Communications on Applied Nonlinear Analysis
ISSN: 1074-133X
Vol 31 No. 5s (2024)

Inconspicuous Discovery of Coronavirus Infected People Based SATL of Star Graphs

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Article History:

Received: *20-05-2024*

Revised: *14-06-2024*

Accepted: *30-06-2024*

Abstract:
Though the pandemic has created many discrepancies and cos-ted many lives in Malaysia, it has in one way cemented the breached relationships, while the rapid development of science and technology met new horizons, humans were actually developing an island of a void. But this pandemic has made humans stop and think about bridging the gaps which are the side effects of globalization.The new normal condition which keeps the most civilized race indoors, also deliberates the necessity of being human and sharing humanity. Thanks to the same scientific and technological developments a new return to nature has happened, and social distancing takes a new turn of meeting nears and dears virtually. This work analyzes the data of covid-19 affected people in a particular place through graph labeling that labels the vertices with edges via SATL graph labeling techniques. Such labeling supports the search of how many neighbours are affected covid-19 in priority order.

Keywords: Star graph; SATL graph; COVID-19; Graph labeling.

1. Introduction

The people who are affected Covid-19 virus in Malaysia were isolated due to awareness of the virus which cause public to be more vigilant. The motivation of this research is to improve the efforts of tracking method for the public who affected Covid-19 by own prediction, own suspect to contracting the viruses. This study was made assuming the necessity of finding the direct contact tracking using graph labeling in positive Covid-19 patients.

An undirected graph G be a finite and simple with d vertices, l edges but no multiple graphs and h be a subgraph of an undirected graph G. Definitions and terminology not mentioned here but may be refered to D.B. West [7]. The basic theory of graph labeling is initiated in [3], of one given by [4] in 1967. For smooth gathering of results on labeling the authors refereed to [9] and [10] and survey on graph labeling by J.A Gallian [8].

SATL label of a graphical representation G, d dots and l lines is a one to one correspondence to the domain set of lines to the codomain set of numbers 1,2,3,...,l with the pair (a,b).

Suppose G antimagic total labeling. Delman and Koilraj [5] defined an SATL which is a generalization of Javid's of generalized extended w- trees [11] and deriving the existence of a SATL on them for $e\epsilon[0,1,2]$ and the study of vertex labeling of a graph G for the edge weight of $xy \in D(G)$ is defined as w(xy)=g(x)+g(y) and the total labeling for the edge weight of $xy \in D(G)$ is defined as f(ab)=f(a)+f(b)+g(ab) have been proved by [6].

Moreover the affected patients are not published to the society and hence it prevents the safety motivation with the medical systems and provisions [13]. The Covid-19 predicted people are listed sequential order in a time series data is referred in [14]. In [1] they proved that friendhip graph contained in (a,1) SATL ⇔ for number of vertices is 1,3,5,..., also they proved that friendship graph contains no (a,2) SATL when n is even and $n \cong 4 \quad mod \quad 12$.

SATL of covering of a graph G is a bijection function $g: D(G) \cup L(G)\} \rightarrow \{1,\ 2,\ 3,\ \cdots,\ |D(G) + L(G)|\}$ such that for all subgraphs h' of G isomorphic h then h' weights

$wt(h')= \sum_{d\epsilon D(h')} g(d) + \sum_{e\epsilon L(h')} g(l)$

form an A.P $b, b+e, b+2e, \dots, b+(m-1)e$, where $b \geq 0$ and $e \geq 0$ are two fixed integers. The labeling is called a SATL if $g(D(G)) = 1,2,3, \dots, |D(G)|$.

By referring the articles [2], they mentioned a problem, for each e, $4 \leq e \leq d+l+2$, either prove the SATL of the graph $G_x(S_m), m \geq 3$, here star graph is a complete bipartite graph denoted by S_m.

By inspiring of the problem, here we try to prove the existence of SATL of $G_x(S_3)$, $G_x(S_4)$, $G_x(S_5)$ and $G_x(S_m)$ graphs given as a open problem 10 in [2].

