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On GCYD-Method In e-Abacus Diagram

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Abstract
We will provide a new method in this study that integrates two types of applications, namely Graph Theory and Conjugate Young Diagram, the idea of combining the graph and the Young diagram is presented by Ali And Mahmood, which is primarily based on the idea of the e-abacus diagram, the new method is called GCYD, it directly applies to the English letter section, which will be a two-layer coding. It makes it difficult to detect the word or sentence.

Keywords: Partition Theory, e-Abacus Diagram, Young Diagram, Conjugate Young Diagram, Graph Theory.

حول طريقة – GCYD في المخطط المعداد من النمط – e

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الخلاصة
نقدم هنا طريقة جديدة من الدراسة التي تجمع بين نظرية البيان و مرافق مخطط يونك, قدم كل من علي ومحمود الفكرة التي تجمع بين نظرية البيان و مخطط يونك حصرا من خلال المخطط المعداد من النمط – e وسنطلق على هذه الطريقة الرمز GCYD من خلال تجزئة الاحرف الانكليزية حيث سنلاحظ انه باستخدام هذه الطريقة سيكون لدينا ترميز فوق ترميز (ثنائي الطبقات).

1. Introduction

Let t be a non-negative integer number. The sequence of non-negative numbers $\delta = (\delta_1, \delta_2, \ldots, \delta_n)$ is called a partition of t if $\left(|\delta| = \sum_{j=1}^{n} \delta_j = t\right)$ & $(\delta_j \geq \delta_{j+1}, \forall\, j \geq 1)$. A Young diagram, for short, we will write (YD) [1], of a partition δ is the subset $[\delta] = \{(\tau, \sigma): 1 \leq \sigma \leq \delta_\tau \text{ and } \tau \geq 1\}$ of $N \times N$. For example, if $\delta = (7, 6, 5, 5, 1, 1, 1, 1)$, then the YD is:

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$[\delta]$ =

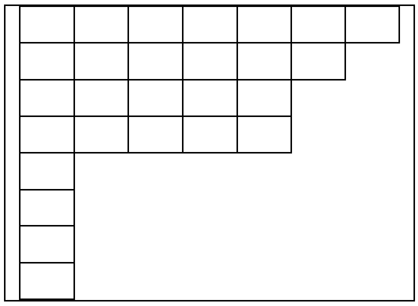


Diagram 1: YD of (7, 6, 5, 5, 1, 1, 1, 1)

Defining $\beta_i = \delta_i + b - i, 1 \leq i \leq b$. The set $\{\beta_1, \beta_2, \cdots, \beta_b\}$ is said to be the set of β - numbers for δ. Let e be a positive integer number greater than or equal to 2, we can express using a "main diagram or e- abacus diagram" see [2-3], by the following:

Table 1: *e*-Abacus Diagram

Runner 1	Runner 2	⋯	Runner *e*
0	1	⋯	*e*-1
e	*e*+1	⋯	2*e*-1
2*e*	2*e*+1	⋯	3*e*-1
⋮	⋮	⋯	⋮

where every β will be represented by (■) and the rest of the sites by (-). From the above example then we have:

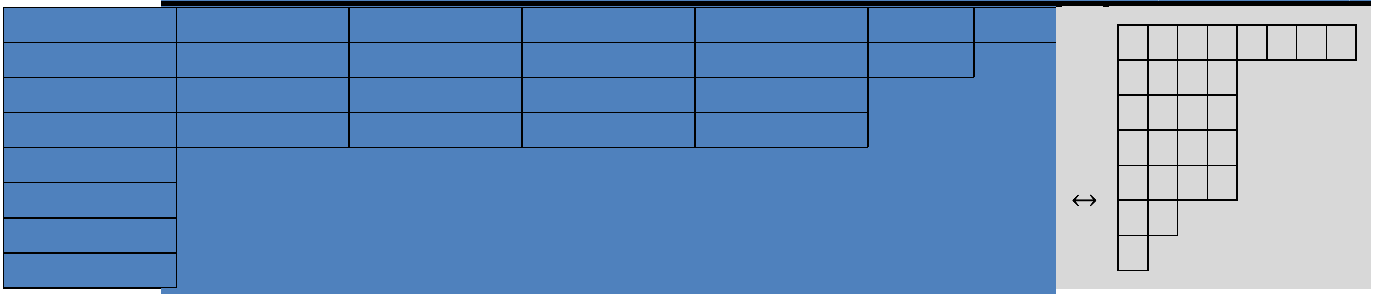
Table 2: *e*-Abacus Diagrams of (7, 6, 5, 5, 1, 1, 1, 1)

