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Application of artificial intelligence to employ mathematical relations between numbers and their ranks in information security

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ABSTRACT

The personal secret numbers of computers, portable devices, electronic protection systems and other security methods and digital encryption. In this paper, the mathematical relations between numbers and mattresses were discussed and highlighted. Artificial intelligence has been used to employ the properties that connect the numbers at intervals to be used in digital protection systems. These relationships were implemented in the field of information security through the use of MATLAB, and good results were obtained and the method was very effective.

KEYWORDS: artificial intelligence to employ mathematical relations between numbers and their ranks in information security Exactly 5 terms (no more and no less) and separated by comma.

NOMENCLATURES :

Cp	Specific heat, J/kg.K
h	Enthalpy, J/kg
P	Pressure, Pa
T	Temperature, K
U	Overall heat transfer coefficient, $W/m^2.K$

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Introduction

After the apparent increase in computers and communication systems, especially in 1960, it became necessary to provide means to protect the information represented by digits (digital) and that other security services must be available. Data Encryption Standard DES is a well-known cryptographic method in the history of cryptographic study and has been considered an effective means of securing economic information in the field of financial resources [5,6,7,13].

In 1970, a significant development took place when Diffe & Hellman published a new paper. Penetration is an important issue [8,10].

Methodology of work

The process of sending and receiving encrypted messages is one of the most important topics at the present time. Mathematics is considered the basis of information security science.

The use of artificial intelligence techniques in all applications is a qualitative leap in modern science, because of the availability of time, effort and accuracy [11, 12], and this work includes the application of three basic concepts: the theory of numbers, artificial intelligence and information security.

This work includes a number of basic concepts and hybrid methods, in order to reach the main objective of it. Where the basics were adopted in the preparation of research, including

Any integer P can be represented as follows:

$$P = a_0 * 1^0 + a_1 * 10^1 + a_2 * 10^2 + a_3 * 10^3 + \cdots + a_n * 10^n$$

$$\text{where } P, a_i \in Z^+ \cup \{0\} \cup Z^-, \forall i, P, a_i$$

Any integer in iterative form ($n \in Z, n * \sum_{i=0}^{5} 10^i$)) is divisible by 7 [2,3,4,9]

$$\text{Also, } X = \begin{bmatrix} x_{11} & x_{12} & x_{13} & \cdots\cdots & x_{1(n-1)} & x_{1n} \\ x_{21} & x_{22} & x_{23} & \cdots\cdots & x_{2(n-1)} & x_{2n} \end{bmatrix}_{2*n} * \begin{bmatrix} 10^0 \\ 10^1 \\ 10^2 \\ 10^3 \\ . \\ 10^{n-2} \\ 10^{n-1} \end{bmatrix}_{n*1}$$

New lemma: If n is any positive and integer number, then:

$$mod(n,7) = 0 \; iff \; n = n * (10^0 + 10^1 + 10^2 + 10^3 + 10^4 + 10^5), \forall n \in Z, were \; Z = Z^+ \cup \{0\} \cup Z^-$$

The Natural Representation

Bacteriology is one of the most important branches of microbiology. Bacteria are a type of microorganism, which is characterized by being a single-celled organism. Bacteria are among the first living organisms on Earth to be found in different environments and places in addition to living in the bodies of organisms, and according to the results of many studies interested in microorganisms, each one gram of soil contains This is equivalent to about (40) million bacterial cells in addition to the living of about (one million) bacterial cells per milliliter of fresh water, and bacteria have a high mobility as it is through its many motor tools in addition to doing many Other life functions of its own, especially reproduction and growth[12].

