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# Preface

The International Conference on Applied Sciences Mathematics and Informatics (ICASMI) is an annual conference hosted by University of Lampung that brings together academics, scholars and researchers from around the world to meet and exchange the latest ideas and discuss issues concerning all fields of sciences, mathematics, informatics and their application. It also allows representatives of industry, government employers and postgraduate students to have an opportunity to discuss with experts on some issues they concern.

The theme for ICASMI 2018: "The Contribution of Sciences on Sustainable Valorization of Natural Resources" is to highlight the role of sciences tackling problems and creating synergies with other fields on sustainable valorization of natural resources. The conference will provide researchers and scientists from mathematics and computer science, researchers from various application areas such as physics, chemistry, life sciences, and engineering, as well as in education and social fields, to discuss problems and solutions in the area, to identify new issues, and to shape future directions for research.

We would like to acknowledge all of those who have supported ICASMI 2018. Each individual and institutional help were very important for the success of this conference. Especially we would like to thank the organizing committee for their valuable advices in the organization and helpful peer review of the papers.

We hope that ICASMI 2018 will be a forum for excellent discussions that will put forward new ideas and promote collaborative researches. We are sure that the proceedings will serve as an important research source of references and the knowledge, which will lead to not only scientific and engineering progress but also other new products and processes.

Dr. Junaidi, M.Sc.

### Peer review statement

All papers published in this volume of *Journal of Physics: Conference Series* have been peer reviewed through processes administered by the proceedings Editors. Reviews were conducted by expert referees to the professional and scientific standards expected of a proceedings journal published by IOP Publishing.





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KESATU

 Mengangkat Tim Reviewer 2<sup>nd</sup> International Conference on Applied Science Mathematics and Informatics "The Contribution of Sciences on Sustainable Valorization of Natural Resources" dengan susunan personalia sebagaimana tercantum dalam lampiran keputusan ini.

KEDUA

Tim Reviewer 2<sup>nd</sup> international Conference on Applied Science Mathematics and Informatics "The Contribution of Sciences on Sustainable Valorization of Natural Pesources" bertugas untuk mereview semua paper atau makalah yang masuk ke ICASMI.

KETIGA

 Tim Reviewer 2<sup>nd</sup> International Conference on Applied Science Mathematics and Informatics "The Contribution of Sciences on Sustainable Valorization of Natural Resources" dalam melaksanakan tugasnya bertanggung jawab kepada rektor.
 Keputusan ini mulai berlaku sejak tanggal ditetapkan dan apabila di kemudian hari terdapat kekeliruan, akan diadakan perbatkan

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Important Dates

# **Registration Schedule**

ıly 22 <sup>th</sup> , 2018
ıne 10 <sup>th</sup> - July 26 <sup>th</sup> , 2018
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ugust 2 <sup>nd</sup> , 2018
ugust 9 <sup>th</sup> - 11 <sup>th</sup> , 2018
ugust 31 <sup>st</sup> , 2018

# Conference Schedule

# • August 9, 2018

Time	Activities
07.30 am	Registration
08.30 am	Opening Ceremony
08.40 am	Indonesian National Anthem
08.45 am	Al-Qur'an Recitation
08.55 am	Traditional Dance

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Time	Activities	
C2018	Poster Session	Q ≡
(https://icasmi.fr 11.30 pm /2018/)	nipa.unila.ac.id Lunch Break	
01.00 pm	Parallel Session 4	
	Room A: Chemistry and Applied Chemistry	
	Room B: Biology and Applied Biology	
	Room C: Mathematics and Applied Mathematics	
	Room D: Informatics and Computer Science	
	Room E: Physics and Applied Physics	
03.00 pm	Coffee Break	
03.15 pm	Parallel Session 5	
	Room A: Chemistry and Applied Chemistry	
	Room B: Biology and Applied Biology	
	Room C: Mathematics and Applied Mathematics	
	Room D: Informatics and Computer Science	
	Room E: Physics and Applied Physics	
04.15 pm	Photo session & Closing remark	
>		
Detail Parallel ar	nd Poster Session (http://icasmi.fmipa.unila.ac.id/2018/wp-content/u	ploads/2018/08