2-main abacus		3-main abacus			4-main abacus				5-main abacus					
-	■	-	■	■	-	■	■	■	-	■	■	■	■	
■	■	■	■	-	■	-	-	-	-	-	-	-	■	
■	-	-	-	-	-	■	■	-	■	-	■	-	■	
-	-	■	■	-	■	-	■	-						
-	■	■	-	■										…
■	-													
■	-													
■	-													

Murphy in [4] defined Conjugate YD by $\delta' = \{(\sigma, \tau) \in \delta' : (\tau, \sigma) \in \delta\}$.

Table 3: YD and CYD of (7, 6, 5, 5, 1, 1, 1, 1)

$\delta = (7, 6, 5, 5, 1, 1, 1, 1)$	$\delta' = (8, 4, 4, 4, 4, 2, 1)$



2. GCYD-Method

In this section, we present the idea of combining the graph theory of *e*-abacus diagram [5] and CYD, it is called the GCYD-Method, and it applies to the encoding of English letters and later the word or sentence [6-7], which will be extremely difficult to decipher without prior knowledge of the word or sentence, and this method will be a two-layer method. The merging procedure is based on the premise that the chosen shape should be (more like a square matrix) utilizing graph theory, which is the e-abacus diagram that is presented for each letter of the English language and that is achieved in the initial layer of the coding process [5]. Now, we will use the CYD to create the second layer which was demonstrated in [8] for each English letter. To make everything clearer, we look at each step separately:

First-Layer:

This case starts with two concepts: the first one is the encoding of each English letter according to the carefully determined model and integrated research so that each letter is completely distinct from the others, and it is impossible to have two letters that are identical in any way. Exactly with the second idea, which states that any graph must ultimately begin with the first notion. A.B. Mahmood and A.S. Mahmood in [6-7] put the optimal model for each letter based on the 5-abacus diagram, because any model that is smaller than the one chosen will not achieve the optimal shape due to the possibility of two letters being similar in one or the lack of clarity of the shape, and we give the coding for this in the following table:

Table 4: The Partition For Each English Letters

Letter	partition	Letter	partition
A	$(11, 8^2, 5^7, 2, 1^3)$	**N**	$(11,9, 8^2, 7, 6^4, 5, 4^2, 3,1)$
B	$(11^3, 19,8, 6^3, 5,3, 1^3)$	**O**	$(12^3, 11, 8^2, 5^2, 2, 1^3)$
C	$(13^3, 12,9, 5^2, 2, 1^3)$	**P**	$(11^3, 8, 6^3, 5,3, 1^3)$
D	$(12^3, 11,9,8,6,5,3, 1^3)$	**Q**	$(11^4, 10^2, 8^2, 5^2, 2, 1^3)$
E	$(12^4, 8, 6^3, 2, 1^4)$	**R**	$(13,11,10,8, 6^3, 5,3, 1^3)$
F	$(12,8, 6^3, 2, 1^4)$	**S**	$(13^3, 12, 7^2, 2, 1^3)$
G	$(11^3, 10, 7^4, 6,2, 1^3)$	**T**	$(14,10,6,2, 1^5)$
H	$(13,11,10,8, 7^4, 6,4,3,1)$	**U**	$(14^2, 12,10,9,7,6,4,3,1)$
I	$(15^3, 12,8,4, 1^3)$	**V**	$(16,13,12,11, 8^2, 5)$
J	$(14,11,10,8,4, 1^3)$	**W**	$(14,13,12,11, 10^2, 9, 8^2, 5)$
K	$(15,13,11,10, 7^2, 5,4,3,1)$	**X**	$(13,10,9,8,5,2,1)$
L	$(17^4, 13,9,5,1)$	**Y**	$(16,12, 9^3, 8,5)$
M	$(12, 9^2, 8, 7^2, 6, 5^2, 4,3,2,1)$	**Z**	$(13^5, 10,7,4, 1^4)$

