Bharath
INSTITUTE OF HIGHER EDUCATION AND RESEARCH
(Declared as Deemed-to-be University under section 3 of UGC Act, 1956)
(Vide Notification No. F.9-5/2000 - U.3, Ministry of Human Resource Development, Govt. of India, dated 4th July 2002)
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Ref No.SMS-2018-O-23

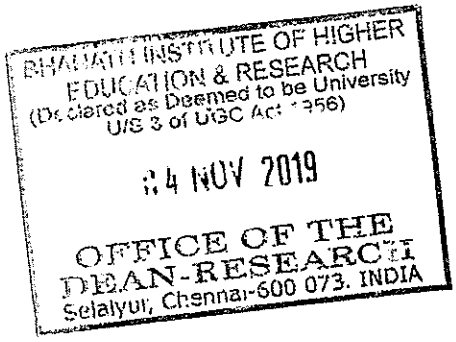
Date: 04/11/2019

TO

Mrs. Dr. N. Ramya,

Associate Professor/ Mathematics,

BIHER.



Thro: Concern Head of the Department

Greetings!!!

We are happy to announce that the Research Advisory Committee has approved your proposal for Seed Money Scheme-2018 which was presented by you. You are requested to complete the proposal and send the progress report to the Dean Research in the prescribed time period.

Title of the Project: Labelling concept to network addressing and social networks

Seed Money Amount: Rs.1, 00,000/- (Rupees One Lakh Only)

Approved on: 02/11/2019

Payment details:

Voucher No.23 **Dated: 08/11/2019**

With Regards

04/11/19

Dean-Research

Bharath University

SELAIYUR, CHENNAI - 600 073, TAMIL NADU, INDIA.

CASH / PAYMENT VOUCHER

Date 08/11/19.

V.No. 023

Debit _____ Amount

Rs. 1,00,000/-

PAID TO Mrs. N. Ramya

RUPEES One Lakh only

TOWARDS Seed Money Scheme 2018

Authorised by **Finance Manager** **Cashier/Accountant** **Payee's Signature**

FORMAT FOR PROPOSAL SUBMISSION

1. Details of Principal Investigator

Name	:	Dr.N.Ramya
Designation	:	Associate professor
Highest Qualifications	:	Ph.D.
Department	:	Mathematics
E-mail	:	drramyamaths@gmail.com
Contact no	:	9710602510
Date of Joining	:	01/09/2005

2.Details of Co-Principal Investigator

Name	:	S.R.Prathiba
Designation	:	Associate professor
Highest Qualifications	:	Ph.D.
Department	:	Mathematics
E-mail	:	s.r.prathiba@gmail.com
Contact no	:	9176640746

Technical details

1. Introduction

Graph Theory is still young even though it has experienced developments during the last sixty years. It has lot of applications in many areas of computing social and natural sciences.

There are many diversity concepts in graph theory In particular the concept of labelling of graphs has wide range of applications to coding theory, circuit design, network design and communication problems.

Now a days the study of graph labelling include abundance of different types of labelling.

Graph labeling were first introduced in the late 1960's.

A Graph G = G(V,E) with V vertices is said to admit prime labelling if its vertices can be labelled with distinct positive integers not to exceeding V such that the labels of each pair of adjacent vertices are relatively prime. A graph G which admits prime labelling is called a prime graph

The field of Graph Theory plays vital role in various fields. One of the important areas in graph theory is Graph Labeling used in many applications like coding theory, x-ray crystallography, radar, astronomy, circuit design, communication network addressing, data base management. This paper gives an overview of labeling of graphs in heterogeneous fields to some extent but mainly focuses on the communication networks. Communication network has two types 'Wired communication' and 'wireless communication'. Day by day wireless networks have been developed to ease communication between any two systems, results more efficient communication. This paper also explored role of labeling in expanding the utility of this channel assignment process in communication networks. Various papers based on graph labeling have been observed, and identified its usage towards communication networks. This paper addresses how the concept of graph labeling can be applied to network security, network addressing, channel assignment process, social networks. An overview and new ideas has been proposed here.

