ISSN: 2319-8753

International Journal of Innovative Research in Science, Engineering and Technology

(ISO 3297: 2007 Certified Organization)

Vol. 2, Issue 8, August 2013

RADIO LABELING OF A CLASS OF PLANAR GRAPHS

N.SRINIVASA RAO[1], K.SRINIVASA RAO[2], K.MAHALAKSHMI[3]

Associate Professor, Dept Of Mathematics, Vignan's University, Vadlamaudi, A.P. India

Assistant Professor, Dept Of Mathematics, Tirumala Engineering College, Jonnalagadda, India

Assistant Professor, Dept Of Mathematics, Vignan's Nirrula Engineering College, Guntur, India

Abstract: This paper deals with radio labeling of planar graphs. We proved that a certain class of planar graphs defined using the complete planner graphs, and a class of planar bipartite graphs defined using the complete bipartite graphs are radio labeled properly subject to the certain conditions. We also provide radio labeling for friendship graph.

Key words: class of planar graphs, class of bipartite planar graphs**,** Radio number, Radio labeling.

Subject classification: 05C12

I.INTRODUCTION

Radio labeling of graphs is motivated by restrictions inherent in assigning channel frequencies for radio transmitters[1].To avoid interference, transmitters that are geographically close must be assigned channel with large frequency difference, transmitters that are further apart may receive channels with relatively close frequencies. The general situation is modeled by identifying transmitters with the vertices of a graph subject to a restriction conenering the distance between the vertices. The goal is to minimize the largest integer used.

Definition (1.1): Distance d (u, v) is a shortest path between the vertices u, v in a graph "G".

Definition (1.2): Diameter d(G) is a maximum distance of a graph "G".

Definition (1.3): A Radio labeling is one to one mapping $C: v(G) \rightarrow Z^+$ satisfying the condition
$d(u,v) + |c(u)-c(v)| \geq d(G)+1$, for every vertices u, v in G.

Definition (1.4): The span of a labeling "C" is the maximum integer maps that "C" maps to a vertex of graph "G".

Definition (1.5): Radio number of graph G, is defined as the lowest span taken over all radio labeling of graph G, and is denoted by rn (G)

II.THE CLASS OF PLANAR GRAPHS

In [2] Babujee defines a class of planar graphs by removing certain edges from the complete graphs. The class of planar graphs so obtained is denoted by "PL_n" and contain maximum number of edges possible in planar graphs on N vertices.

Definition (1.6)[2]: The class of graphs $PL_n(V_n, E_n)$ has the vertex set $V_n=\{1,2,3,..n\}$, and the edge set $E_n=E(K_n)/\{(k, l), 1\leq k\leq n-4, k+2\leq l\leq n-2\}$

The embedding we use for Pl_n is described as follows. Place the vertices $v_1, v_2, ..v_{n-2}$ along a vertical line in that order with v_1 at the bottom and v_{n-2} at the top as shown in figure 1.Now place the vertices v_{n-1} and v_n as the end points of a horizontal line segment (perpendicular to The line segment used for placing the other n-2 points) with v_{n-1} to the left of v_n so that the Vertices v_n, v_{n-1} and v_{n-2} form a triangular face. See figure 1 for an illustration. The edges of the Graph Pl_n

IJIRSET

ISSN: 2319-8753

International Journal of Innovative Research in Science, Engineering and Technology

(ISO 3297: 2007 Certified Organization)

Vol. 2, Issue 8, August 2013

can now be drawn without any crossings. All the faces of this graph are of length 3. From now on, in this section, when we refer to the faces by the vertices of the face, we use the vertex numbers from the embedding described.