Which corresponds, for example, to some letters:

Table 5: e-abacus diagram of (O, V, T, E) in YD

		O					V					T					E			
16	17	18	19	20	1	2	3	4	5	11	12	13	14	15	6	7	8	9	10	…
-	■	■	■	-	-	-	-	-	-	-	■	■	■	■	-	■	■	■	■	
■	-	-	-	■	■	-	-	-	■	■	-	■	-	-	-	■	-	-	-	
■	-	-	-	■	■	-	-	-	■	-	-	■	-	-	-	■	■	■	-	
■	-	-	-	■	-	■	-	■	-	-	-	■	-	-	-	■	-	-	-	
-	■	■	■	-	-	-	■	-	-	-	-	■	-	-	-	■	■	■	■	

Each letter has been converted to a graph in accordance with [5], assuming that the chosen abacus represents "similar to a square matrix of amplitude e" and so it will satisfy all of the hypotheses proposed in [5], for example, the abacus for the letters mentioned in Table 5 is:

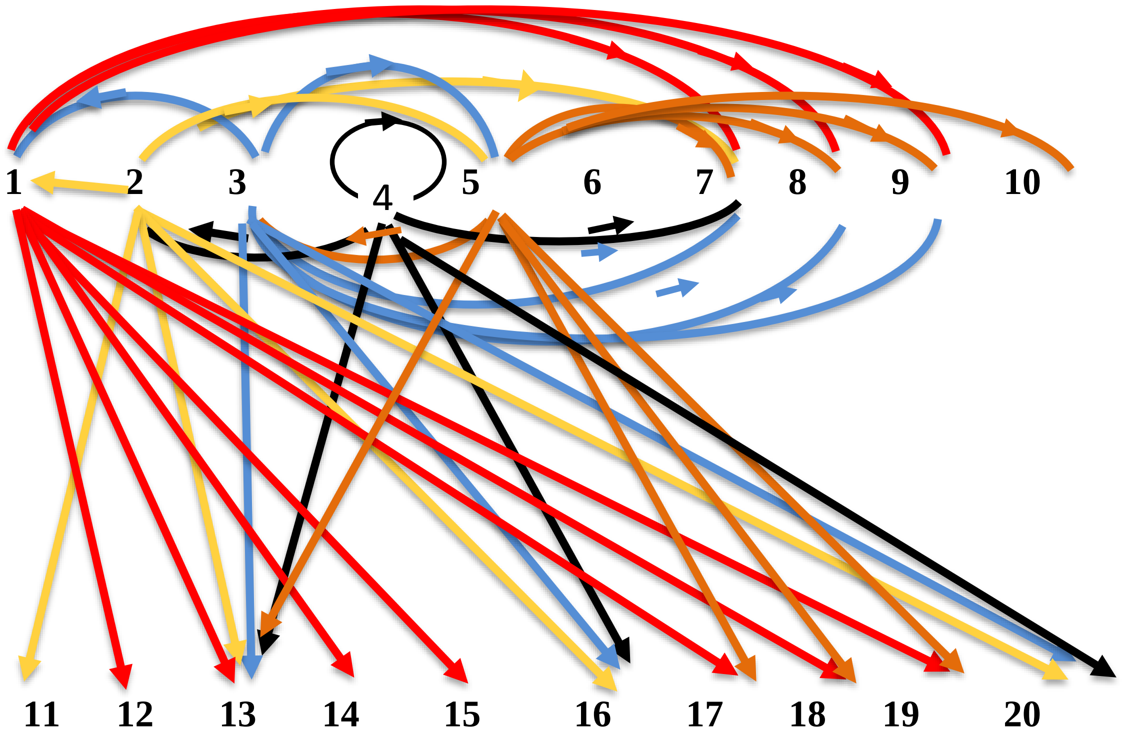


Figure 1: Graph of the word (VETO) in general case

Second-Layer:

We concentrate on the work of Fatmah A. Basher in [8]. She studied the CYD on English letters; also Mahmood and Basher in [9] used two methods to find this new partition in this case the following table is produced:

Table 6: Partition of any English letters (YD & CYD-methods)

