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The Dominating Characteristics Of A Total Graph Of A N-Sunlet Graph In Mobile Networking

Ms. B. Logapriya, Dr.A.Shobana

Department of Science and Humanities, Sri Krishna College of Engineering and Technology, Coimbatore, Tamil Nadu, India.
logapriya@skcet.ac.in, shobanaa@skcet.ac.in

Abstract

The total graph of an undirected graph J represents the adjacencies and incidences between vertices and edges of J. Let T be a set in U, which is a dominating set of a graph J. Thus, every vertex and edge in (U-T) is adjacent tin J. $\gamma(J)$ is a domination number denoting the minimum cardinality of dominating set in J. The domination number of total graphs of n-sunlet graph are determined in this paper.

Keywords

Total Graph, n-Sunlet Graph, Dominating set, Domination Number, Neighbourhood of Vertices

I Introduction

The domination number γ(T(J)) is the number of vertices in a smallest dominating set for J. The domination problem was studied from the 1950's onwards but the role of research on domination significantly increased in the mid 1970's.

The networks with sensors consists of one or more stations and many economical nodes that combine sensors and wireless radios. As the range of the radio is limited, all the nodes cannot be communicated directly with the base station, nevertheless depend on the other nodes to forward messages to and from base stations. In mobile networking, the message routing is performed by all the nodes. Mobile networks has no specific network infrastructure, so routing and networking must be performed through the other nodes. The efficiency and performance of computer networks are the organization of the network infrastructure into a hierarchical structure. Due to the lack of network infrastructure, sensor networks and mobile networks are essentially flat.

In order to achieve efficiency and performance, new algorithms have arisen that depend on virtual network infrastructure that manages ordinary nodes into a hierarchy. The construction of this type of infrastructure is the application of dominating sets in networks. The use of dominating sets in wireless sensor networks performs a wide range of communication functions.

Dominating sets are of practical intersects in areas. In wireless networking, dominating sets are used to find efficient routes within ad-hoc mobile networks. They have also been – used in document summarisation and in designing secure systems for electrical grids. Besides mobile networking the domination sets also finds it use in finding routes for various transportation media including school bus, tourism, civil transports to locate shortest routes. Also, various problems including biological operands and secured networks, Nuclear power plants related queries, find its solution through dominating sets. One of the main applications of dominating sets is that it is very useful in Graph Theory including Coding Theory Criteria's including Biometrics also verified using dominant set.

A mobile network can be represented by a graph G= (V,E) which consists of a vertex set V and edge set E. Any two vertices u,v $\in$V, (u,v) $\in$E if and only if the vertices u and v are connected by a

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line when u and v are within the communication range. The communication range is structured as a disk centred at the vertices with radius equal to the radio's transmission range.

In this paper, mobile networks are considered to be the total graph of n-sunlet graph and the domination number of total graph of Sunlet Graph has been determined. The Domination Number is the minimum cardinality of dominating set.

II Preliminaries

Definition: 2.1:

The undirected graph with the set of vertices U and set of Edges F be J = (U, F) which is also denoted as U(J) and F(J).

Definition: 2.2:

The degree of the vertex with self-loops connected twice which is denoted by $f(V_n)$ be the number of edges incident at the vertex V_n.

Definition: 2.3:

The graph which is basically constructed on 2n vertices normally obtained by attaching n-independent edges to the cycle C_i is known as the n-Sunlet graph which is denoted by S_i.

Definition: 2.4:

If in a set of vertices, every vertices of J are adjacent to at least one vertex of S. Then such set of vertices is a dominating set of J. The minimum dominating set is referred to as the dominating set of cardinalities γ(G).

Definition: 2.5:

Total dominating set is considered as a set of vertices of the graph such that all the vertices of the dominating set have a neighbour vertex in the set. Also, the size of a smallest total dominating set of a graph is the Total Domination Number of the graph.