2.Review of status of Research and Development in the subject

Fast Communication in sensor networks Using Radio Labeling

Given a set of transmitters, each station is assigned a channel (a positive integer) such that interference can be avoided. The smaller the distance between stations is, the stronger the interference becomes, and hence the difference in channel assignment has to be greater. Here each vertex represents a transmitter and any pair of vertices connected through an edge corresponds to neighboring transmitters. Here the kind of labeling used is Radio labeling which is defined as Let G = (V (G),E(G)) be a connected graph and let d(u, v) denote the distance between any two vertices in G. The maximum distance between any pair of vertices is called the diameter of G denoted by diam (G). A radio labeling (or multilevel distance labeling) for G is an N union {0} such that

For any vertices u and v, |f (u) −f (v)|◊injective function f: V (G) >=diam (G) − d (u, v)+1

International Status

For Any application applied radio labeling process proved as an efficient way of determining the time of communication for sensor networks.

Here the network is considered as chain graph in which every sensor planted in the network is a vertex communicating at time t, where t is radio channel assignment. It was found that the random dump of junk in the network then the radio labeling has the property of having "consecutive" channel assignments – close time frames far away from each other. Channel labeling can be used to determine the time at which sensor communicate.

Designing Fault Tolerant Systems with Facility Graphs

In this application the network is represented in the form of a facility graph. A facility graph is a graph G whose nodes represent system facilities and whose edges represent access links between facilities. A facility here is said to be a hardware or software components of any system that can fail independently. Hardware facilities include control units, arithmetic processors, storage units and input/output equipments. Software facilities include compilers, application programs, library routines, operating systems etc. Since each facility can access some other facilities, the real time systems are represented as a facility graph.

Facility types are indicated by numbers in parentheses which is termed as graph vertex labeling. The graph indicates the types of facilities accessed by other facilities. The node x1 accesses the nodes x2 and x4. Similarly, the node x5 with facility type t1 access the facility types t3, t1 and t2 of nodes x3, x2 and x4 respectively. In this facility graph when ever any node fails no need to worry about the communication link because here the facility graph find out another path and communication process done as well as before.

To find an efficient way, safe transmissions are needed in areas such as Cellular telephony, Wi-Fi, Security systems and many more. It is unpleasant being on the phone and getting someone else on the same line. This inconvenience is given by interferences caused by unconstrained simultaneous transmissions. Two close enough channels can interfere or resonate thereby damaging communications. The interference can be avoided by means of a suitable channel assignment.

The channel assignment problem is the problem to assign a channel – nonnegative integer, to each TV or radio transmitters located at various places such that communication do not interfere. In a graph model of this problem, the transmitters are represented by the vertices of a graph; two vertices are very close if they are adjacent in the graph and close if they are at distance two apart in the graph.

In a private communication the channel assignment problem in which close transmitters must receive different channels and very close transmitters must receive channels that are at least two apart.

This problem is addressed by means of modeling the network wireless LAN in the form of an interface graph and solving it using graph labeling technique.

In interference graph the access points (vertices) are interfering with some other access points in the same region. The graph is called as interference graph, which is constructed by the access points as nodes. An undirected edge is connecting these nodes if the nodes interfere with each other when using the same channel. Now, the channel allocation problem is converted into graph labeling problem i.e. vertex labeling problem.

C where C is the set of colors corresponds to the channels on the access points. These channels are preferably non overlapping edges. A labeling algorithm – DSATUR (Degree of Saturation) is used for labeling purpose. The algorithm is a heuristic search i.e. it finds vertices with largest number of differently colored neighbors. If this◊A vertex coloring function f: v (G) subset contains only one vertex it is chosen for labeling. If the subset contains more than one vertex then the labeling is done based on the order of decreasing number of unlabeled neighbors. If more than one candidate vertex is available then the final selection is replaced by a deterministic selection function to select the vertex. The protocol operation is done by identifying the neighbors by means of listening the messages generated by the access points. The protocol operation finishes when a message is rebroadcasted by the access points. After finishing this, the interference graph is constructed and the labeling algorithm is applied. The correspondence between the channels and the graph is that as the channels listen the messages in regular intervals as the same way the labeling algorithm should be kept running at regular intervals.

