पेटेंट कार्यालय
शासकीय जर्नल

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पेटेंट कार्यालय का एक प्रकाशन
PUBLICATION OF THE PATENT OFFICE

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(54) Title of the invention : RECHARGEABLE WIRELESS SENSOR NETWORKS WITH MULTIPLE SINKS

(51) International classification	:H04W0084180000, H04W0028220000, H04W0040100000, G01D0009000000, G06T0003000000
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(61) Patent of Addition to Application Number	:NA
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Filing Date	:NA

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(57) Abstract :
ABSTRACT RECHARGEABLE WIRELESS SENSOR NETWORKS WITH MULTIPLE SINKS In this invention here, we propose a higher data generation rate maximized it as an optimization problem for a network with multiple sinks, to achieve a desirable balance between energy replenishment amount and the data gathering rate is maximized and the sensor can migrates among those root sink nodes, however the low output of energy may cause increase of recharging opportunities in the data collection rate the rapid improvement of wireless sensors are deployed by joint energy and replenish their work more faster and to the maximum extent of data collection in turn as a linear programming problem. Accordingly, a double problem by introducing a language multiplier is build. Sequentially distribute algorithm for maximizing data collection rate and the sub gradient algorithm are used to solve it in a distributed technique. Through extensive simulation and experiment, we demonstrate our algorithm is efficient to maximize data collection rate in rechargeable wireless sensor networks

No. of Pages : 29 No. of Claims : 7

Controller General of Patents, Designs & Trade Marks

सत्यमेव जयते

G.A.R.6
[See Rule 22(1)]
RECEIPT

INTELLECTUAL PROPERTY INDIA
PATENTS | DESIGNS | TRADE MARKS
GEOGRAPHICAL INDICATIONS

Docket No 29238 **Date/Time 2021/04/05 13:22:03**

To
Dr. H.JOSEPH PRABHAKAR WILLIAMS
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CBR Detail:

Sr. No.	Ref. No./Application No.	App. Number	Amount Paid	C.B.R. No.	Form Name	Remarks
1	TEMP/E1/17600/2021-CHE	202141015900	1600	12431	FORM 1	RECHARGEABLE WIRELESS SENSOR NETWORKS WITH MULTIPLE SINKS
2	E12/1337/2021/CHE	202141015900	2500	12431	FORM 9	----

TransactionID	Payment Mode	Challan Identification Number	Amount Paid	Head of A/C No
N-0000784896	Online Bank Transfer	0504210004117	4100.00	1475001020000001

Total Amount : ₹ 4100

Amount in Words: Four Thousand One Hundred Only

Received from Saurabh Kumar Jain the sum of ₹ 4100 on account of Payment of fee for above mentioned Application/Forms.

* This is a computer generated receipt, hence no signature required.

Print

From
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Date: 05/04/2021

To
The Controller of Patents,
The Patent Office, Chennai
Sub: Submission of Patent Application with Complete Specification

TITLE OF THE INVENTION: RECHARGEABLE WIRELESS SENSOR NETWORKS WITH MULTIPLE SINKS

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Sir/Madam,
We are submitting herewith following documents towards filing of a patent application
1. Form-1
2. Form 2 and Complete Specification
3. Form- 3
4.Form-5
5.Form-9
You are requested to take the same on record and issue a receipt for the same.

Thanking You

Yours Faithfully

Dr. H.JOSEPH PRABHAKAR WILLIAMS

"FORM 1 THE PATENTS ACT 1970 (39 of 1970) and THE PATENTS RULES, 2003 **APPLICATION FOR GRANT OF PATENT** (See section 7, 54 and 135 and sub-rule (1) of rule 20	(FOR OFFICE USE ONLY)

Application No.	
Filing date:	
Amount of Fee paid:	
CBR No:	
Signature:	