III Remarks

No. of vertices in a n-Sunlet graph (S_i) = 2n
No. of edges in a n-Sunlet graph (S_i) = 2n
Maximum Degree in a n-Sunlet graph (S_i) = 3
Minimum Degree in a n-Sunlet graph (S_i) = 1
No. of vertices in a Total graph of a Sunlet graph (T_{oi}) = 4n
No. of edges in a Total graph of a Sunlet graph (T_{oi}) = 8n
Maximum Degree in a Total graph of a Sunlet graph (T_{oi})= 6
Minimum Degree in a Total graph of a Sunlet graph (T_{oi})= 2

IV Dominating Characteristics of a Total Graph Of a n-Sunlet Graph:

Theorem 4.1

The domination number of total graph of a 3- Sunlet graph $\gamma(T(S_3)) = 3$
Proof:

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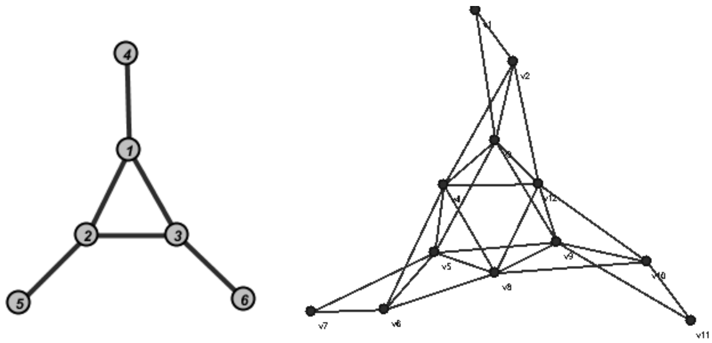

Fig : 4.1: 3- sunlet graph and its total graph

Let D= {U_7, U_9, U_{11}}. Here the vertex U_7 dominates U_1, U_3, U_4 and U_8 and the remaining vertices of the dominating set D dominates other vertices as such. Therefore, D is considered as the Dominating set. Considering the vertex $U_7$to be removed then the vertices U_1, U_3, U_4 and U_8 are not dominated by U_7.And hence the set D cannot be the dominating set. This case also fits for the remaining vertices of the set D. Beyond the considered dominating set D no other minimal vertices could be considered as the dominating set D. Therefore, D is the minimal dominating set.

The Domination numbers of total graph of a 3-sunlet graph is 3.

Theorem 4.2

The domination number of total graph of a 4- Sunlet graph γ (W (T_4)) = 4

Proof:

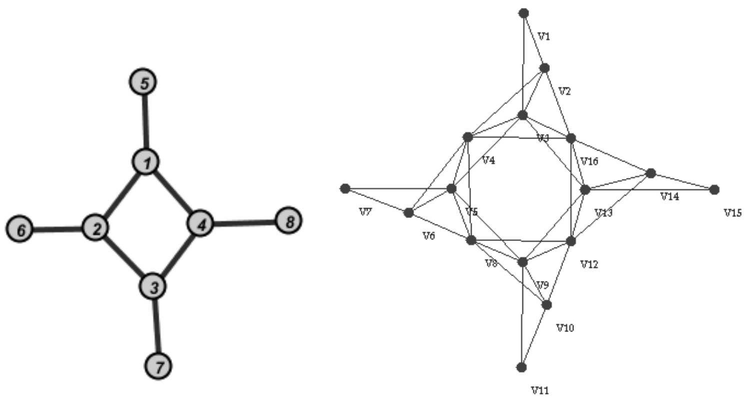

Fig : 4.2: 4- sunlet graph and its total graph

Let us consider the set D = {U_9, U_{11}, U_{13}, U_{15}}

Here the point U_9 dominates the vertices U_{10}, U_5, U_4, U_1, and the remaining vertices of the dominating set D dominates other vertices as such. Therefore, D is considered as the Dominating set. Considering the vertex U_9 be removed then the vertex U_{10}, U_5, U_4 and U_1 are not dominated by U_9. And hence the set D cannot be the dominating set. This case also fits for the remaining vertices of the set D. Beyond the considered dominating set D no other minimal vertices could be considered as the dominating set D. Therefore, D is the minimal dominating set

The domination number of total graphs of a 4-Sunlet graph is 4.

