical calculation based on term like(taking power and modulo of power). This provides essential security and in start it was assumed unbreakable but this mathematical base is prime problem as it quite time consuming and took lot of time for long documents. This time is quite important in multimedia system also essential on distributed client server technology. Another problem with RSA is that its choice for primary keys which must be prime to each other. With the development in technology RSA is nowadays breakable by using attacks like Brute force. So its protection is nowadays limited.

3. New Proposed Algorithm and its Procedure

3.1. New Proposed Algorithm (Modified PSR)

In this section we are going to introduce our algorithm and its working. Algorithm follows three fundamental encryption skim. This includes a phase of Substitution, Position and Random encryption. It generates only single key and takes a key level from the users which is used in Substitution and Position method. Since it undergoes three phases the overall complexity increases and algorithm becomes quite immune to attack.
The generated key is based on length of text as well as a private key is generated which must be kept secret. So it provided double secrete level protection. Even though the complexity is very high, but time taken by the algorithm for encryption is less and procedure to encrypt the text is simple. Thus algorithm is become so multipurpose usable. We will explain the algorithm by the way that it follows sequence for encryption.

3.1.1. Position method: In This technique a word may be an alphabet, number or Special character is shift on the basis of the key provided by the end user.
Procedure can be step wised explained as follows:

Step1: Enter the Source file and key level.

Step2: Check whether key is valid or not (i.e:0<key<11)

Step3: Access a valid encryption string of alphabets from database.

Step4: Encrypt Source file on basis of accessed string.

Step5: Generate a key for user on the basis of length of file.

3.1.2. Substitution method: A Substitution technique is based on replacing the character by shift provided by the user. By this feature a lot of complexity getting added and it is quite difficult for cryptanalyst to break the code.
Substitution method can be explained step by step as follows:

Step1: Take the positional encrypted and user provided key level

Step2: Divide the file into block of length 64 byte.

Step3: substitute character on basis of shift provided by the user.

Step4: Store it in array of length 64 byte.

Step5: Use them for remaining procedure of Random pattern.