1. APPLICANT'S REFERENCE / IDENTIFICATION NO. (AS ALLOTTED BY OFFICE)	

2. TYPE OF APPLICATION [Please tick ( ) at the appropriate category

Ordinary (√)		Convention (x)	PCT-NP (x)		
Divisional ()	Patent of Addition ( )	Division ( )	Patent of addition ()	Division ( )	Patent of Addition ( )

3A. APPLICANT(S)

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			Country	INDIA
			Pin code	313001

Natural Person (√)	Other than natural Person		
	Small Entity (x)	Startup (x)	Others (x)

4. INVENTOR(S) [Please tick at the appropriate category]

Are all the inventor(s) same as the applicant(s) named above?	**Yes (√)**	
If "No", furnish the details of the inventor(s)		

5. TITLE OF THE INVENTION

RECHARGEABLE WIRELESS SENSOR NETWORKS WITH MULTIPLE SINKS

6. AUTHORISED REGISTERED PATENT AGENT	IN/PA No. Name	**- NA-**
7. ADDRESS FOR SERVICE OF APPLICANT IN INDIA	Name	Dr. H.JOSEPH PRABHAKAR WILLIAMS
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	Telephone No.	
	Mobile No.	9486951395
	Fax No.	
	E-mail ID	melkejosh@gmail.com ; senanipindia@gmail.com

8. IN CASE OF APPLICATION CLAIMING PRIORITY OF APPLICATION FILED IN CONVENTION COUNTRY, PARTICULARS OF CONVENTION APPLICATION

Country	Application Number	Filing date	Name of the applicant	Title of the invention	IPC (as classified in the convention country)
NA	NA	NA	NA	NA	NA

9. IN CASE OF PCT NATIONAL PHASE APPLICATION, PARTICULARS OF INTERNATIONAL APPLICATION FILED UNDER PATENT CO-OPERATION TREATY (PCT)

International application number	International filing date
NA	**NA**

10. IN CASE OF DIVISIONAL APPLICATION FILED UNDER SECTION 16, PARTICULARS OF ORIGINAL (FIRST) APPLICATION

Original (first) application No.	Date of filing of original (first) application
NA	NA

11. IN CASE OF PATENT OF ADDITION FILED UNDER SECTION 54, PARTICULARS OF MAIN APPLICATION OR PATENT : NA

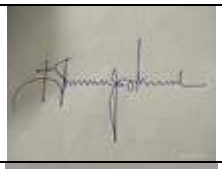
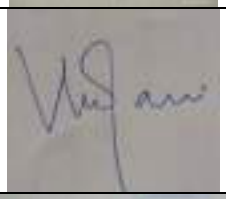
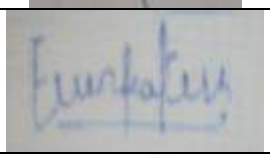
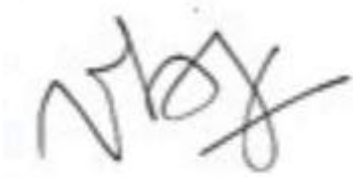
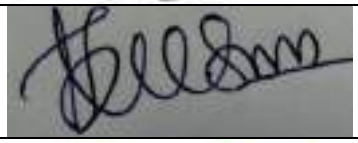
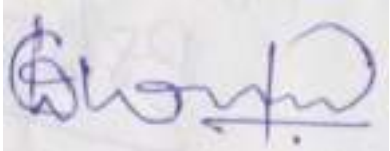
Main application/patent No. : **NA**	Date of filing of main application : **NA**

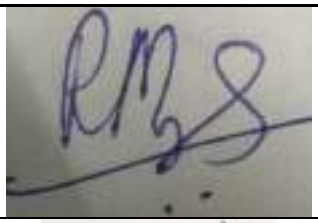
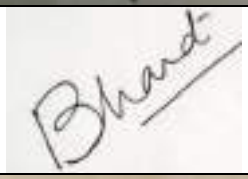
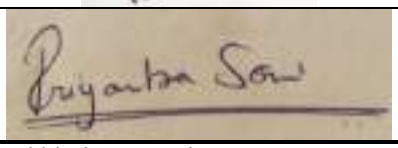
12. DECLARATIONS

(i) Declaration by the inventor(s)

(In case the applicant is an assignee: the inventor(s) may sign herein below or the applicant may upload the assignment or enclose the assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period).