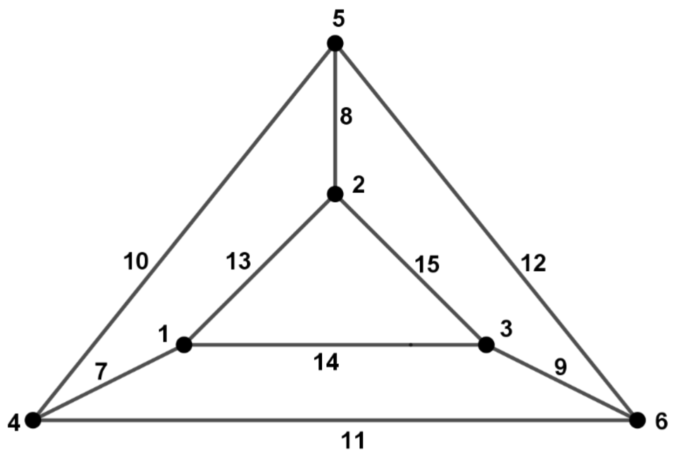

Figure 1: Super $(50,5) - C_4$-antimagic total labeling

2. Main Results

The labeling SATL of h- graph is stands for the label super (b,e)-h-SATL diagram is a finite graph and h subset of a representation in x dots and y lines is an mapping $g: D(G) \cup L(G)\} \rightarrow$

$\{one,\ two,\ three,\ \cdots,\ |D(graph) + L(graph)|\}$ and hence for every subgraphs $h' \cong$ h the h' weights.

$wt(h')= \sum_{d \epsilon D(h')} g(d) + \sum_{e \epsilon L(h')} g(l)$

generate an arithmetic progression A.P $b, b+e, b+2e, \dots, b+(n-1)e$, where b and e are positive integers and n is the number of subgraphs of G isomorphic to h. In this research we analyze SATL of general star graph with the solution for an open problem 10 in [2]. Let $G' \cong G_x(S_m)$ then $|D(G')| = d+m$ and $|L(G')| = r+n$, referred by [2].

Theorem 2.1 *The graph* $G_u(S_3)$ *admits a SATL* $\Leftrightarrow e\epsilon \left\{0,1,2,\dots,q+r-\left[\frac{(q-1)(q-2)}{2}\right]\right\}$

Proof. By refereed to the theorems from [1], the SATL labeling is structured as:

$g_i(w_1) = q - i,$

$g_i(e_{q+one}) = q + r + 3 - i\ ,\ 1 \le i \le q-2,$

$g_i(w_2) = q - 1,$

$g_i(e_{q+2}) = q + r + 5$

$g_i(w_3) = q + 1 + i,$

$g_i(e_{q+3}) = q + r + 6$

Therefore sum of the induced labels of S_3 are 2q+r+3-two(i), 2q+r+6-i and 2q+r+9. Hence, $e = three + i,\ one \le i \le q - two,$

Hence e=four,five,...,q+one, for all i, $one \le i \le r - \left[\frac{(q-2)(q-1)}{2}\right] - 1$, denote the labels of g_i:

$g_i(v_1) = one,$

$g_i(e_{edges+1}) = numberofedges + 6 - 2i\ ,\ one \le j \le edges - \left[\frac{(q-2)(q-1)}{2}\right] - 1$

$g_i(w_2) = 3,$

$g_i(e_{q+2}) = p + q + 5 - i$

$g_i(w_3) = q + 3,$

$g_i(e_{q+3}) = q + r + 6$

Therefore sum of the induced labels of S_3 are r+7-2i, q+r+8-i and 2q+r+9.

Hence e=q+1+i, $1 \le i \le r - \left[\frac{(q-2)(q-1)}{2}\right] - 1$

Hence, $e = q+2, q+3, q+4, \dots, q+r-\left[\frac{(q-1)(q-2)}{2}\right]$

Theorem 2.2 $G_u(S_4)$ *admits a SATL for each e=i,* $4 \le i \le q+1$ *and* $q \ge 3$.

Proof. Let $G' \cong G_u(S_4)$ and d_i, w_1, w_2, w_3, w_4, $1 \le i \le q$ is the dots of the graph and (S_4).

$l_i, l_{r+1}, l_{r+2}, l_{r+3}, l_{r+4}$, $1 \le i \le r$ is the joints of G and (S_4) respectively.

Then $|D(G_x(S_4))| = q + 4$ and $|D(G_x(S_4))| = r + 4$.

suppose there exists a bijective mapping,

$g{:}\, sum\ \ of\ \ vertices\ \ and\ \ edges \rightarrow \{one,\ two,\ three,\ \cdots,\ edges + r + 8\}$ which is a SATL of G'.