The process of bacterial reproduction occurs in two steps:

The first step involves the transfer of the genetic material from one bacterial cell to another, and is done in one of three ways Figure (1):

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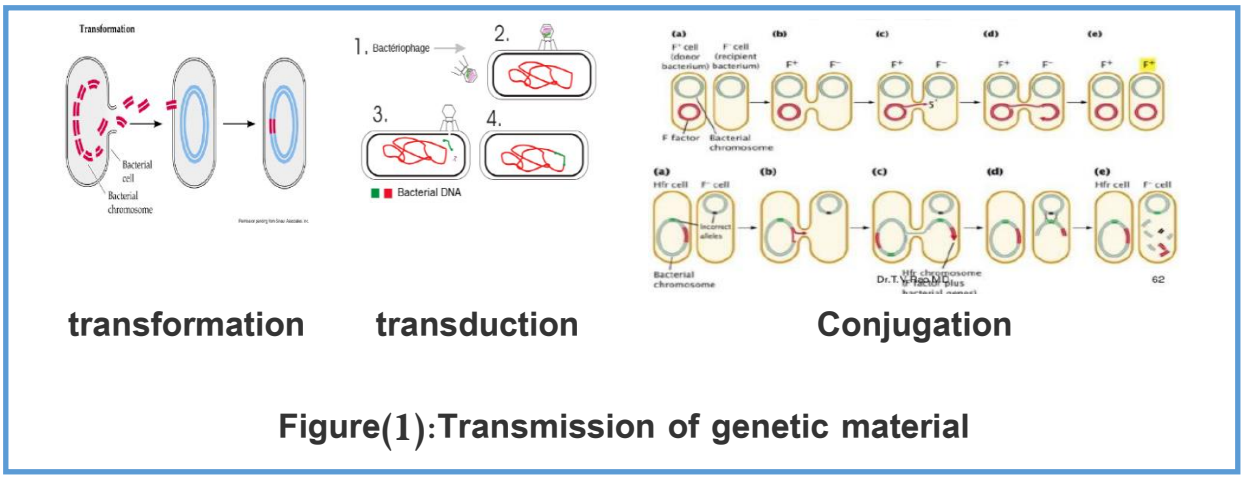
(1The phenomenon of transformation (transformation) The transfer of DNA possesses genetic characteristics to another cell, causing genetic changes in the new cell. Genetics and genetic engineering technique.

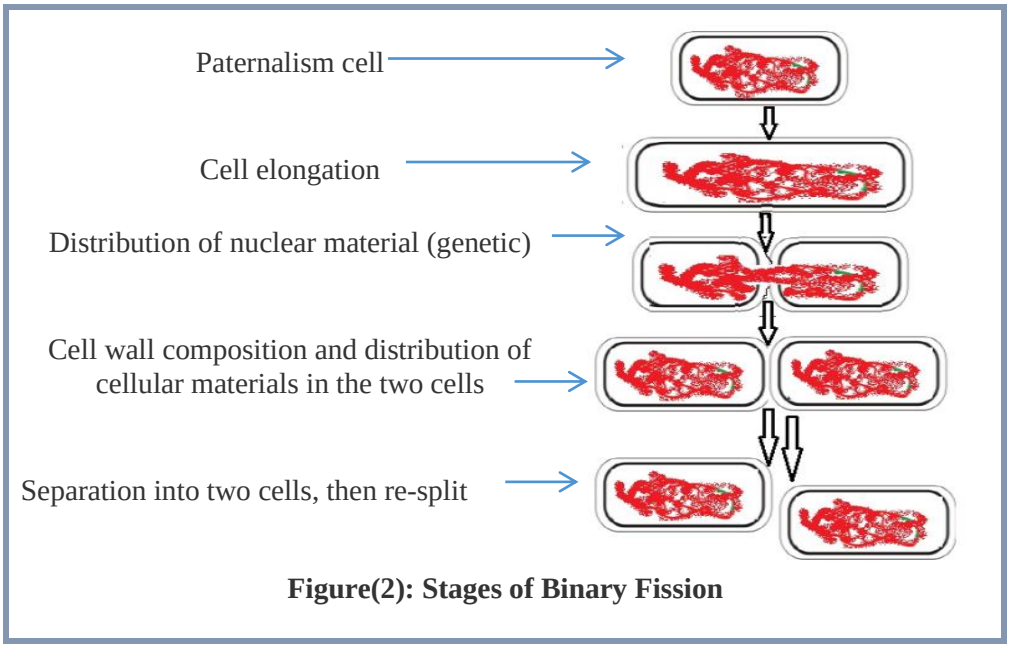
(2The phenomenon of conduction (transduction) is similar to its predecessor, but it occurs with the presence of a catalyst, it could be a virus that infects the bacterial cell.