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### The Implementation of Digital Text Coding Algorithm Through A Three Dimensional Mapping Derived From Generalized -mKdV Equation Using Mathematica

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### The Implementation of Digital Text Coding Algorithm Through A Three Dimensional Mapping Derived From Generalized -mKdV Equation Using Mathematica

#### Notiragayu<sup>1</sup> and L Zakaria<sup>1</sup>

<sup>1</sup> Mathematics Department, University of Lampung, Bandar Lampung, Indonesia

**Abstract.** Encryption-decryption algorithm using a mapping can be done for encoding a digital text, such as two dimensional mapping -sine Gordon equation. In this article, we will be given an encryption-decryption algorithm to a digital text through a three dimensional mapping that derived from the generalized -mKdV equation. Implementation of Encryption-decryption algorithm in this article using MATHEMATICA.

### 1. Introduction

Cryptography is an attempt to secure digital data files (etc. text and images). Cryptography, based on security keys, can be classified into two types of keys, symmetric keys and asymmetric keys [1].

An efficient and effective encryption-decryption algorithm is a necessity in cryptography for data security. A simple encryption-description algorithm is implemented into a computer programming and produces a high degree of difficulty in finding the security key for opening the data is an absolute thing in Cryptography. Encryption-decryption algorithm which involves mathematics in it can be found in ElGamal's article (1985) and the articles in the reference [2].

Among Cryptographic encryption-decryption algorithms that use mathematical concepts, there is a Cryptographic encoding algorithm that involves mapping. For encoding in an image for example, Rinaldi (2012) has introduced the use of Arnold Cat Map (ACM) linear mapping [3]. Meanwhile, Arinten and Hidayat (2017) use Logistic Map (LM). Likewise with Ronsen, Arwin, and Indra (2014), they used ACM and Nonlinear Choatic Algorithm (NCA) in coding for an image [4,5]. Thus a mapping can be used as a means of building cryptographic encoding for a digital data (image).

With regard to digital text data, popular cryptographic algorithms used are public key algorithms, commonly referred to as asymmetric keys, for example the ElGamal public key [6]. While the use of a mapping for cryptographic algorithms text data is relatively little published.

In this article, we will discuss an application of map in cryptographic algorithms for text data. The mapping is a part of the nonlinear mapping derived from a generalized traveling wave solution - mKdV [7].

This article is divided into four sections. In the first section an illustration of a descriptive algorithm is provided for cryptographic coding of text data using a 2-dimensional periodic nonlinear method. The second part, in the form of case studies, discusses cryptographic algorithms of text data using 2-dimensional mapping derived from the equation of a generalized traveling wave solution - sine Gordon. In the third part, the implementation of the cryptographic algorithm of text data into the Mathematic programming language. In the fourth section, the conclusions are briefly described in the results obtained in the previous section.

(1)

**2. Encryption-Decryption Algorithm For Digital Text Submission Using Mapping: An Ilustration** Consider the following nonlinear mapping:

where

 $\mathbf{g} : \mathbb{R}^2 \qquad \mathbb{R}^2$  $(x, y) \mapsto \frac{1}{x y}, x .$ 

It can be examined that equation (1) is a 3-periodic nonlinear mapping with the parameter values and set as any but not zero.

Example:

Consider the following text data.

FromWolfram: Mathematica's ex extensive base of state-of-the-art algorithms, efficient handling of very long integers, and powerful built-in language make it uniquely suited to both research and implementation of cryptographic number theory.

We are coding the text data using mapping (1) whose symmetrical key is selected from and . Descriptively, the encryption-decryption algorithm for example text like this can be done in the following way.

2.1. Encryption stage

- 1. Grouping Text into two parts, for example parts x(n) and y(n) with  $n \, N$  are the values of numeric data associated with text data. And assume the length of the text data l is the same that is  $l(x) \, l(y) \, m \, \mathbb{N}$ .
- 2. Convert text data to numeric data. The ASCII code can be used or uses a self-made encoding.
- 3. Do the mapping iteration process as much as r times with the provisions of  $g^0 = g^r$ ;  $r = \mathbb{N}$ .
- 4. Select the parameter value , 0 and make it as the key value.