Numbering the vertices d_i, $one \leq i \leq q$ corresponding numbers of A then the edge labels one_i, $1 \leq i \leq r$ from numbers in B mixing arrangement,

$A = [q + 2] - q + 2 - i, q + 1$,by the condition $4 \leq i \leq q + 1$ and

$B = q + 5, q + 6, \ldots, q + r + 7 - q + r + 10 - 2i, q + r + 11 - 2i, q + r + 9 - i$, $4 \leq i \leq q + 1$.

The graph G and the subgraph having the equal sweights $(G + l_i)$, i=1,2,3,4. It is sufficient to prove the numbers of the star graph S_4, for every 'i' $4 \leq i \leq p + q - \left[\frac{k(k+3)}{two}\right]$, then f_i is defined as :

$$g_i(w_1) = q + 2 - i,$$

$$g_i(e_{q+one}) = q + r + 10 - 2i\ ,\ 4 \leq i \leq q + 1,$$

$$g_i(w_2) = q + 1,$$

$$g_i(e_{q+2}) = q + r + 11 - 2i$$

$$g_i(w_3) = q + 3,$$

$$g_i(e_{q+3}) = q + r + 9 - i$$

$$g_i(w_4) = q + 4,$$

$$g_i(e_{q+4}) = q + r + 8$$

Therefore the labels of S_4 are 2q+r+12-3i, 2q+r+12-2i,2r+q+12-i and 2q+r+12. Hence, $e = i$, $4 \leq i \leq q + 1$.

Theorem 2.3 $G_u(S_4)$ *admits a SATL for each e=i,* $4 \leq i \leq q, whereq \geq 4$.

Proof. Let $G' \cong G_u(S_5)$ and $d_i, w_1, w_2, w_3, w_4, w_5$, $1 \leq i \leq q$ be the vertices of G and (S_5).

Let $l_i, l_{r+1}, l_{r+2}, l_{r+3}, l_{r+4}, l_{r+5}$, $1 \leq i \leq r$ be the edges of G and (S_5).

Then $|D(G_x(S_5))| = q + 5$ and $|L(G_u(S_5))| = r + 5$,

and defined a bijective mapping,

$g{:}\, vertex(G') \cup L(G')\} \rightarrow\ \{one,\ two,\ three,\ \cdots,\ numberofedges + r + ten\}$

it describes SATL of G'. Numbering the graph G with d_i, $one \leq i \leq q$ with the labels of A with the numbers one_i, $1 \leq i \leq r$ and labels of B,

$A = [q + 1] - q - 1$, $4 \leq i \leq q$ and

$$B = q + 6, q + 7, \ldots, q + r + 9 -$$

$q + r + 16 - 4i, q + r + 13 - 3i, q + r + 12 - 2i, q + r + 11 - i$, $4 \leq i \leq q$.

The graph and subgraphs having the equal weight $(G + l_i)$, i=1,2,3,4,5.

It is possible to find the labels of the graph S_5, every i $4 \leq i \leq q$, we express the label g_i:

$$g_i(w_1) = q - one,$$

$$g_i(e_{q+1}) = q + r + 16 - 4i\ ,\ 4 \leq i \leq p + q - \left[\frac{k(k+1)}{2}\right],$$

$$g_i(w_2) = q + 2,$$

$$g_i(e_{q+2}) = q + r + 13 - 3i$$

$$g_i(w_3) = q + 3,$$

$$g_i(e_{q+3}) = q + r + 12 - 2i$$

$$g_i(w_4) = q + 4,$$

$$g_i(e_{q+4}) = q + r + 11 - i$$

$$g_i(w_5) = q + 5,$$

$$g_i(e_{q+5}) = q + r + 10$$

Therefore the labels of S_5 are 2q+r+15-4i, 2q+r+15-3i,2q+r+15-2i,2q+r+15-i and 2q+r+15.

Hence, $d = i$, $4 \leq i \leq q$.

Theorem 2.4 $G_u(S_m)$ *where* $n \geq 6$ *generates a SATL for all e=i,* $4 \leq i \leq q - m + 5$, *where* $q \geq m - 1$.

Proof. Let G' isomorphic to $G_u(S_m)$. Let $d_1, d_2, d_3, \ldots, d_q$ correspondingly $w_1, w_2, w_3, \ldots, w_m$ be the vertices of G and (S_m).

Let $l_1, l_2, l_3, \ldots, l_r$ and $l_{r+1}, l_{r+2}, l_{r+3}, \ldots, l_{r+n}$ be the adjacents of G and (S_m).