Avoiding Stealth Worms by Using Vertex Covering Algorithm

The vertex cover algorithm (Given as input a simple graph G with n vertices labeled 1, 2,...n, search for a vertex cover of size at most k. At each stage, if the vertex cover obtained has size at most k, then stop.) is used to simulate the propagation of stealth worms on large computer networks and design optimal strategies to protect the network against virus attacks in real time. The importance of finding the worm propagation is to hinder them in real time.

The main idea applied here is to find a minimum vertex cover in the graph whose vertices are the routing servers and the edges are the connections between the routing servers. Then an optimal solution is found for worm propagation.

Analyzing Communication Efficiency in sensor networks with Voronoi Graph

The sensor networks have got variety of applications. Tracking of mobile objects, collection of environmental data, defense applications, health care etc...,

The sensor network is modeled as a graph to analyze the communication efficiency. Here voronoi graph is used to model the sensor network. Because voronoi graph is constructed in a

plane in the form of polygons with nodes as the sensors and the Polygon boundaries can be considered as the sensing range of each sensor.

The polygon can be considered as the sensing range of these sensors. Among these sensors one sensor will be the cluster head for reporting function. Two sensors are considered as neighbors if their sensing ranges share a common boundary in the voronai graph.

When the objects cross the boundary of one sensor i.e. the sensing range of one sensor, and enter into the sensing range of another sensor it should be reported to the neighboring sensor properly by the previous sensor.

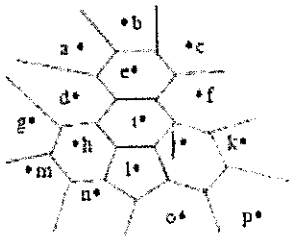


FIG 3. Vornoi Graph

In the diagram a, b are neighbors. Similarly, e,f; e,d; e,I; are also neighbors. When the objects cross the boundary of one sensor i.e. the sensing range of one sensor, and enter into the sensing range of another sensor it should be reported to the neighboring sensor properly by the previous sensor. Finally the communication efficiency can be increased by taking the above voronoi graph in sensor networks.

Reducing the Complexity of Algorithms in Compression Networks

Here a large network is considered. Dealing with such huge networks is a complex task in all aspects. In this, graphical summary of the large graphs arising in the domain of enterprise IP networks are created. Domain is rich in large highly engineered graphs. This is done by transforming the original graph into a smaller one using structural features of the graph that have well understood semantics in our domain. This results smaller and usually annotated, graph can then be visualized, and understood by a human being confronted with such a dataset. This process is referred as graph compression or more properly, semantic graph compression, to

distinguish it from algorithmic graph compression where a graph is compressed in order to reduce the time or space complexity of a graph algorithm. In Compression Networks a graph is compressed in order to reduce the time or space complexity of a graph algorithm. There are many advantages of creating a communications network. One advantage is that if a link goes out, a simple algorithm could detect which two centers are no longer linked, since each connection is labeled with the difference between the two communication centers. Another advantage is that this network also would have all the same properties as a graceful graph; such as having cyclic decompositions.

Graph Labeling in Communication Relevant to Adhoc Networks

Graph labeling can also use for issues in Mobile Adhoc Networks (MANETS). In Adhoc networks, issues such as connectivity, scalability, routing, modeling the network and simulation are to be considered. Since a network can be modeled as a graph, the model can be used to analyze these issues. Graphs can be algebraically represented as matrices. Also, networks can be automated by means of algorithms. The issues such as node density, mobility among the nodes, link formation between the nodes and packet routing have to be simulated. To simulate these concepts random graph theory is used. Various algorithms are also available to analyze the congestion in MANET's where these networks are modeled based on graph theoretical ideas.