Theorem 4.3

The domination number of total graph of a 5- Sunlet graph γ (W (T_5)) = 5

Proof:

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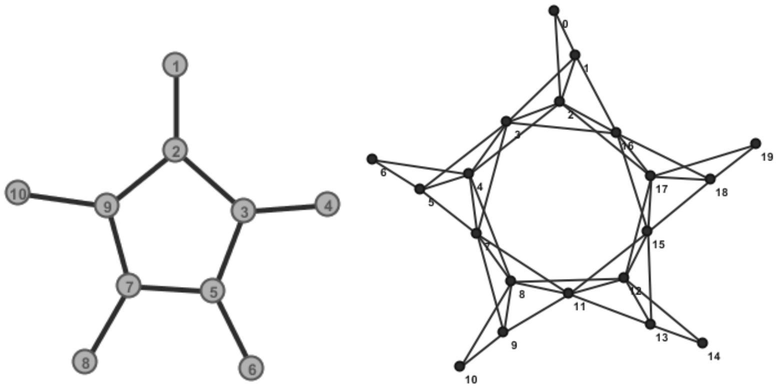

Fig : 4.3: 5- sunlet graph and its total graph

Let D= {U_{11}, U_{13}, U_{15}, U_{17}, U_{19}}

Here the vertex U_{11} dominates the vertices U_{12}, U_6, U_5, U_1 and the remaining vertices of the dominating set D dominates other vertices as such. Therefore, D is considered as the Dominating set. Considering the vertex U_{11} be removed then the vertices U_{12}, U_6, U_5 and U_1 are not dominated by U_{11}. And hence the set D cannot be the dominating set. This case also fits for the remaining vertices of the set D. Beyond the considered dominating set D no other minimal vertices could be considered as the dominating set D. Therefore, D is the minimal dominating set

The domination number of total graphs of a 5-Sunlet graph is 5.

Theorem 4.4

The domination number of total graph of a n- Sunlet graph γ (W (T_5)) = n

Proof:

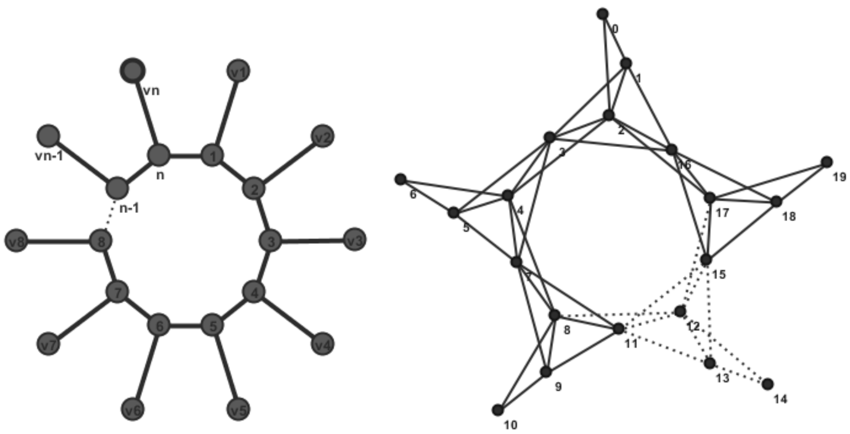

Fig : 4.4: n- sunlet graph and its total graph

Let D= {U_{2n+1}, U_{2n+3}, U_{2n+5}, ………… , U_{4n-1}}

Here the vertex U_{2n+1} dominates the vertices U_{i1}, U_{i2}, U_{i3}, U_{i4}…. U_{in} and the remaining vertices of the dominating set D dominate other vertices as such. Therefore, D is considered as the Dominating set. Considering the vertex U_{2n+i} be removed then the vertices U_{i1}, U_{i2}, U_{i3}, $U_{i4....}U_{in}$ are not dominated by U_{2n+i}. And hence the set D cannot be the dominating set. This case also fits for the remaining vertices of the set D. Beyond the considered dominating set D no other minimal vertices could be considered as the dominating set D. Therefore, D is the minimal dominating set

The domination number of total graphs of a n-Sunlet graph is n.

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V Conclusion

Dominating sets are used to solve a variety of communication problems in wireless sensor networks. Dominating sets are useful to determine the energy efficiency, unicast and multicast routing, in accessing media. In this paper, mobile networks are considered as a total graph of n-sunlet graph and its domination numbers are identified.

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