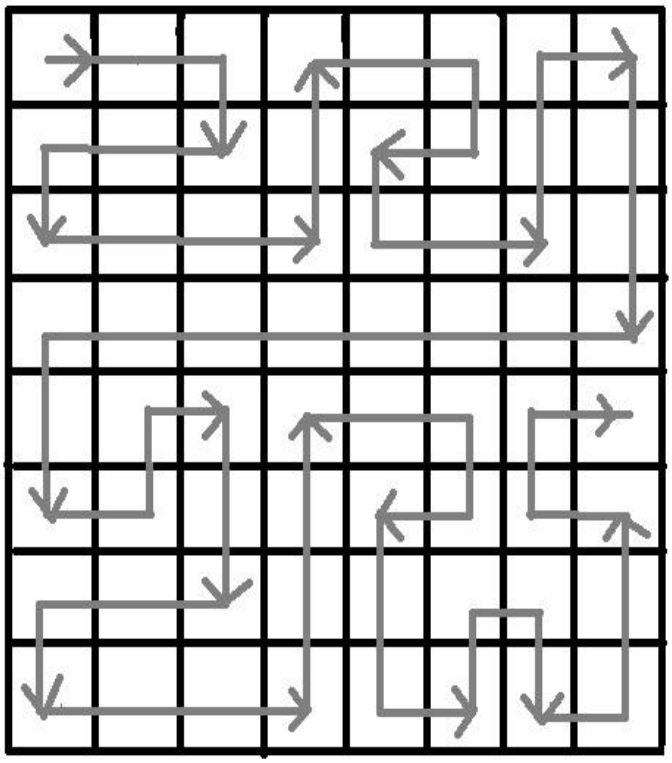


Figure 1. Example 1

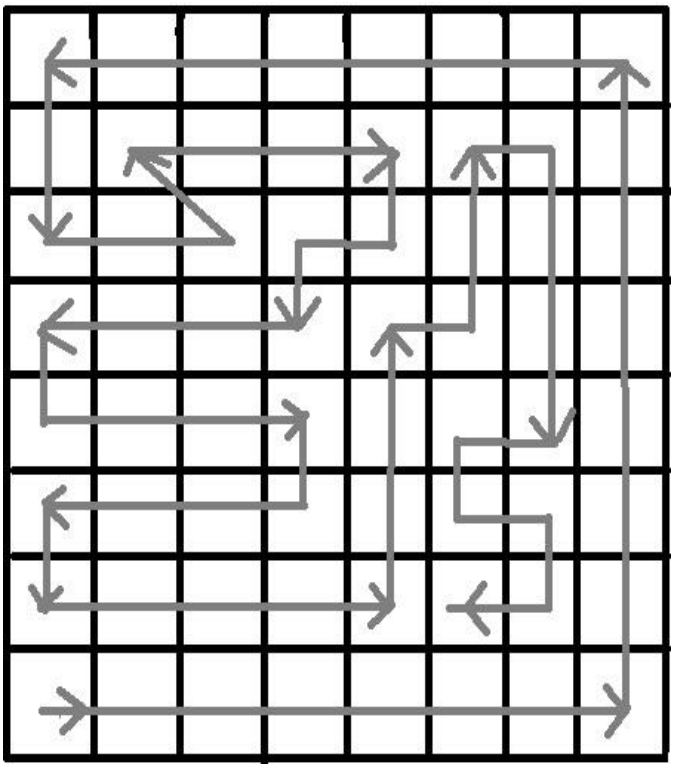


Figure 2. Example 2

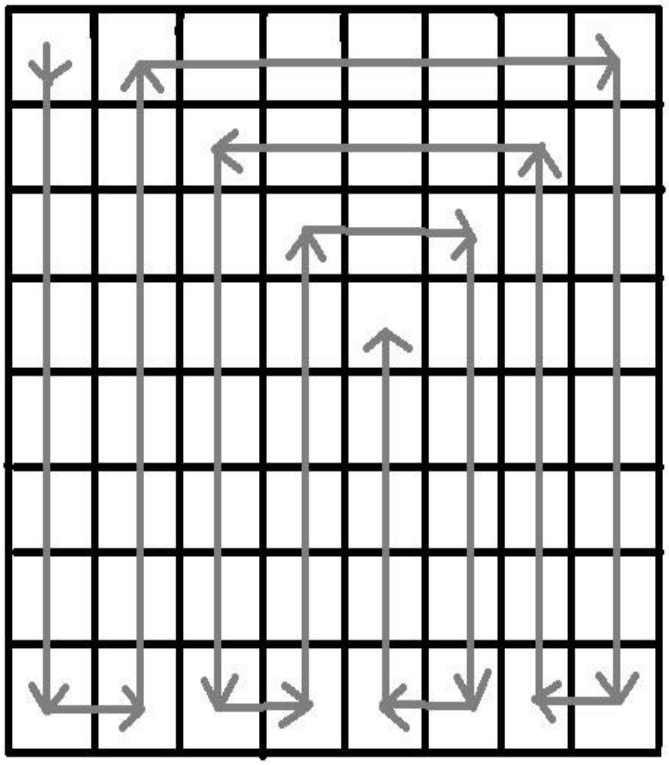


Figure 3. Example 3

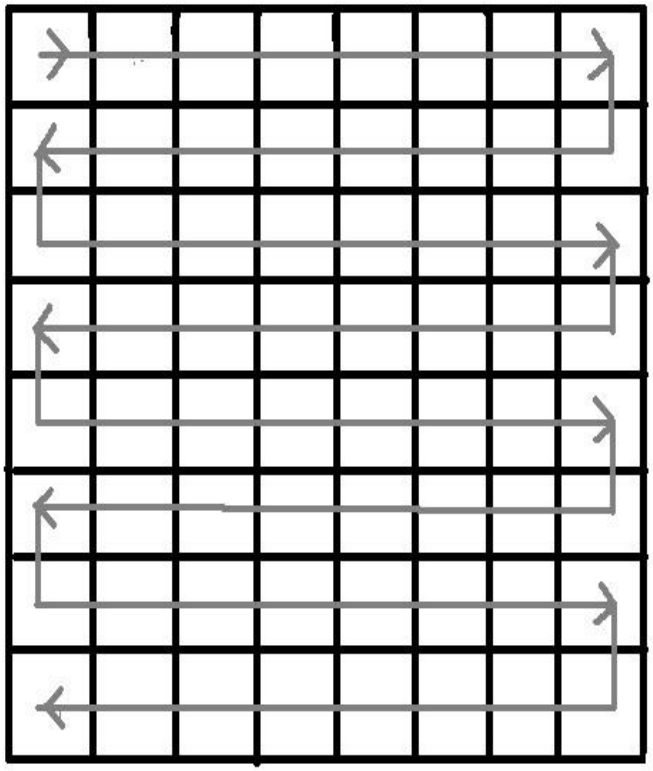


Figure 4. Example 4

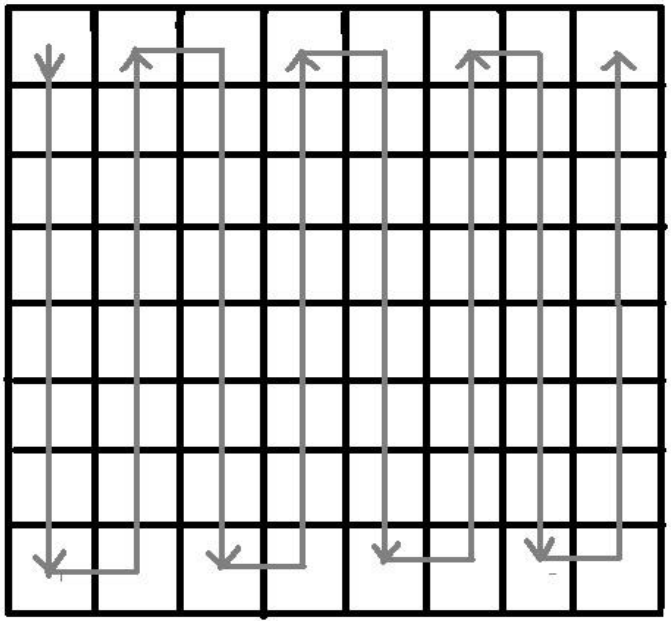


Figure 5. Example 5

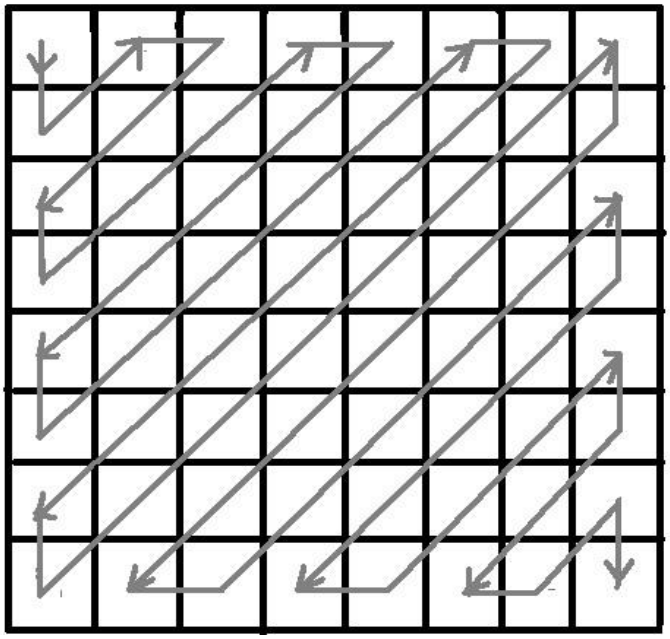


Figure 6. Example 6

3.1.3. Random Patterns: In this procedure we are going to jumble the text by passing through Zigzag manner. Thus 3rd degree protection is added to the final algorithm. Because of such encryption final encryption pattern is different from normal pattern. So the overall attack is minimized with this technique.