We, the above named inventor(s) are the true & first inventor(s) for this Invention and declare that the applicant(s) herein are our assignee or legal representative.

NAME	SIGNATURE	DATE
Dr. H.JOSEPH PRABHAKAR WILLIAMS		05/04/2021
Dr. C.VEERAMANI		05/04/2021
Mr. E.VENKATESH		05/04/2021
Dr B.VEERA JYOTHI		05/04/2021
Dr. K.KALAIVANI		05/04/2021
Mrs. T. KALAISELVI		05/04/2021
Dr. G. BABU		05/04/2021
Mr.DHARAMALLA CHANDRA SEKHAR		05/04/2021
Prof. DHARAMVIR		05/04/2021

Dr R MURUGESAN		05/04/2021
Dr. BHARAT SINGH DEORA		05/04/2021
Ms. PRIYANKA SONI		05/04/2021

(ii) Declaration by the applicant(s) in the convention country
(In case the applicant in India is different than the applicant in the convention country: the applicant in the convention country may sign herein below or applicant in India may upload the assignment from the applicant in the convention country or enclose the said assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period)

We, the applicant(s) in the convention country declare that the applicant(s) herein are our assignee or legal representative.

(a) Date
(b) Signature(s) -------NA----------
(c) Name(s) of the signatory

(iii) Declaration by the applicant(s)

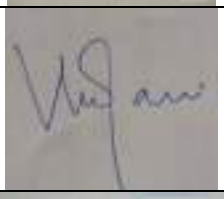
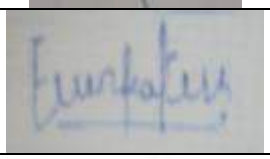
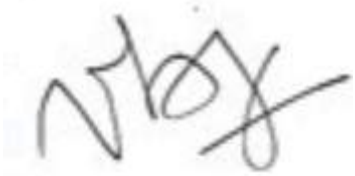
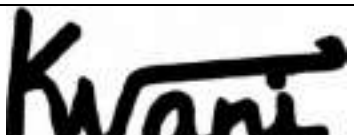
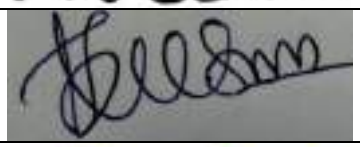
- We the applicant(s) hereby declare(s) that: -
- We are in possession of the above-mentioned invention.
- The ~~provisional~~/complete specification relating to the invention is filed with this application.
- ~~The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.~~
- There is no lawful ground of objection(s) to the grant of the Patent to me/us.
- We are the true & first inventor(s).
- We are the assignee or legal representative of true & first inventor(s).
- ~~The application or each of the applications, particulars of which are given in Paragraph-8, was the first application in convention country/countries in respect of our invention(s).~~
- ~~We claim the priority from the above mentioned application(s) filed in convention country/countries and state that no application for protection in respect of the invention had been made in a convention country before that date by me/us or by any person from which I/We derive the title.~~
- ~~Our application in India is based on international application under Patent Cooperation Treaty (PCT) as mentioned in Paragraph-9.~~
- ~~The application is divided out of my /our application particulars of which is given in Paragraph-10 and pray that this application may be treated as deemed to have been filed on DD/MM/YYYY under section 16 of the Act.~~
- ~~The said invention is an improvement in or modification of the invention particulars of which are given in Paragraph-11.~~

13. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION (a) Form 2

Item	Details	Fee	Remarks
Complete specification	No. of pages : 28		
No. of Claim(s)	No. of claims : 07 and No. of pages :01		
Abstract	No. of pages :01		
No. of Drawing(s)	No. of drawings :-- and No. of pages:--		

