Implementation of Nihilist Cipher Algorithm in Securing Text Data With Md5 Verification

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Abstract. The development of information technology that is increasingly racing today makes it easy for anyone to exchange data or information. On the other hand, there are problems with data security which can be disrupted by irresponsible parties such as wiretapping, destruction, data theft or other misuse. The application of cryptographic techniques is one solution that can be done to overcome these security problems. Cryptography is the science or art of maintaining data security by scrambling data or messages. In cryptography the term hash one-way function is widely used to test the integrity of a file. In this study, cryptographic algorithms and hash functions used are Nihilist Cipher and MD5. Messages or files text that will be sent are first encrypted using the algorithm Nihilist Cipher. Then the MD5 algorithm is used to get the hash value from the encrypted message. Furthermore, to get the original message back by decryption Nihilist Cipher, the file verification process is first done to ensure that the file received has not changed or is still original. The results show that the algorithms Nihilist Cipher and MD5 can be implemented properly so that data security can be increased because before decrypting the message, the message has to be verified first.

1. Introduction

1.1 Background
In conveying information, security is very important to be implemented in it. In making a data document, most users use an application called Ms. Office, the software has many types of applications that can form a document including Ms. Word, Ms. Excel, Ms. Power Point and so on. Most users use application Ms. Word to form a document data. But there are also many Ms. Word users that does not care about information security in it. Those who are not responsible in the exchange of information can steal and modify the message in it. Therefore, researchers propose security in the word file, the security that can be applied is cryptography and hash functions that have the purpose to test the integrity of a data and prevent third parties from modifying the data.

1.2 Research Contribution
Results of this study can be used to overcome data security problems that can be disrupted by irresponsible parties such as theft and modification of messages. In addition to securing a message, this research can also maintain messages in modifications made by irresponsible parties.
2. Platform Theory

2.1 Cryptography

Cryptography is the science and art of maintaining the confidentiality of messages by encoding them in a form that cannot be understood anymore. In cryptography, there are two processes, namely encryption and decryption. The message to be encrypted is called plaintext. It’s called as plaintext because this information can easily be read and understood by anyone. The algorithm used to encrypt and decrypt a plaintext involves using a key form. Plaintext messages that have been encrypted (or encoded) are known as ciphertext. In cryptography we will often find various terms or terminology.

2.2 Nihilist Cipher

Nihilist cipher was first developed by the Russian Nihilists, namely Russians who supported the way of violence to achieve the desired political change, in this case overthrowing the power of Tsar Alexander II in Russia. They used the algorithm Nihilist to communicate and organize terrorists against Tsarist supporters in the 1880s. In addition, this algorithm is also widely used by the First Chief Directorate, a division of the KGB (Russian intelligence agency) to communicate their potential spies. Also used to communicate with their allies. By applying this method the theft of the message can be overcome. (Mukhlis, 2013: 2).

This algorithm uses Polybius Square (table 1), which is a 5x5 box, referring to the Latin letter by removing the letter J from the alphabet. Each box element is different from each other which is represented by 2 coordinate digits related to the element in question. The placement of each letter can be scrambled, it doesn’t have to be regular.

|   |   |   |   |   |
|---|---|---|---|---|
| 1 | A | F | L | Q |
| 2 | B | G | M | R |
| 3 | C | H | N | S |
| 4 | D | I | O | T |
| 5 | E | K | P | U |

In the case of the word MEDAN, the letter M = 23 E = 51 D = 41 A = 11 N = 33 so as to produce a coordinate (23 51 41 11 33).

2.2.1 Nihilist Cipher Encryption

The following steps will explain how to encrypt the algorithm Nihilist Cipher with the assumption that the Latin letters are used.

1. Referring to the table Polybius Square a plaintext is obtained with the word KASKUS so it can be represented as a coordinate (52 11 34 52 54 34). The coordinates are obtained based on the rows and columns in the table Polybius Square as follows:
   a. The letter K is in row 5 and column 2, the coordinate of the letter K is 52
   b. The letter A is in row 1 and column 1 the coordinate of the letter A is 11
   c. The letter S is in row 3 and column 4 then the coordinates of the letter S is 34
   d. The letter K is in line 5 and column 2 then the coordinates of the letter K are 52
   e. The letter U is in row 5 and column 4 then the coordinates of the letter U are 54
   f. Letter S is in row 3 and column 4 is the coordinate the letter S is 34

2. Then specify the key to be used is CENDOL, the coordinates are obtained (31 51 33 41 43 13). For the key does not have to have the same character length in plaintext, if the length key is shorter than plaintext, the key will be repeated periodically. The coordinates on the key are obtained based on the rows and columns in the table Polybius Square following:
   a. The letter C is in row 3 and column 1 then the coordinates on the letter C are 31
   b. The letter E is in row 5 and column 1 then the coordinates on letter E are 51
   c. Letter N is in row 3 and column 3 then the coordinates on letter N are 33
d. The letter D is on row 4 and column 1 then the coordinates on letter D are 41

e. Letter O is in row 4 and column 3 then the coordinates on letter O are 43

f. Letters L line on line 1 and column 3 then the coordinates of the letter L are 13