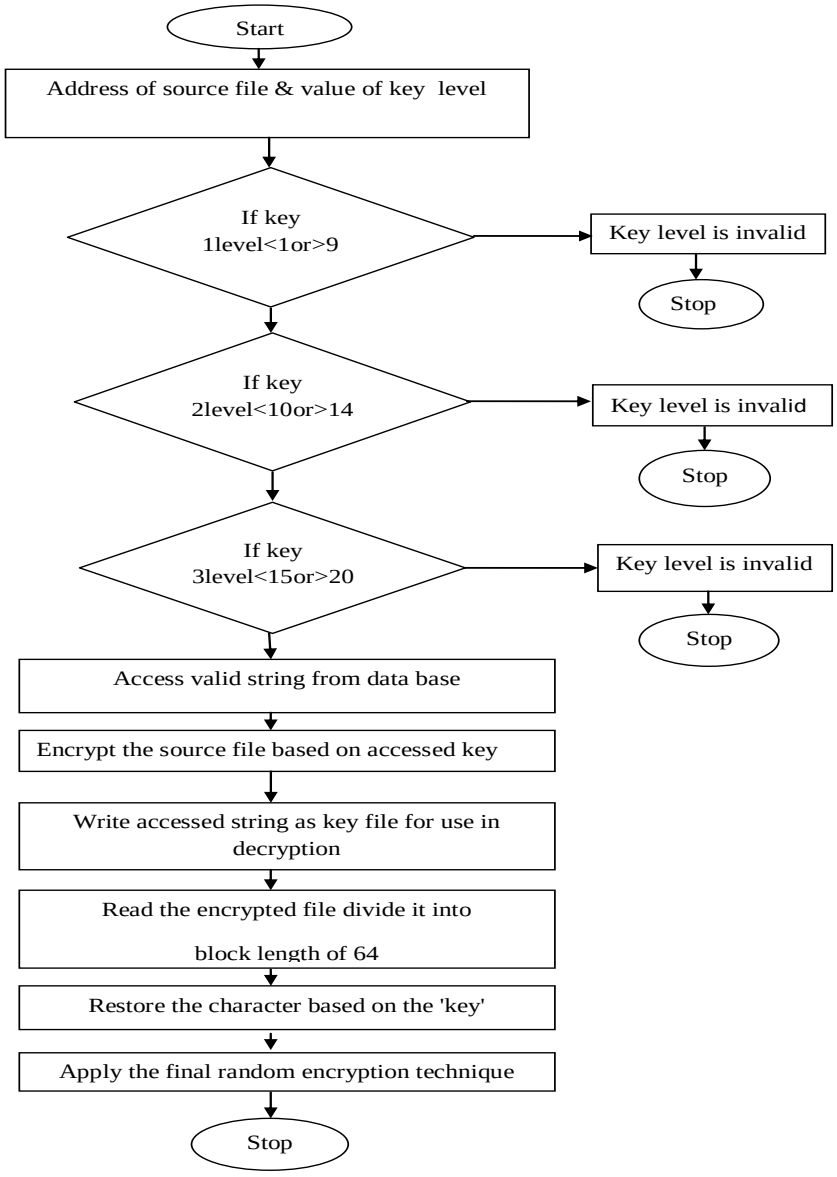
Procedure can be step wised explained as follows:

Step1: Take the 64 bytes array
Step2: Apply the Zigzag coding to this array.
Step3: Combine the entire 64 bytes array to form a single file of encrypted text.
Step4: Generate the private encryption key for future use for decoding.

3.2. Flow Chart

1. Read the source file.
2. Enter the key one value in the range 0 to 9; otherwise go to key level is invalid.
3. Enter the second key value in the range 10 to 14, otherwise go to key level is invalid.
4. Enter the third key value in the range 15 to 20, otherwise go to key level is invalid.
5. With the first key, the string will be converted into cipher text based on key length given in that range.
6. In the second stage the obtained string will be substituted by another character based on the key length given in that range.
7. In third stage according to the key value the string will be rearranged in zigzag pattern.
8. Finally the encrypted file is ready.

FLOW CHART:



3.3. Comparison of Algorithms.

3.3.1. Time requirements

RSA: Encryption and decryption time is more. It took about 1078 ms for encryption and 875 ms for decrypting the same file (say ALPHA).