(3conjugation phenomenon, in which two cells stick together and the genetic material is transmitted.



Figure(1):Transmission of genetic material

The second step involves the growth process, in which the bacterial cell is divided into two cells by simple binary fission (Binary Fission) after a regular increase in the quantity of all its components, to create bacterial nuclei cells similar to the parental cell from which they originated. There are some bacteria such as nocardia, whose growth is dense filamentous, later subdivided, under the surrounding conditions Figure(2).



Figure(2): Stages of Binary Fission

that is the time spent in the process of fission, which is known as the time of doubling or generation time (Doubling Generation). note that the measure of the growth process is calculated by the number of cells formed, where the growth equation of the bacterial colony can be calculated by equation, and in general that the stages of growth is four Stages (see Figure()), namely:

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Lag Phase
Logarithmic Phase or Exponential Phase
Stationary Phase
Death or Decline Phase

Simulation of The Natural Representation

This paragraph It's involves simulating the reproduction and growth of Nocardia bacteria, which are growth is dense in series (sequence of numbers), which is subsequently fragmented, under ambient conditions (by text length), by some of the following hypotheses:

Input text: $T\ and\ X_,$: where:

$$T = T_1T_2T_3T_4T_5 \dots T_m \;\; S.t.T(i) = T_i;\ \forall i;\ \ i = 1,2,\dots\dots,m;\ \ i \in Z$$

Where m denoted to the length of the T.

Where $X_1\ \ ,X_2$ are Numbers of the sender and the recipient, respectively.

$$X_1\ \ ,X_2\ are\ two\ positve\ and\ integer\ numbers$$

$$X_1 = \left(x_{11} * d^0 + x_{12} * d^1 + \cdots + x_{1(n-1)} * d^{n-2} + x_{1n} * d^{n-1}\right)$$

$$X_1 = (x_{11}x_{12}, x_{13}, \dots, x_{1n})$$

$$X_2 = \left(x_{21} * d^0 + x_{22} * d^1 + \cdots + x_{2(n-1)} * d^{n-2} + x_{2n} * d^{n-1}\right)$$

$$X_2 = (x_{21}x_{22}, x_{23}, \dots, x_{2n})$$

Where $x_{ij} \in [0,9], \forall i,j;\ i,j \in Z^+$

$$S.t.\ X_1 = \begin{bmatrix} x_{11} & x_{12} & x_{13} & \dots & x_{1(n-1)} & x_{1n} \end{bmatrix} * \begin{bmatrix} d^0 \\ d^1 \\ d^2 \\ d^3 \\ . \\ d^{n-2} \\ d^{n-1} \end{bmatrix}_{n*1}$$

$$X_2 = \begin{bmatrix} x_{21} & x_{22} & x_{23} & \dots & x_{2(n-1)} & x_{2n} \end{bmatrix} * \begin{bmatrix} d^0 \\ d^1 \\ d^2 \\ d^3 \\ . \\ d^{n-2} \\ d^{n-1} \end{bmatrix}_{n*1}$$

The simulation involves the following two steps when assuming that X_1 is the virus, X_2 is the bacterial cell

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Step 1: which is includes the transmission of the genetic material from virus X_1, to X_2 during transduction to form a new bacterium (number) with additional traits.

$$BACT = X_1 + d^n * X_2$$
$$BACT = X_2 X_1$$
$$BACT = X_2 X_1$$
$$BACT = \begin{bmatrix} x_{11} & x_{12} & x_{13} & \dots & x_{1(n-1)} & x_{1n} & x_{21} & x_{22} & x_{23} & \dots & x_{2(n-1)} & x_{2n} \end{bmatrix} * \begin{bmatrix} d^0 \\ d^1 \\ d^2 \\ d^3 \\ . \\ d^{n-2} \\ d^{n-1} \\ d^n \\ d^{n+1} \\ d^{n+2} \\ d^{n+3} \\ . \\ d^{2n-2} \\ d^{2n-1} \end{bmatrix}_{2n*1}$$