~~# In case of a complete specification, if the applicant desires to adopt the drawings filed with his provisional specification as the drawings or part of the drawings for the complete specification under rule 13(4), the number of such pages filed with the provisional specification are required to be mentioned here.~~

~~(b) Complete specification (in conformation with the international application)/as amended before the International Preliminary Examination Authority (IPEA), as applicable (2 copies).~~
~~(c) Sequence listing in electronic form~~
~~(d) Drawings (in conformation with the international application)/as amended before the International Preliminary Examination Authority (IPEA), as applicable (2 copies).~~
~~(e) Priority document(s) or a request to retrieve the priority document(s) from DAS (Digital Access Service) if the applicant had already requested the office of first filing to make the priority document(s) available to DAS.~~
~~(f) Translation of priority document/Specification/International Search Report/InternationalPreliminary Report on Patentability.~~
(g) Statement and Undertaking on Form 3
(h) Declaration of Inventorship on Form 5
(j)……..
Total fee
We hereby declare that to the best of our knowledge, information and belief the fact and matters slated herein are correct and We request that a patent may be granted to us for the said invention.

NAME	SIGNATURE	DATE
Dr. H.JOSEPH PRABHAKAR WILLIAMS		05/04/2021
Dr. C.VEERAMANI		05/04/2021
Mr. E.VENKATESH		05/04/2021
Dr B.VEERA JYOTHI		05/04/2021
Dr. K.KALAIVANI		05/04/2021
Mrs. T. KALAISELVI		05/04/2021
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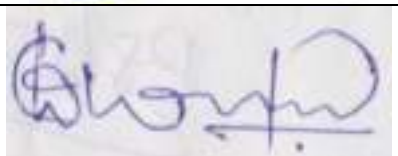
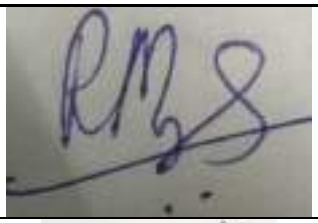
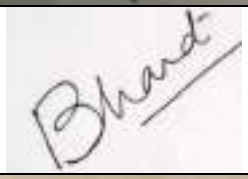
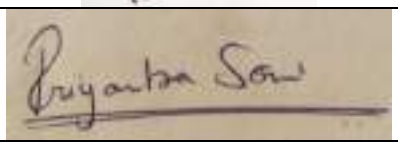
Mr.DHARAMALLA CHANDRA SEKHAR		05/04/2021
Prof. DHARAMVIR		05/04/2021

Dr R MURUGESAN		05/04/2021
Dr. BHARAT SINGH DEORA		05/04/2021
Ms. PRIYANKA SONI		05/04/2021

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Form 2

THE PATENT ACT, 1970

(39 of 1970)

&

The Patent Rules, 2003

COMPLETE SPECIFICATION

(Section 10 and Rule 13)

RECHARGEABLE WIRELESS SENSOR NETWORKS WITH MULTIPLE SINKS

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The following specification particularly describes the invention and the manner in which it is to be performed.