3.Progress/achievement so far, Social relevance and usefulness of the project :

A communication network is composed of nodes, each of which has computing power and can transmit and receive messages over communication links, wireless or cabled. The basic network topologies are include fully connected, mesh, star, ring, tree, bus.

4. Work Plan:

- Analysing communication efficiency in sensor networks
- Avoiding stealth worms by using vertex covering
- Communication in networks using Radio labelling

4.1 Methodology:

The communications network addressing: A communication network is composed of nodes, each of which has computing power and can transmit and receive messages over communication links, wireless or cabled. The basic network topologies are include fully connected, mesh, star, ring, tree, bus. A single network may consist of several interconnected subnets of different topologies

4.2 Time Schedule of activities giving milestones through BAR diagram.

S. NO	ACTIVITIES	1st 4 (month)		2nd 4 (month)		3 rd 4 (month)	
1	Literature survey						
2	Recruitment						
3	Data Collection						
4	Analysis the Labelling						
5	Analyzing communication efficiency						
6	Compilation of results, submission of papers & report preparation						

4.3 Expected outcome within the time period of Seed Money Scheme

- The novel synthesis and sensor methodology that will be obtained through this proposed project may be potential for biological applications in near future.
- The resultant sensing methodology of this project could be nationally as well as internationally patented.
- The completed project work could be commercialized towards the large scale development of product.
- The results of our project work will be consolidated, published in highly reputed journals.
- A group of full time research scholars working under the guidance of PI will be highly benefited and will be trained to carry-out an independent research in this field.

5. Suggested Plan of action stating the name of funding agency where the project will be communicated for financial support within the time period of project.

NIL

6. Bibliography: NIL

7. List of Projects submitted/implemented by the Investigators (Separate for Pi and Co-PI)

NIL

7.1 Details of Projects submitted to various funding agencies:

Sl. No.	Title	Cost in lakhs	Month of submission	Role as PI/ Co-	Agency	Status
	NA	NA	NA	NA	NA	NA

7.2 Details of Projects under implementation

Sl. No.	Title	Cost in lakhs	Duration	Role as PI/ Co-PI	Agency
	NA	NA	NA	NA	NA

7.3 Details of Projects completed during the last 5 years

Sl. No.	Title	Cost in lakhs	Duration	Role as PI/ Co-PI	Agency
	NA	NA	NA	NA	NA

8. List of publications published by the Investigator

1. Ramya, N., Rangarajan, K. and Sattanathan, R. "On coloring of bi-magic 4-regular graphs", International Journal of Physical Sciences Ultra Scientist, Vol. 23, No. 3A, pp. 738–742, 2011.
2. Ramya, N, Rangarajan, K. and Sattanathan, R. "4-regular graphs and its prime labeling", International Journal of Combinatorial Graph Theory and Applications, Vol. 5, No.1, pp. 71–82, 2012.
3. Ramya, N., Rangarajan, K. and Sattanathan, R. "On prime labeling of some classes of graphs", International Journal of Computer Applications, Vol. 44, No. 4, pp. 1–3, 2012.
4. Ramya, N., Rangarajan, K. and Sattanathan, R. "On rainbow coloring of some classes of graphs", International Journal of Computer Applications, Vol. 46, No. 18, pp. 36, 2012.
5. Ramya, N., Rangarajan, K. "On edge–magic labeling of some Graphs", IJPAM, Vol. 6, No. 4, pp. 277–281, 2013.
6. Ramya, N., Kumaravel.A Rangarajan, K. "Energy Characteristic for Honey comb Cluster" Journal of Innovative research and solution.Vol2(1),pp50-53,2013

7. Ramya.N"On coloring of corona graphs" vol 7, 3(s) March 2014,Indian Journal of Science and Technology.
8. Ramya.N"On coloring of Wheel graphs" vol 7, 3(s) March 2014, Indian Journal of Science and Technology.
9. Ramya.N"On coloring of Fish tail graphs" vol 7, 5(s) March 2014, Indian Journal of Science and Technology
10. Ramya.N"On Star Chromatic Number Of P3(n)" vol 7, 5(s) March 2014, Indian Journal of Science and Technology
11. Ramya.N Shalini.R"On Lucky edge labeling of some graphs" vol 4, (9) pp8146-8148,2015, IJIRSET
12. Ramya.N"On Rainbow coloring of some graphs" vol 4, (8s) pp 7091-7093,2015, IJIRSET