Step 2: Includes the growth process, and includes the fission of the number BACT resulting from the first step in successive mathematical operations and depending on the length of the text m, to form a dense strip of numbers, which is subsequently fragmented to scatter the original text.
the scale which used to measure the growth and increase the bacterial preparation bar is to calculate the number of cells formed by repeating the fission process according to a Special requirement, which is the length of the text is not less than the length of BACT, as the following steps:

Calculate L, Where it's denoted to the length of the T.

$$\text{Iteration} = L, \text{iter} = 0;$$

Do the following steps:

ST=[];

{$\text{Iter} + +;$

Set: N=2*n;

Compute Ne_Bact function, where $NE\_BACT(BACT) = BACT + d^N * BACT$

$$L_{Bact} = length(BACT)$$

n=N;

$$[ST] = [ST; (BACT)]$$
$$(BACT) = ST;$$

}while($\text{Iteration} < L_{Bact}$)

$$ST = (BACT)(BACT)(BACT)(BACT)(BACT)(BACT) \dots . (BACT)$$

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$$ST = ST_1 ST_2 ST_3 ST_4 ST_5 \ldots . ST_m$$

Where $ST_i = ST(i);\ \forall i; i = 1,2,\ldots\ldots,m;\quad m \in Z^+$

Now applying $trans(T)$, where, $trans(ST_i, T_i) = ASCII(T_i) \pm ST_i$

$$NT = trans(ST, T)$$

Where NT denoted to the new text, and the process will be encryption if the orginal text was T, otherwise the process will be decryption if the text was the cypher text, then will using

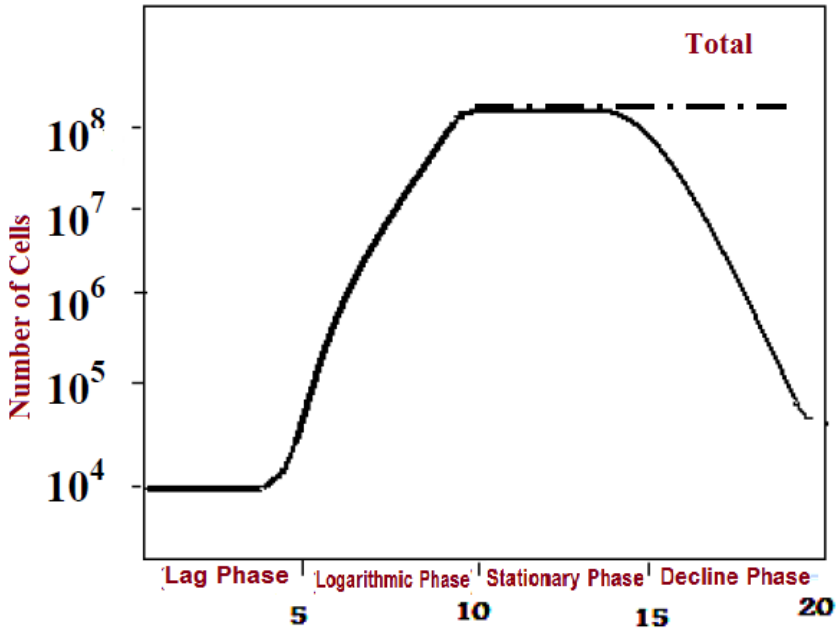
$$T_i = ASCII(NT_i) \mp ST_i\ , \forall i; i = 1,2,\ldots\ldots,m;\quad m \in Z^+$$

From the results obtained from the implementation of programs using Matlab software, it is clear that the amount of new community growth represented by the increase in the number of bacterial cells (BACT) during the fission simulation process is increasing during specific periods, shown in the following table:

n	2	3	4	…….	9
A	2^i	$3 * 2^i$	$4 * 2^i$	…….	$9 * 2^i$
B	2^{i-1}	$3 * 2^{i-1}$	$4 * 2^{i-1}$	…….	$9 * 2^{i-1}$

Where A and B are two +ive integer numbers, which are denoted to the lower and upper bound, respectively, of the interval which containing the length of text. $L \in (A, B]$