2.2. Decryption Stages

1. Reuse the parameter value , 0 which is the key value at encryption.

2. Perform the mapping iteration process provided until it reaches the r iteration, that is  $g^r$ ;  $r \in \mathbb{N}$ .

3. Convert numeric data into text data.

4. Finish.

The implementation of the descriptive algorithm above using Mathematica is given in the next section.

#### 3. Digital Text Description-Encryption Algorithm Using A Mapping Derived From Generalized -mKdV Equation

*3.1. The 2-Dimensional Periodic Mapping Formulation Derived from Generalized -mKdV Equation* 

In this section, we will follow a technique for a generalized sine-Gordon equation (see [8]). Look at the family of four mapping parameters derived from the generalized -mKdV equation follows:

$${}_{1}V_{l,m}V_{l,m-1} = {}_{2}V_{l-1,m}V_{l-1,m-1} = {}_{3}V_{l,m}V_{l-1,m} = {}_{4}V_{l,m-1}V_{l-1,m-1} = 0,$$
<sup>(2)</sup>

with 1 1 2p, 2 4 2p, 3 2 1q and 4 2 4q. Using the following transformation

$$V_{l,m} \quad V_n$$
 where  $n \quad z_1 l \quad z_2 m$ ,

where the parameter values of  $z_1$  and  $z_2$  are relatively prime integers, we can reduce the form of the current wave solution (2), namely

$${}_{1}V_{n}V_{n \ z_{2}} \qquad {}_{2}V_{n \ z_{1}}V_{n \ z_{1}} \qquad {}_{2}V_{n \ z_{1}}V_{n \ z_{1}} \qquad {}_{3}V_{n}V_{n \ z_{1}} \qquad {}_{4}V_{n \ z_{2}}V_{n \ z_{1} \ z_{2}} \qquad 0$$
(3)

Equation (3) is a form of traveling wave solution from -mKdV. It can be examined that the equation (3) is invariant for a transformation  $z_1^{\mathsf{TM}} \quad z_1, p^{\mathsf{TM}} \quad p$ , and  $z_1 \,\check{\mathbf{S}} \quad z_2$ . Besides that it also fulfills the periodic nature, namely  $i \quad z_2, j \quad z_1$ . Equation (3) is equivalent to mapping

$$V_{z_{1} \ z_{2} \ 1}^{'} = \frac{V_{0} \ 3}{4} V_{z_{1}} \ 1}{4} V_{z_{2}} \ 2} V_{z_{1}}^{'}$$

$$V_{z_{1} \ z_{2} \ 2}^{'} = V_{z_{1} \ z_{2} \ 1}$$

$$\vdots$$

$$V_{1}^{'} \ V_{2}$$

$$V_{0}^{'} \ V_{1} \ \%$$

$$(4)$$

Select  $z_1 = 1$  and  $z_2 = 2$ . The third order difference equation of equation (4) can be stated as follows:

$$_{1}V_{n}V_{n}_{2}$$
  $_{2}V_{n}_{1}V_{n}_{3}$   $_{3}V_{n}V_{n}_{1}$   $_{4}V_{n}_{2}V_{n}_{3}$  0

which is equivalent to the following three-dimensional mapping:

$$V_{n 2} = \frac{V_{n 3}V_{n 2} V_{n 1}}{4V_{n 1} 2V_{n 2}}$$

$$V_{n 1} V_{n 2}$$

$$V_{n V_{n 1}}$$
(5)

The equation in (5) is usually given a three-dimensional mapping derived from the generalized -mKdV equation.

Look at equation (5). Suppose that  $_n$  is a line in  $\mathbb{R}^2$  that is defined as

$$\frac{V_{n-2}}{V_{n-1}}$$
<sup>n</sup>

$$\frac{V_{n-1}}{V_n}$$

Suppose that is a parameter vector in  $\mathbb{R}^4$ : (1, 2, 3, 4). Therefore, three-dimensional statements can be reduced to a two-dimensional mapping, namely:

$$n_{n-1} \mathbf{g}(n)$$

where

$$\mathbf{g} : \mathbb{R}^2 \qquad \mathbb{R}^2 \qquad (x, y) \mapsto \frac{1}{xy} \frac{3^{x-1}}{2^{x-4}}, x \qquad (6)$$