	YD-Method	CYD-Method		YD-Method	CYD-Method
A	$(11, 8^2, 5^7, 2, 1^3)$	$(14, 11, 10^3, 3^3, 1^3)$	**N**	$(11, 9, 8^2, 7, 6^4, 5, 4^2, 3, 1)$	$(14, 13^2, 12, 10, 9, 5, 4, 2, 1^2)$
B	$(11^3, 19, 8, 6^3, 5, 3, 1^3)$	$(13, 12^2, 9^2, 8, 5^2, 4^2, 3)$	**O**	$(12^3, 11, 8^2, 5^2, 2, 1^3)$	$(12, 9, 8^3, 6^3, 4^3, 3)$
C	$(13^3, 12, 9, 5^2, 2, 1^3)$	$(11, 8, 7^3, 5^4, 4^3, 3)$	**P**	$(11^3, 8, 6^3, 5, 3, 1^3)$	$(12, 9^2, 8^2, 7, 4^2, 3^3)$
D	$(12^3, 11, 9, 8, 6, 5, 3, 1^3)$	$(12, 9^2, 8^2, 7, 6^2, 5, 4^2, 3)$	**Q**	$(11^4, 10^2, 8^2, 5^2, 2, 1^3)$	$(14, 11, 10^3, 8^3, 6^2, 4)$
E	$(12^4, 8, 6^3, 2, 1^4)$	$(13, 9, 8^4, 5^2, 4^4)$	**R**	$(13, 11, 10, 8, 6^3, 5, 3, 1^3)$	$(12, 9^2, 8^2, 7, 4^2, 3^2, 2, 1^2)$
F	$(12, 8, 6^3, 2, 1^4)$	$(10, 6, 5^4, 2^2, 1^4)$	**S**	$(13^3, 12, 7^2, 2, 1^3)$	$(10, 7, 6^5, 4^5, 3)$
G	$(11^3, 10, 7^4, 6, 2, 1^3)$	$(13, 10, 9^4, 8, 4^3, 3)$	**T**	$(14, 10, 6, 2, 1^5)$	$(9, 4, 3^4, 2^4, 1^4)$
H	$(13, 11, 10, 8, 7^4, 6, 4, 3, 1)$	$(12, 11^2, 10, 9^2, 8, 4, 3^2, 2, 1^2)$	**U**	$(14^2, 12, 10, 9, 7, 6, 4, 3, 1)$	$(10, 9^2, 8, 7^2, 6, 5^2, 4, 3^2, 2^2)$
I	$(15^3, 12, 8, 4, 1^3)$	$(9, 6^3, 5^4, 4^4, 3^3)$	**V**	$(16, 13, 12, 11, 8^2, 5)$	$(7^5, 6^3, 4^3, 3, 2, 1^3)$
J	$(14, 11, 10, 8, 4, 1^3)$	$(8, 5^3, 4^4, 3^2, 2, 1^3)$	**W**	$(14, 13, 12, 11, 10^2, 9, 8^2, 5)$	$(10^5, 9^3, 7, 6, 4, 3, 2, 1)$
K	$(15, 13, 11, 10, 7^2, 5, 4, 3, 1)$	$(10, 9^2, 8, 7, 6^2, 4^3, 3, 2^2, 1^2)$	**X**	$(13, 10, 9, 8, 5, 2, 1)$	$(7, 6, 5^3, 4^3, 3, 2, 1^3)$
L	$(17^4, 13, 9, 5, 1)$	$(8, 7^4, 6^4, 5^4, 4^4)$	**Y**	$(16, 12, 9^3, 8, 5)$	$(7^5, 6^3, 5, 2^3, 1^4)$
M	$(12, 9^2, 8, 7^2, 6, 5^2, 4, 3, 2, 1)$	$(13, 12, 11, 10, 9, 7, 6, 4, 3, 1^3)$	**Z**	$(13^5, 10, 7, 4, 1^4)$	$(12, 8^3, 7^3, 6^3, 5^3)$