Then $|D(G_x(S_m))| = q + m$ and $|L(G_x(S_m))| = r + m$.

suppose the mapping is arises which is a bijective,

$g\colon (sum\ \ of\ \ vertices\ \ and\ \ edges) \to \{one,\ two,\ three,\ \cdots,\ q + r + 2(m)\}$ which is a SATL of G'.

Numbering the vertices d_i, $one \leq i \leq q$ with the numbers of A and number the edges l_i, $1 \leq i \leq r$ from numbers in B ,

where $A = [q + m] - q + m, q + m - 1, q + m - 2, q + m - 3, \ldots, q + 1$ and

$B = [q + r + 2m] - q + r + 2m, q + r + 2m + 4 - 4i, \ldots, q + r + m - mi.$

By the above theorems we have n=3,4,5. The graph G and the subgraphs $(G + e_i)$, i=1,2,3,...,m, having the same weight and hence it is possible to prove the numbers of the star S_m, for all i there is a fnction g_i:

$$g_i(w_1) = q + 1,$$

$g_i(l_{r+1}) = q + r + m - mi$

$g_i(w_2) = q + 2,$

$g_i(l_{r+2}) = q + r + (m-1) - (m-1)i$

$g_i(w_3) = q + 3,$

$g_i(l_{r+3}) = q + r + (m-2) - (m-2)i$

$g_i(w_4) = q + 4,$

$g_i(l_{r+4}) = q + r + (m-3) - (m-3)i$

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$g_i(w_{m-4}) = q + m - 4,$

$g_i(l_{r+m-4}) = q + r + 2m + 4 - 4i$

$g_i(w_{m-3}) = q + m - 3,$

$g_i(l_{r+m-3}) = q + r + 2m + 3 - 3i,$

$g_i(w_{m-2}) = q + m - 2,$

$g_i(l_{r+m-2}) = q + r + 2m + 2 - 2i$

$g_i(w_{m-1}) = q + m - 1,$

$g_i(l_{r+m-1}) = q + r + 2m + 1 - i$

$g_i(w_n) = q + m,$

$g_i(l_{r+m}) = q + r + 2m$

Therefore labels of S_m are $2q + r + 1 + m - mi, 2q + r + 2 + (m - one) - (m - one)i, 2q + r + 2 + (m - 1 + 1) - (m - 1 + 1)i, 2q + r + 1 + 1 + (m - 3) - (m - 3)i, \ldots, 2q + r + 3m - 3i, 2q + r + 3m - 2i, 2q + r + 3m - i, 2q + r + 3m$, where $m \geq 6$.

Hence, $e = i$, $4 \leq i \leq q - 1$ where $q \geq m - 1$.

Hence the proof.

3. Observation

Here is the graph that shows SATL of the graph $G_u(S_7)$.

Let $G' \cong G_u(S_7)$, $\{1,3,\ldots,7\}$ and $\{8,9,10,\ldots,14\}$ be the dots of G and (S_7) r.

Let $\{15,16,,17\ldots,21\}$ and $\{22,23,24,\ldots,42\}$ be the lines of G and (S_7).

Then $|D(G')|$=14 and $|L(G')|$=28.

Therefore there is an arises of map,

when i=5 in the labeling of the theorem(2.4) constitutes an arithmetic progression we get e=5 and all the subgraphs which is ≅ to h. Also here $g(D(G)) = \{1,3,\ldots,7\}$ then g is a SATL.

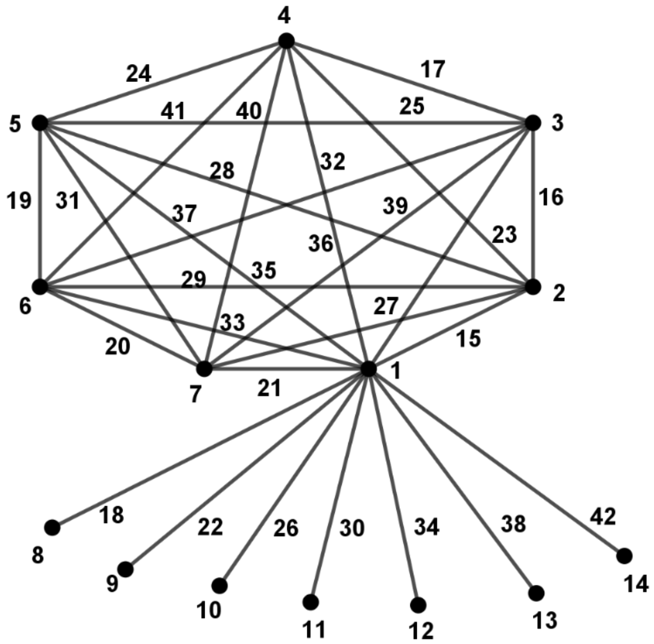

Figure 2: SATL of (26,5)