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where  $y = \frac{V_{n-1}}{V_n}$  and  $x = \frac{V_{n-2}}{V_{n-1}}$ . It can be checked that the mapping in equation (6) has an integral

(there is a function  $S:\mathbb{R}^2$   $\mathbb{R}$  so that  $S(n_1)$   $S(n_2)$  for all  $n \mathbb{N}$ ) [8]. If  $\frac{-1}{4}$ ,  $\frac{-2}{4}$ , and

 $\frac{3}{3}$ , then the map in equation (6) can be written as

$$\mathbf{g}_{,,} : \mathbb{R}^2 \qquad \mathbb{R}^2 \qquad (x, y) \mapsto \frac{1}{xy} \frac{1}{x \cdot 1}, x \quad (7)$$

3.2. Implementation of Digital Text Data Encryption Algorithms Based on 2-Dimensional Mapping Using Mathematica

To implement a cryptographic algorithm into a computer program, a number of software can be used, such as *Matlab* and *Mathematica*. In this article, we will use *Mathematica* that its rules and technical writing of this program in full in a reference written by Shifrin (2008) [9].

Look at the descriptive algorithms presented in section two. Against the text and 4-periodic mapping given in that section, the implementation of algorithms using Mathematica is as follows.

str1 = "From Wolfram: Mathematica's extensive base of state-of-the-artal gorithms,"

efficienthandlingofverylongintegers, ";

*str2*="andpowerfulbuilt-inlanguagemakeituniquelysuitedtobothresearchand implementationofcryptographicnumbertheory.";

 $\begin{aligned} StringLength[str1] \\ StringLength[str2] \\ A = ToCharacterCode[str1]; \\ B = ToCharacterCode[str2]; \\ AccountingForm[Grid[Partition[A,10]]]; \\ AccountingForm[Grid[Partition[B,10]]] \\ x = A; y = B; r = 3; = 0.0001523; \\ \end{aligned}$ 

### THIS SECTION IS A SUBRUTIN PROGRAM NAMED coding1 FOR ITERATION PROCESSES g (A, B) TO THE r- ITERATION.

xx=SetPrecision[coding1[[r-1,2]],10]; yy=SetPrecision[coding1[[r-1,1]],10]; AccountingForm[Grid[Partition[xx,5]]]; AccountingForm[Grid[Partition[yy,5]]];

# THIS PART IS A SUBRUTIN PROGRAM NAMED recoding 1 FOR ITERATION PROCESSES $g^{-1}$ (AA, BB) TO R-ITERATION.

*Flatten*[*FromCharacterCode*[*Round*[*recoding1*[[*r* –1]]]]]

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114	27	109	58	32	77	97	118	104	111	102	117	100	.32	90	117	105	100
101	109	97	118	105	99	97	39	115	116	15	105	110	.32	106	97	110	103
32	101	120	116	101	110	115	195	113	117	97	100	101	3.2	109	97	107	101
101	32	39	97	115	101	32	111	102	32	105	116	32	117	110	105	113	117
32	115	118	97	118	101	32	45	32	101	105	121	32	115	117	105	118	101
111	102	.32	45	.32	116	101	101	32	100	32	116	111	32	98	111	118	104
4.5	32	97	114	116	32	97	100	103	32	114	101	115	101	97	114	99	104
111	114	105	11.6	104	109	115	44	32	32	97	110	100	32	105	109	112	103
101	102	102	105	99	105	101	110	116	101	109	101	110	116	97	116	105	111
32	104	97	110	100	103	105	110	103	110	32	111	102	.32	99	114	121	112
32	111	102	32	113	101	114	121	32	116	111	10.3	114	97	112	104	1.0.5	99
103	111	110	103	32	105	110	118	101	3.2	110	117	109	90	101	114	32	116

**Figure 1.** Conversion results of text data A (left) and B (right) to numerical data before the mapping iteration process is carried out  $(g^0)$ .

Figure 1 shows the result of the conversion of program outputs text data into numerical data using ASCII code (based on  $g^0$ ). Another output of the program, for parameter values 0.0001523 and 8.1037277, we have the following numerical data.