Table 7: e-abacus diagram of (O, V, T, E) in CYD

O					V					T					E					
16	**17**	**18**	**19**	**20**	**1**	**2**	**3**	**4**	**5**	**11**	**12**	**13**	**14**	**15**	**6**	**7**	**8**	**9**	**10**	**…**
-	-	-	■	-	-	■	■	■	-	-	■	■	■	■					■	
□	■	■	-	-	■	-	■	-	■	-	■	■	■	■	■	■	■		■	
□	■	■	-	-	■	■	-	-	■	-	■	■	■	■	■				■	
□	■	■	-	■	■	■	-	■	■	-	■	-	-	-	■	■	■		■	
-	-	-	■	-	■	■	■	-	-	-	-	■	-	-					■	

Also, if we used the GCYD for the word (VETO), then we have the following diagram:

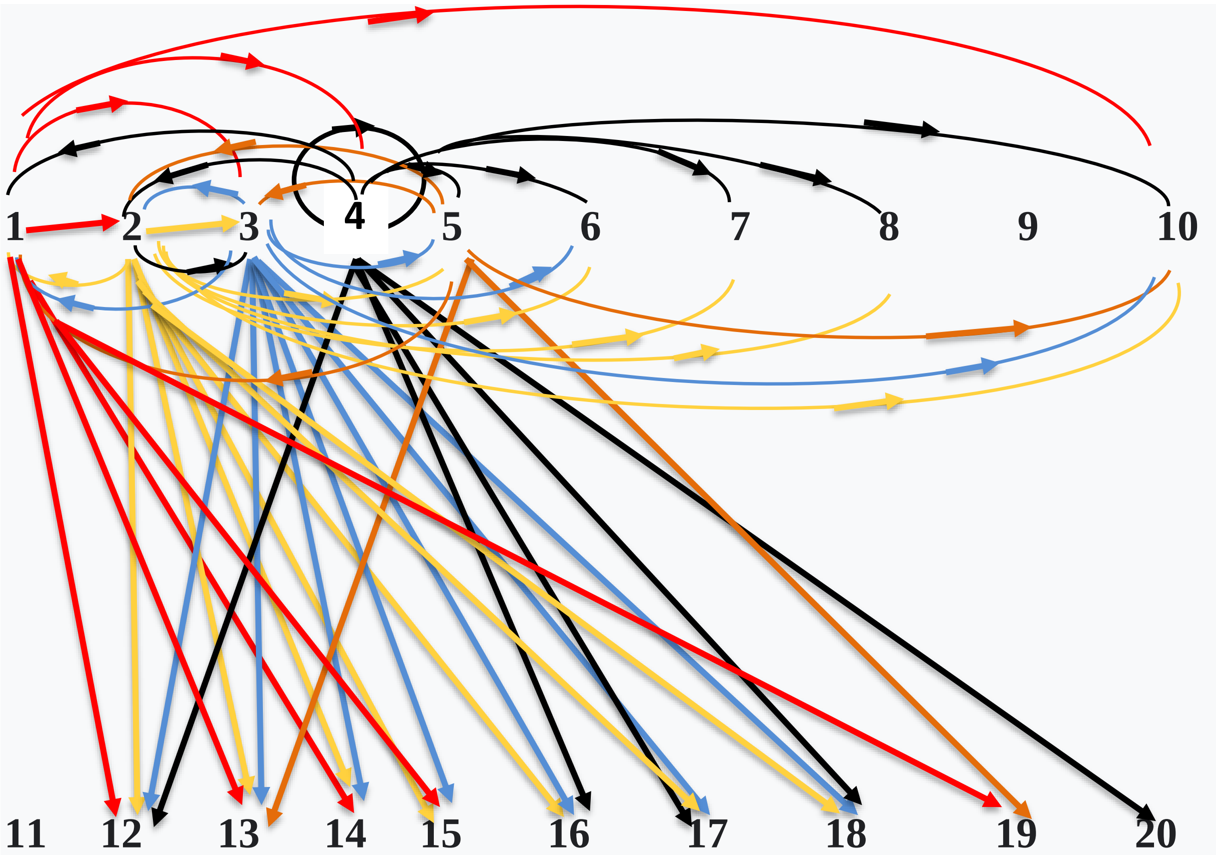


Figure 2: The Graph of (VETO) by used GCYD-Method

Conclusion:

This application is considered safer and more difficult to encode any message. Thus, it will achieve a kind of very important confidentiality.

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