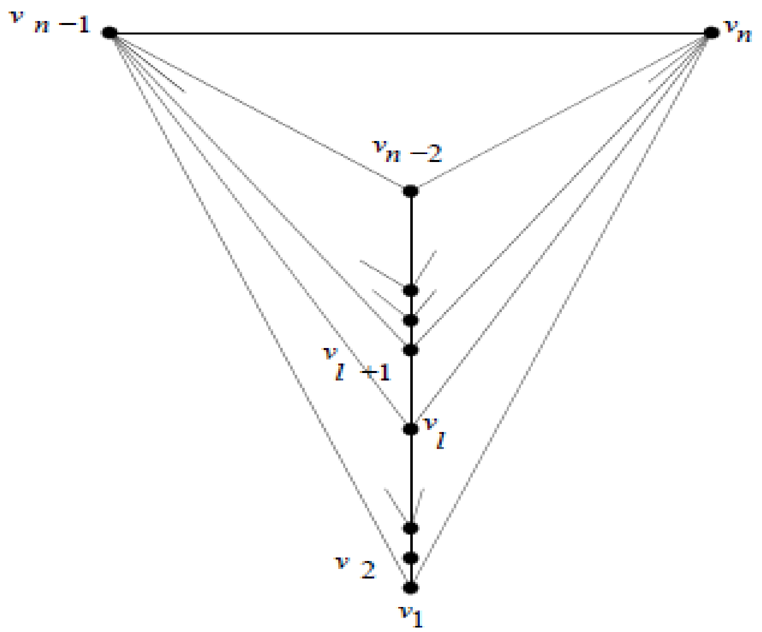

Figure 1: The class Pl_n.

The class of $pl_{m,n}$ of bipartite graphs:

Definition (1.7)[3]: the plane (v, E), the vertex set is V = {v_1 ,v_2,..v_m ,u_1,u_2,..u_n} and the set of edges E=E($k_{m,n}$/{(u_l, up): l==3,4,…m, and p=2,3…n-1}

The graph is bipartite planner graph with maximum number of edges 2m+2n-4 and m+n vertices. we now describe the embedding we use for our proofs. Place the vertices u_1, u_2,..u_n in that order along a horizontal line segment with u_1 as the left end point and u_n as the right end point as shown in figure2. Place the vertices $v_{m.}$, v_{m-1},.., v_3, v1 in that order along a vertical line segment with v_m as the top endpoint and v_1 is the bottom end point so that this entire line segment is above the horizontal line segment where the vertices $u_1$through u_n are placed . finally place v_2 below the horizontal line segment so that the vertices $v_{1,}u_k$,v_2,u_{k+1} form a place of length 4 for $1 \le k \le n-1$. Notice that though we talk about placement along a line segment, no edges other than those mentioned in the definition are to be added. From now on , in this section, when we refer to the faces by listing the vertices forming the face, we use the vertex numbers given by the above embedding.

ISSN: 2319-8753

International Journal of Innovative Research in Science, Engineering and Technology

(ISO 3297: 2007 Certified Organization)

Vol. 2, Issue 8, August 2013

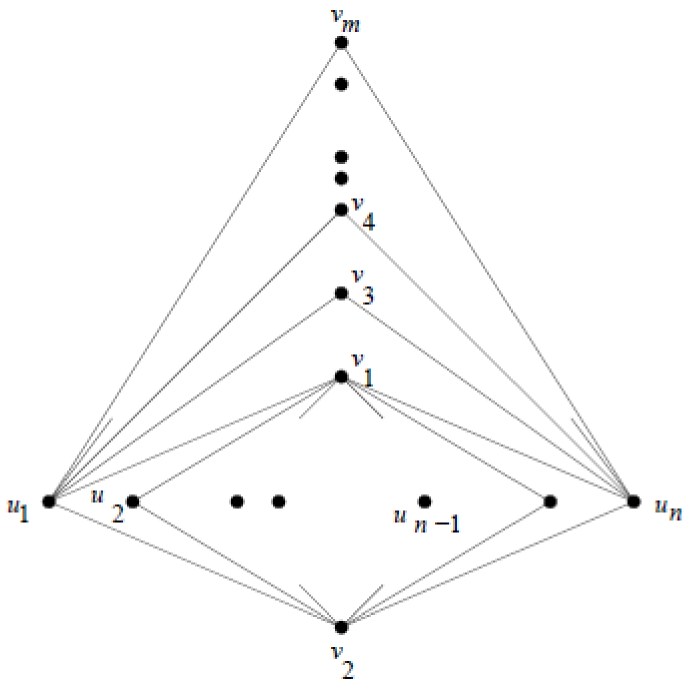

Figure 2: The class $Pl_{m,n}$.

III.RESULTS

In this paper, we focused on radio labelling of certain class of planar graphs, planar bipartite graphs and friend ship graphs.

Proposition (2.1): The graph pl_n is Radio labelled where $n \geq 5$

Proof: Consider a planar class $pl_n(V, E)$ with n vertices $v_1, v_{2....}, v_n$ and 3(n-2) edges.