Quigt 2Fg/AssessmillingPoint+				
(0.00000000000000000000000000000000000	[0.0000001118931168] (0.0000001001542005)	(0.0000001030617011) (0.00000009601610625)	(0.0000001132110092) 0.0000001197025665)	(0.00001208078128) (0.0000009495225901)
1.1.1.00.1.00124725.08.0H)	(0.0000000-625154501)	0.0000000000000000000000000000000000000	(F. B. RUCHT-TIERVEILTE)	(0.00.000016.06.000025.)
(0.0000001087230459)	(0.00000010121262891	10.3000001098646734	0.0000000052240495)	0.00000023136002041
(3 0003301211505665)	(0 00000005670046895)	(0.000003652619640)	0 0000001154185982)	(0.0000001811510256)
(J.000JJ0287556876)	(0.0030001341789786)	(0.0000000206990371)	0.0000000283860285	(0.0000000008031E??0)
(0.0000000032260426)	(0.0000002518049207)	(0.000001039190992)	0.0000001105220390)	(0.0000001098353260)
(3) 1-00 1 0110 (\$ (40 (0) 20))	(0.00.00.08.0).0644077	(0. 001000382(2)(191.40))	0 10 00 00 00 00 catist (c7)	(11) 010 3000 309 (53) 5 (596-4.)
(C.000CC000171011780)	(0.0030001110711373)	10.3000036726190181	(0.000000000000185711)	0.0000001000020100
(3.0003005013069937)	(0.000000000000000000000000000000000000	(0.0000000791070541)	0.0000005975515466)	(0.000000000000000000000000000000000000
[3] THE TREAM PRODUCT STREAM PROPERTY (1)	(IT BRITER DOMESSION FOR THE D	[0. 000 000 000 000 000 000 000 000 000	0 10100-002343-0004-0077)	[0.00.000001000010005]
(0.0000003760437355)	(0.0000002224252446)	(0.3000002470470470)	(0.000001205078125)	(0.0000001055502167)
(1.1.00.1.02003-00033-04)	[11:00:00:01:05260990]	[0. 80.000870***826*2)	0 10:00 00 55-4444449)	10.00.000.02.020*54851
(0.0000001280869256)	(0.00000000112002000)	(0.000001083250108)	0.0000000075818163)	(0.0000001118031168)
[0.0000001104199923]	(0.0030001151979309)	10.3000024740390991	0.0000001115924165)	(0.0000001060990260)
( ) 1-00 F 91906 (29-04 81)	(n. on an oa ar soar 60. )	0.00.0000000000000000000000000000000000	[0.00.00.00.003844435560.	(0.0090026.P06894G)
(0.0000003570401653)	(0.0000001209685225)	10.3000001109911855)	0.0000001197825665)	(0.0000001088398368)
(3) 1.00 (1000 (9680 + 01))	(0.000001211506495)	0 00000000032141498)	0.0000000000000000000000000000000000000	(0.000000000087204538)
(0.00000000000000000000000000000000000	(0.0000000707002202)	10.0000011400048481	0.00000010008217171	(0.00000038562800001
(3.00033031833233332)	(0.000000100010510)	[3.00000000273224692]	0.00000030606065653	(0.000000002474680348)
(0.0000001001941052)	(0.0000001174566914)	10.3000002283675429)	0.0000000075105552)	(0.0000001090876945)
(1 C001101041028212)	(0 00000000012711581)	10 3000030552320203	0 0000008570601052)	(0.0000001030647011)
[C.0JOCC00J668159688]	(0.0000001000106011)	(0.000000000000000000)	0.0000001163601071)	(0.30000039610510367)
(0.0000003334253446)	[0.0000001055240498]	(0.3000001151979089)	0.0000002209465325)	(0.00000009751557120)
Out11303/AccountingTorm-				