List of publications published by the Co- Investigator

1. K. Sumathi & S. R. Prathiba, Magneto hydrodynamic viscous flow due to rotation of a Circular cylinder bounded by a Porous medium, Indian Journal of Mathematics and Mathematical sciences, 5(2), (2009), 41-47.

2. S. R. Prathiba & K. Sumathi, Magnetohydrodynamic flow past a rotating circular cylinder, International Journal of Computer Application,4(3),(2013),18-29.

3. C. Loganathan & S. R. Prathiba, Magnetohydrodynamic flow past a porous spherical aggregate with stress jump condition, Progress in Nonlinear Dynamics and Chaos, 1, (2013), 76-92.

4. C. Loganathan & S. R. Prathiba, Magnetohydrodynamic oscillatory Stokes flow past a porous sphere, Elixir Applied Mathematics, 74, (2014), 26960-26974.

9. DETAILS OF BUDGET

Sl. No.	Head	Amount in INR
1	Permanent equipments (only project specific, minor equipments: major equipments /facilities are expected to be already available with the institution(s): Name & cost may be indicated) IR Camera -1 No	60,000/-
2	Travel support for the purpose of research work.	10,000
3	Contingency Consumables (CD, Hard Disk for data Storage) Other Consumable, cartridge, paper roll	19,000/-
4	Others	11,000/-
	Total	1,00,000/-

10. Name of at least two subject experts from the Institute and one from the outside Institute with their contact details:

a) Dr. K.Manimekalai

HOD of Mathematics,BIHER,

Contact No: 9841756446

b) Dr.S.Balamuralitharan

Associate Professor in Mathematics,

SRM Institute of Science and Technology.

Contact No: 9841922575

CERTIFICATE FROM THE INVESTIGATOR

Project Title: Labelling concept to network addressing and social networks

It is certified that

1. I do hereby agree to submit a complete proposal for financial support to the external funding agency within the time period of SMS-2018

2. I undertake that spare time on equipment procured in the project will be made available to other users.

3. I agree to submit a certificate from Institutional Biosafety Committee, if the project involves the utilization of genetically engineered organisms. I also declare that while conducting experiments, the Biosafety Guidelines of Department of Biotechnology, Department of Health Research, GOI would be followed in to.

4. I agree to submit ethical clearance certificate from the concerned ethical committee, if the project involves field trails/experiments/exchange of specimens, human & animal materials etc.

5. I agree to abide by the terms and conditions of SMS-2018, BIHER,Chennai.

Name and signature of

Principal Investigator

(CN.RAMYA)

S.R.Prabha

Name and signature of

Co-Principal Investigator

[DR.SR.PRATHIBA]

Date: 04/10/2019
Place: Chennai-73

Forwarded by Head of the Department

Signature of the Head

PROJECT EVALUATION FORMAT

Recommendation Sheet

Name of the Principal Investigator	Dr. N.Ramya
Name of the Co-Investigator	Dr.S.R.Prathiba
Name of the Department	Mathematics
Title of project	Labelling concept to network addressing and social networks
Recommendation of the evaluation committee	—Recommended—
Financial allocation recommended	Rs. 100,000/-

Sl. No.	Head	Amount in INR
1.	IR Camera -1 No	60,000/-
2	Travel support for the purpose of research work.	10,000
3	Contingency Consumables (CD, Hard Disk for data Storage)Other Consumable, cartridge, paper roll	19,000/-
4	Others	11,000/-
	Total	1,00,000/-

Name and Signature of the Research Advisory Committee members with date

Dr. P. Navaneethan

BIHER * Internal Quality Assurance Cell * IQAC Chennai-73 Selaiyur