PSR: Encryption and decryption time is less. It took about125 ms for encryption and 62 ms for decrypting the same file(say ALPHA).

3.3.2. Confidentiality

RSA: Encryption requires public key and decryption requires private key so two key are requires .To decode it user must need private key so authorized person having private key can only decode the text.

PSR: Encryption requires the key level and decryption requires private key .To decode it user must need private key so authorized person having private key can only decode the test.

3.3.3. Integrity and usability:

RSA: Encryption and decryption is accurate if they are run with valid public and private key. After encryption plain text is modified to cipher text which is unreadable this can only be obtained after correct decryption. It is well for long text level encryption.

PSR: Encryption and decryption is accurate if they are run with key level and private key. After encryption plaintext is modified to cipher text which is unreadable this can only be obtained after correct decryption. It is well for long text level encryption as well as short text level encryption.

3.3.4. Key length:

RSA: A Key generated after the encryption is basically depends on the length of the plaintext. By experimentally the generated key is 86400 after encrypting the file ALPHA.
PSR: A Key generated after the encryption is basically depends on the length of the plaintext. By experimentally the generated key is 78195 after encrypting the file ALPHA.

Table 1. Performance Analysis of Modified PSR Method Key1 is Variable and Keys 2&3 are Fixed

K1(position method)	K2 (substitution method)	K3(random method)	Elapsed time in sec
1	10	15	15.653
2	10	15	12.51
3	10	15	9.253
4	10	15	8.624
5	10	15	7.358
6	10	15	7.88
7	10	15	9.77
8	10	15	8.3
9	10	15	8.6

Table 2. Performance Analysis of Modified PSR Method Key2 is Variable and keys1&3 are Fixed

K1(position method)	K2 (substitution method)	K3(random method)	Elapsed time in sec
4	10	15	17.674
4	11	15	11.6
4	12	15	9.9
4	13	15	11.1
4	14	15	18

Table 3. Performance Analysis of Modified PSR Method Key3 is Variable and keys1&2 are Fixed

K1(position method)	K2 (substitution method)	K3(random method)	Elapsed time in sec
4	10	15	16.3
4	10	16	12.8
4	10	17	10.87
4	10	18	10.89
4	10	19	12.98
4	10	20	10.08

ENCRYPTION

Sl.NO	MESSAGE SIZE	RSA (time in sec)	PSR (time in sec)	MPSR (time in sec)
1.	10	15	31	30
2.	100	16	31	30
3.	1000	79	31	25
4.	10000	703	93	90
5.	100000	6656	594	450

DECRYPTION

Sl.NO	MESSAGE SIZE	RSA (time in sec)	PSR (time in sec)	MPSR (time in sec)
1.	10	32	15	14
2.	100	32	15	14
3.	1000	187	15	14
4.	10000	578	78	60
5.	100000	10485	562	470

Complete Comparison Table

Sl.no	Complete comparison table			
	CHARACTERISTICS	RSA	PSR	MPSR
1.	TIME REQUIREMENT	More	Less	Less
2.	CONFIDENTIALITY	More	More	More
3.	INTEGRITY AND USABILITY	More and long text	More and long text as well as for short text	More and long text as well as for short text
4.	KEY LENGTH	More	Less	Less

4. Conclusion

In this paper we introduced new algorithm which is compared with RSA for its standardization for various characteristics and display following result in the conclusion. To provide better protection on multimedia system to them multimedia objects we need technique which is better in means of time, immune to attack, applicable to any kind of documents, easy to handle and understand. Today the copyright protection is most essence in digital world but as with time progress older things like RSA are getting weak because of faster technology. Also with this advancement new things are getting developed which are more powerful than older so we need to move our footsteps towards it to take its full advantage.

Our proposed algorithm is not only faster than RSA but also provides more secrecy and also well suitable for larger message size as shown in result. This one is more immune to attack because of its complexity. For small text of encryption also it is most suitable because of its complexity also for long text of encryption it is best as it took lesser time than RSA.

Acknowledgement

We are very thankful to Anil Hingmire, Head of the Department Dr.K. Jagadeesh Babu and Respected Prinicipal Dr.C.Subba Rao.

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