[C.030CC00C750017C57]	10.300003039770657631	[0.0000001247390433]	(0.00000001997022059	(0.0000001407066606)
(in a manufacture example)	(u	for consumption second	fu nu nu nu nu ser recei	In mononanananan)
(0.0000001529070344)	(0.000000000000000000000000000000000000	[3.00030002420964240]	0.0000001487046408}	(0.000000000000000000000000000000000000
(c) 0.0007-0018417-88450)	10 000000055935000000	1.1.1.00.000-28.9520.651	TH 00.00.00156445840.21	(0 000000000444544622)
(C.000CC001928036711)	(0.000000000000000000000000000000000000	[0.00000001802011008]	[0.00300001424201272]	(0.30000031618103685)
(C.000CC00254954750G)	(0.000000000005560594)	[0.0000004007190171]	[0.00000001554203462	10.000000000000000000000000000000000000
(i. a mailen ar a a star web	(n. no on nover servers)	( a roundation structures)	fu an an an an areas and	(0 00 000 00 AB MED 4E)
(0.03000001277624344)	(0.30000304711497525)	(0.00000004522011205)	(0.0000C0012295109C8)	10.3000034905786052)
(0.00000001181789074)	(0 00000001870615462)	[0 00000004532011305]	(0 00100001214021542)	(0 0000000225901280)
(0.00000001/1140/628)	(0.000000002226061600)	(010000001084600107)	[0100000000000848PDF5]	(0.30000031141396262)
(0.0000001268614708)	(0.0000004522011905)	[3.00030002917157368]	(0.00000004731497525)	(0.000000000000000000000000000000000000
[c 0.00.0046528.82.8]	(0.0000004108265153)	for communication worked?	in mananten meterid	(n. m. num ars a sur en i)
(0.0000001219055704)	10.30000303299725455}	(3.00030004575588245)	0.0000001057469444)	(0.30000034174221491)
(n 00000000554800468)	(n hornonni erassens)	(a conjugate see state second	10 00300004905786002	(0. 3000003577365763)
(C.00000001414201172)	(0.30000301421641196)	(3.00030004287038286)	(0.0000000100.0065360)	(0.30000031018300463)
(C.030CC001211720690)	(0.3000004575588942)	(0.0000001320498908)	(0.00000001214802251)	(0.30000032090308117)
(i. a meranaarea sayare)	(n. nu un nuteexcontent)	for communications and short	fu un nu unsecuzzones?	(n. norman restances every
(0.0000001028050108)	(0.3000003195036711)	(0.0000001200720188)	(0.00000001018100160)	(0.0000001182501282)
(C.000CC004256011564)	(0.0000004575500942)	(3.0000001414500575)	10.0000001257100056	(0.0000004750525500)
for a more consistence of the second	fu anana ana sasa sa	for community and worked	fu un nu nu cie unu biva-	(a su ana su appertes)
(0.0000001255902920)	(0.0000001440415572)	(3.00000004174331493)	(0.00300001250282666)	(0.0000001146141150)
(i) 0.000 (000.20 487/a 48)	(n. no.no.nu.z.e.cen.ene)	1.0 0.00.000 40.000 45481	10.00.00.0044191355512	(0 0000001544(80411)
(C.030CC001163152698)	(0.000000000000000000000000000000000000	[3.00000001858727342]	(0.00000001008881960)	(0.00000002211028970)
(C.000CC0011C2252166)	(0.0000000000722185)	[0.00000001121842156]	(0.00000001102781ec1)	(0.0000001200070160)