Clearly the distance between the every pair of vertices is ≤2 i.e. $d(u,v) \leq 2$

∴ Diam (G) =2

The labelling of vertices are $C(v_i)=2i-1$ for i=1(2)n

Clearly the labelling C (v_i) satisfies the radio condition

$$d(u, v)+|C(u)-C(v)| \geq diam(G) + 1$$

∴ The class of planar graphs $pl_n(V,E)$ when $n \geq 5$ is Radio labelled.

It may be seen that Radio number of class of planar graphs $pl_n(V,E)$ when $n \geq 5$ is 2n-1.

Remark: In [1],It is observed that, If G is a connected graph of order "n'' and diameter 2 then $n \leq rn(G) \leq 2n-2$

But we prove that If G is a connected graph of order "n'' and diameter 2 then $n \leq rn(G) \leq 2n-1$.

Proposition (2.2): For all m, $n \geq 3$. The graph $pl_{m,n}$ is radio labelled, either m is odd or m is even and $4n+m \neq 0$

Proof: consider the planar graph $pl_{m,n}$ with m+n vertices $v_1, v_{2....} v_m, u_1, u_2, .. u_n$ and edges 2m+2n-4 edges.

Clearly the distance of every pair of vertices is ≤3 i.e. $d(u,v) \leq 3$

∴ Diam (G)=3

The labelling of vertices are C $(v_i)=2i-1$ for i=1to n

The labelling of vertices are C $(u_j)=2(m+j)$ for j =1 to n

Clearly the labelling $C(v_i)$ satisfies the radio condition

$$d(u,v)+|C(u)-C(v)| \geq \text{diam}(G) + 1 \text{ where } u, v \in V$$

Clearly the labelling $C(u_j)$ satisfies the radio condition

$$d(u,v)+|C(u)-C(v)| \geq \text{diam}(G) + 1 \text{ where } u, v \in U$$

In general the distance between the vertices of U, V is ≤ 3.

∴ The class of planar bipartite graphs $pl_n(V,E)$ when $n \geq 5$ is Radio labelled.

It may be seen that Radio number of class of planar bipartite graphs $pl_n(V,E)$ when $n \geq 5$ is $2(m + j)$.

Friendship graph with 2n+1 vertices and 3n edges:

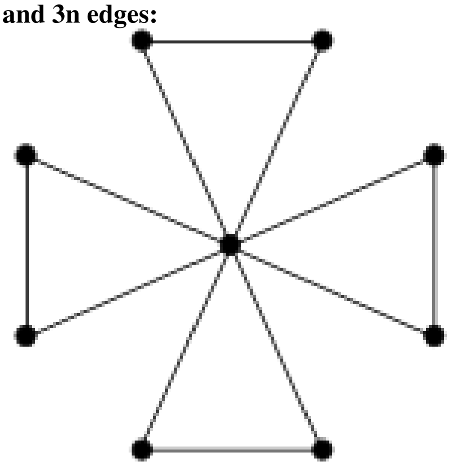

Figure 3

Proposition (2.3): For all $n \geq 1$, the friendship graphs are radio labelled properly.

Proof: consider the friendship graph F_n with 2 n +1 vertices, and 3n edges.

Clearly the distance between the every pair of vertices is ≤ 2 i.e. $d(u, v) \leq 2$

∴diam (G) =2

The labelling of vertices are $C(v_i) = 2i-1$ for i=1 to 2n+1.

Clearly the labelling $C(v_i)$ satisfies the radio condition

$$d(u, v) + |C(u)-C(v)| \geq \text{diam}(G) + 1$$

∴ The class of planar graphs $pl_n(V, E)$ when $n \geq 1$is Radio labelled.

It may be seen that Radio number of friendship graphs F_n where $n \geq 1$ is 2i-1.

Conclusion: Certain classes f planar graphs are properly Radio labelled in this paper.

REFERENCES

1. G.Chartrand, D.Erwin, P.Zhang, and F.Harary, Radio labeling of graphs, bull. Inst.combin.appl. vol 33 page no77 -85. (2001)

2. J.Baskar babujee, Planar graphs with maximum edges- antimagic property. The mathematical education, 37(4):pageno 194-198,(2003)

3. k. Ramanjenyulu, k.Kishore, and Ch. Venkaiah, anti magi labeling of planar graphs, Australian journal of mathematics volume 41 page no283-290. | (2008)

4. Gallian, J.A. "Dynamic survey of graph labeling ".Electronic journal of combinatrics, DS61-58, JAN3, (2007).