3.1 Observation

In [2], there is a problem, for all e, $4 \le e \le q + r + 2$, either prove $G_x(S_m), m \ge 3$, or find the graph is not exists. Here we proved the upper limit for $e = q + r + 2$ does not exists but the lower limit for $e = 4,5,6,7,\ldots$ exists for $G_x(S_m)$ for $m = 3,4,5$. By refereed to the lemma 4 in [2], we have, that the value of a is $(q + n)(r + 1) + \frac{(q+1)(q+2)+(q+1)(q+2)}{2}$ and it is the weight of the first subgraph s_1 for a real numbers of q and r, it is less than 0, therefore it is not possible for $e = q + r + 2$ but it is possible for the graph $G_x(S_m)$ is $4 \le d \le q - 1$ and the proof is given in the theorem (2.4).

4. Goals and Objectives

From the theory of graph network, the undirected graph is the set of all nodes and lines. Graph network may be known as a link, a node-link, a map network, or simply a graph. Nowadays we are surrounding by countless connections and networks; railway tracks, telephone lines, roads, the internet, electronic circuits, and even social networks between friends and families.

Cryptography is the science containing methods to transform an intelligible message into one that is unintelligible and transform the message back to its original form. The original intelligible message is known as plain text and the transformed message is known as cipher text. The procedure for converting a text by convertion and replacing techniques is called as Cipher. Each letter is replaced by the three positions further down the alphabet. Caesar used a key for his communication and it's known as Caesar Cipher or Shift Cipher. Graph representations may be used for public key Ciphers [2]. Sharing secrecy on graphs has applications on two levels.

1. Sharing secrecy on theoretical research.
2. Secret sharing schemes using structures.

Sharing secret messages are expected to be useful, providing coding techniques, meant for communicating any message personally, official, governmental, or military services with high-level secrecy, intricacy, and a sense of sufficiency which are the most important factors for coding. The main action of the research is to achieve the following goals and objectives, which will be finalized in several publications in high impact factor journals.

1. To apply the algorithm of the graph cipher key and the subset X=pi of the polynomials over finite field F, such that for every i, pi(z)=0, and mathematical or non-mathematical clues as a public key.

2. To Encrypt a given message obtaining coded message using cipher polynomial Y as a public key (a randomly chosen letter generated by X)

3. To Decrypt a given message by finding the value of polynomial Y at z.

4. The goal of this research is to implement mathematical modeling in Coding, Network communication and introduce the MATLAB platform.

5. Scope of Work

Network Communication has an important infrastructure in contemporary society. Theory of graph uses in network theory specifically in Network communications and coding theory. Network Communication is mathematical modeling that process and learns from graph-structured data. This work is the rapidly growing body of research using different graph based deep learning models eg; assigning numbers to the vertices and edges of a graph and graphical representation, in different situations from various kinds of network communication eg: Information Technology networks. The communication becomes very much limited between the sender and the receiver and not to be understand by others. In this project, the use of mathematical algorithms based on network communication and sharing secrecy with the applications of graph theory and MATLAB environment. The research propose to work on graph theory, coding theory, and networks approach which are derived from graph representations. The experimental testing will be developed for new algorithms to optimize the mathematical properties in their graph structures.

Network Communication is completely a mathematical model, graphical representation of communication provides simpler views, and graph theoretical techniques provide litral reviews and theory of graph applications gives readable proofs for many problems generating in communicative networks. This research work starts with an exploration of theory of graphs in Network

Communication by using MATLAB and obtaining a secret code by Encrypt and Decrypt algorithms in coding theory. The outcome of this research is not necessarily limited to graphs in coding theory but also be applied in other domains such as cryptographic methods, public key cipher, graph cipher, and wireless and non-wireless networks.

6. Conclusion

There is a proof for the long-standing open problem, that there is SATL where $e = q + r + 2$ of the graph $G_x(S_m), m \geq 3$. The above theorems have shown that SATL is exist for $G_x(S_m)$ for $m = 3,4,5$, and generalized for S_m for different values of e. The author's future work will include investigating the remaining open problems have yet been solved.

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