Figure 2.The results of the conversion of text data to numeric data with the choice of parametervalues0.0001523 and8.1037277, after the iteration of the mapping (7) process is carriedout on  $g^2$  $g^2$ 

3.3. Encryption-Description Algorithm For Setting Digital Text Using Mapping Generalized mKdV Equation

Review the implementation of the algorithm using Mathematica which was given in the previous section. By using the transparent properties found in mapping (6), the periodic mapping iteration process can be replaced by an iteration invers mapping process, namely:

### THIS SECTION IS A SUBRUTIN OF NAMED recoding1 PROGRAMS FOR ITERATION PROCESSES $g^{-1}$ (AA, BB) TO r-ITERATION.

#### Flatten[FromCharacterCode[Round[recoding1[[r -1]]]]].

0.0001524303045	0,0001571059130	0.0001507254614	0.0001494793100
0.0001466320929	0.0004011065548	0.0001010929008	0.0001399669970
0.0001430913061	0.0001507054814	0.0001374675871	0.0001507054614
0.0004011365540	0.0001350550750	0.0001507254614	0.0001330014761
0.0004011365540	0.0001330014761	0.0001272427252	0.0001315929039
0.0001315020039	0.0001350558750	0.0004011365540	0.0001430913061
0.0001480420169	0.0001687254614	0.0001539636976	0.0001466320929
0.0001587754614	8.0001 327273256	0.00049113685648	11.0002368672278
0.0007825589792	0.0007587254614	0.0001/1804010169	0.0000499174944
0.0001524393045	0.0001480430169	0.0001587254614	0.0001350558753
0.0001330014761	0.0001099669978	0.0001272427252	0.0001587254614
0.0003438939063	0.0003466320929	0.0001322222256	h.0001587254614
0.000577058148	0.0001587254614	0.0001399669978	0.0001272427252
0.0001233913065	0.000/8/1365548	0.0001571058108	0.000152/0930/6
$0.000 \pm 1008$ 38	0.000.3 3939039	0.0001587054614	0.006(327273(55
0.0001007254614	0.0001410510907	0.0001557254014	0.0001425509791
0.0001430913061	0.0001524393045	0.0001571050130	0.0001507254614
0.0001430913061	0.0001507254614	0.0001399669970	0.0003347036903
	0.0001234393045 0.0001430313061 0.0004011365540 0.0004011365540 0.0001315625039 0.0001480420169 0.00014842544 0.0001524393045 0.0001524393045 0.0001524393045 0.0001524393045 0.0001438513061 0.0001438513061 0.0001438513061	0.0001234393045 0.0001571059130 0.0001420320329 0.0034011365545 0.0001430913061 0.0001507754614 0.0004011365540 0.0001350550750 0.000111365540 0.0001350550750 0.000135020039 0.0001350555750 0.0001486420160 0.0001350555750 0.0001486420160 0.0001687254614 0.0001524393045 0.0001480430109 0.0001324393045 0.0001480430109 0.0001324393045 0.0001480430109 0.0001324393045 0.0001480430109 0.0001324393045 0.0001480420129 0.000148853061 0.000158754614 0.000148853061 0.000158754614	0.0001824393045 0.0001571059130 0.0001857254614 0.0001426320329 0.0024011365546 0.0001315929038 0.0001430913061 0.0001507554614 0.0001374675371 0.0004011365540 0.0001350556750 0.0001507254614 0.0001315625039 0.0001350556750 0.0004511365540 0.0001466220169 0.0001350556750 0.0004511365540 0.0001466220169 0.0001350556750 0.0004511365540 0.0001466420169 0.000135254614 0.00014364565976 0.00014254393045 0.0001487454614 0.000148706420169 0.0001324393045 0.0001480430109 0.0001572427252 0.00014254393045 0.0001480430109 0.0001572427252 0.00014254393045 0.0001480420169 0.0001572427252 0.00014254393045 0.0001480420169 0.0001572427252 0.00014254393045 0.0001480420169 0.0001572427252 0.00014254393045 0.0001480420169 0.0001572427252 0.00014254393045 0.0001587254614 0.0001572427252 0.0001435913061 0.0001587254614 0.00015946978 0.0001438913061 0.00014135199039 0.0001537254614 0.000167254614 0.0001413519907 0.0001537254614 0.0001436913061 0.0001413519907 0.0001537254614

**Figure 3.** The results of the conversion of text data to numeric data with the value of the choice parameter 0.05234, = 0.7125, and = 6.7111, after the iteration of the mapping (7) process is carried out on  $g^9$ .

With algorithms and implementation of similar algorithms, for mapping (7) with a choice of key values in the form of the choice parameter value = 0.05234, = 0.7125, = 6.7111 as given in figure 3.

#### 4. Conclusion

From the results obtained and discussed in the previous section, it can be concluded that the 3dimensional mapping reduced to 2-dimensional mapping derived from the \_\_\_\_\_\_-mKdV equation can be used to design a text cryptography relatively easily. As the purpose of cryptography is data security, then the choice of a reversible mapping option can be used as an alternative choice of digital text encoding with a symmetric key selected non-zero parameter values. The results of this study, because the statement involved is a mapping that is reversing symmetry, then for the mapping and procedure of cryptographic algorithms used for an image, the request requires a measure preserving nature, and this will be an interesting advanced topic to study.

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