In general, where the figure (3), denoted to the four stage of growing the BACT, $n * 2^{i-2} < L \leq n * 2^{i-1}, \forall n; n = 2, 3, \ldots\ldots, 9$



Figure(3): growing Phases

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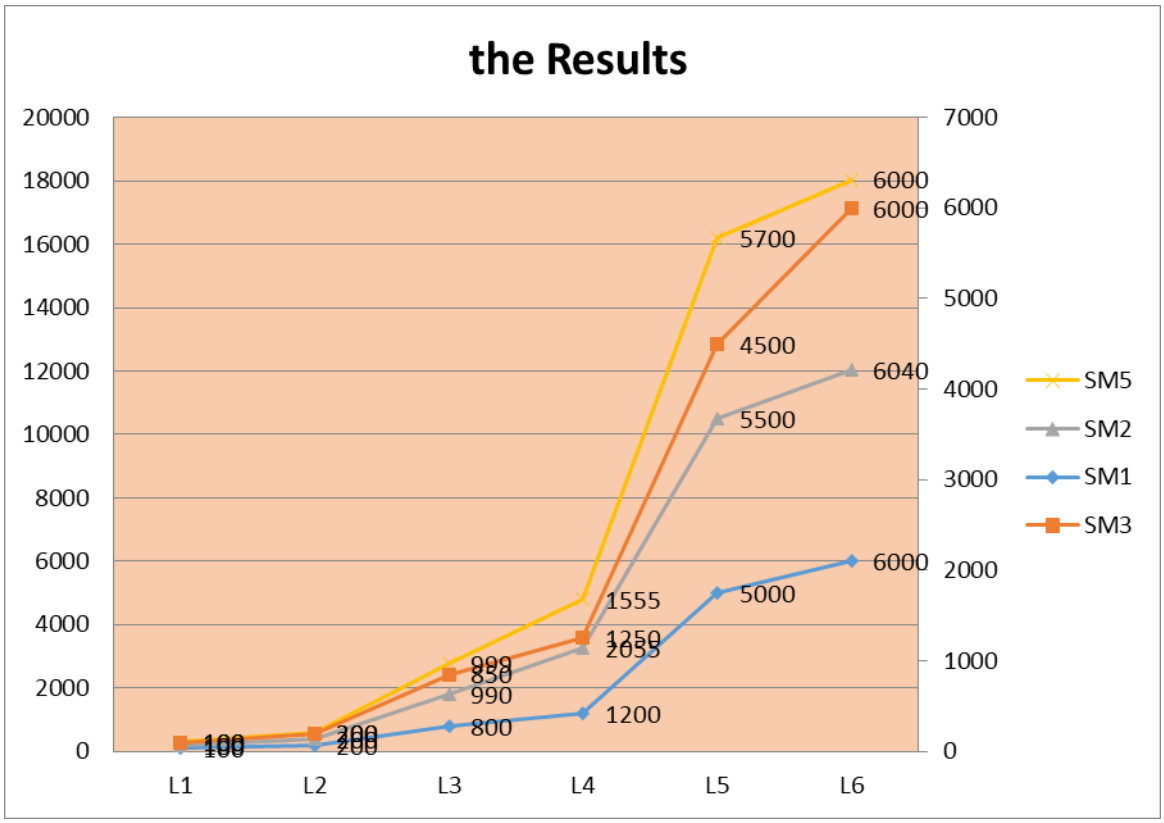
By The results shown in the following table, which can be denoted as:

	PRSM1	PRSM 2	PRSM 3	PRSM5
L1	100%	100%	100%	100%
L2	100%	99.08%	100%	100%
L3	100%	99.98%	100%	100%
L4	99.9%	99.99%	100%	100%

Table(1): Performance Ratio(FR)

From table (1) and figure(4) denoted that FRSM3 and FRSM5 are the best Fitting Ratio Scalar, which is exactly 100%, Although the proposed method of these two cases requires a longer time but is 100 percent efficient without any error.



Figure(4): Total Time Of Suggestion Method(SM)

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