3. Do the addition operations on the plaintext and coordinates key \( k \) for the key \( p \) plaintext \( c \) for ciphertext. Then obtained:

\[
\begin{align*}
p &= 52 \\ k &= 31 \\
61 &+ 34 \\ 52 &+ 54 \\ 34 &+ 47
\end{align*}
\]

From the above operation, the ciphertext obtained from the word KASKUS with key CENDOL is a coordinate 83 62 67 93 97 47

### Table 2. Encryption Results Nihilist Cipher

| p   | 52 | 11 | 34 | 52 | 54 | 34 |
|-----|----|----|----|----|----|----|
| k   | 31 | 51 | 33 | 41 | 43 | 13 |
| Ct  | 83 | 62 | 67 | 93 | 97 | 47 |

#### 2.2.2 The Nihilist Cipher Decryption

The following will explain the steps in decrypting with the algorithm Nihilist Cipher as follows:

1. To do a decryption it must know the key and the ciphertext. The key to be used is CENDOL and 83 62 67 93 97 47 as ciphertext.

2. Referring to the table the Polybius Square word CENDOL can be represented by coordinates 31 51 33 41 43 13. The coordinates are obtained based on rows and columns in the table Polybius Square as follows:
   a. Letter C is in row 3 and column 1 then the coordinates on the letter C are 31
   b. The letter E is in row 5 and column 1 then the coordinates on the letter E are 51
   c. The letter N is in row 3 and column 3 then the coordinates on the letter N are 33
   d. Letter D is on the line 4 and column 1 the coordinates in letter D are 41
   e. Letter O is in row 4 and column 3 then the coordinates on letter O are 43
   f. Letter L is in line 1 and column 3 then the coordinates in letter L are 13

### Table 3. Polybius Square

|   | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | A | F | L | Q | V |
| 2 | B | G | M | R | W |
| 3 | C | H | N | S | X |
| 4 | D | I | O | T | Y |
| 5 | E | K | P | U | Z |

3. Then do the subtraction operation between the coordinates on the ciphertext and key. It is known \( c \) is for the ciphertext and \( k \) is for the key and obtained:

\[
\begin{align*}
c &= 83 \\ k &= 31 \\
62 &- 51 \\ 67 &- 33 \\ 67 &- 41 \\ 67 &- 43 \\ 93 &- 47 \\
97 &- 13 \\ 97 &- 47 \\
47 &- 47 \\
\end{align*}
\]

\[
\begin{align*}
p &= 52 \\ 11 &+ 34 \\ 52 &+ 54 \\ 34 &+ 47
\end{align*}
\]
| c | 83 | 62 | 67 | 93 | 97 | 47 |
|---|---|---|---|---|---|---|
| k | 31 | 51 | 33 | 41 | 43 | 13 |
| p | 52 | 11 | 34 | 52 | 54 | 34 |

4. The final step is to find the equivalent characters for each coordinate obtained above with the **Polybius Square** table as in table II.3, obtained the word plaintext KASKUS.

### 2.3 Hash Function

The hash function is a function that accepts input *string* any length and converts it into a *string*, fixed-length output is generally much smaller than the size of the original *string*.

The hash function can accept any input of *string*. If the *string* declares a *message*, then the message of *M* with any size is compressed by the *H hash* function through the equation.

\[ h = H(M) \quad \ldots \ldots \quad (1) \]

The output of the hash function is also called the *hash value* (*hash-value*) or *message digest*. In equation (2.1), *h* is the *hash value* or digest *message* of the *H function* for input *M*. In other words, the hash function compresses any message of any size into a *message digest* whose size is always fixed (and shorter than the original message length). The hash function is usually used to store passwords, as testing the integrity of data, and as *fingerprint* messages.

In this study the author uses the hash function used to test integrity and integrity of a data. In practice, the data to be sent in advance will be encrypted, and the encryption result will be hashing process. by using hashing data, the received data can be tested in advance whether intact or have been modified by parties who are not responsible.

### 3. Testing System

Testing system is carried out to ensure that the system that has been built can run well in accordance with the functions previously determined at the stage of analysis and planning system. The results from the system can be seen in the following figure:

#### 3.1 System Encryption Testing

![Figure 1. Plaintext](image-url)
Figure 2. Ciphertext

3.2 Generate Hash MD5

Figure 3. Hash Value MD5

3.3 Testing System Decryption

Figure 4. Ciphertext

3.4 Message Verification Process in the System

Figure 5. Message Verification Process
3.5 Decryption Results

![Decryption Results](image)

Figure 6. Plaintext

4. Conclusions
The conclusion of this research are as follows:
1. The algorithm Nihilist Cipher can be applied to the system to properly and correctly encrypt and decrypt.
2. MD5 algorithm is able to perform data integrity testing so as to ensure that the message received is genuine and does not experience modification.

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