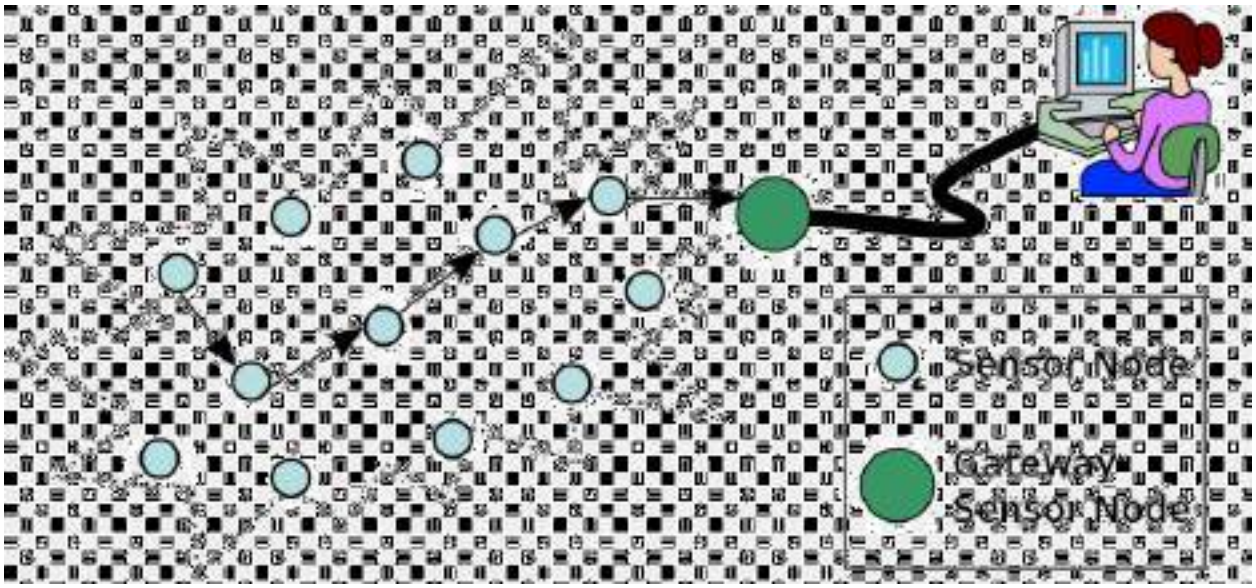
TECHNICAL FIELD

This invention proposed first generic maximal data generation rate algorithm with LP technique in R-WSNs with multiple sinks.

BACKGROUND

WIRELESS SENSOR NETWORKS

Wireless Sensor Networks (WSNs) is built with notes from a few to several hundreds are even with thousands and ten thousands. Each node is connected to one or more sensors, and set to form a significant portion of the smart Pervasive Internet of Things (IOT). In a deployment scenario for WSNs, generally a large number of small wireless sensor nodes randomly scattered over the area of interest to collection information on entities of interest, which are predominantly assumed utilizing a portable and limited energy source to power them, viz, batters shown in figure1.1. Nodes are the sense of environment to communicate the information gathered and monitored to the respective field through wireless linking nodes. The nodes are stationary by moving aware of their location also homogeneous. Therefore, once the power supply is exhausted, a group of spatially dispersed sensors for monitoring and recording the physical conditions of the environment by collecting data at a central location a sensor can no longer fulfil its role.



Gateway of sensor nodes

Even though much of the research on efficient methods to minimize energy usage for prolonging network lifetime , it is inevitable that sensors' batteries run out, and they have to be discarded because it is generally impractical to render servicing for sensors and wireless Adhoc networks in the sense that they relay on wireless connectivity and sparkling formation with networks can be transported wirelessly which usually are deployed in remote or dangerous areas.

DATA GATEWAY

Data gateway is nothing but a bridge which act as a transferring tool between one premises of data to the other. Single gateway of data is used for different services at a time. Data gateway implements to transport encryption and decryption of data at all the nodes. Only the gateway can be installed by a static controller planning to an authentication of a member to a data source within an environment. Formatting and translating the features of the data gateway helps the premises of data to the best level to achieve its energy rate at multiple tasks.

Currently, Energy Harvesting Rechargeable Wireless Sensor Networks (EHWSNs or R-WSNs) have attracted more and more attention benefiting from the lifetime extending of sensor nodes by equipping them with rechargeable technologies, an autonomous sensors to monitor environmental or physical conditions whereas temperature, pressure, sound, etc., can pass their data through the network by the central location combining with main locations which convert sources, such as body heat , foot strike , finger strokes and solar into electricity.

SENSOR NODES OR SENSOR SINKS

A sensor node(wireless sensor platform) a mote is a node but a node not always a mote. Each and every wireless sensor nodes are existing to connected nodes by forming the networks. Mostly sensor nodes with particular domain are constructed data collection, sensing temperature. Even sensor node attached to an animal with a subsystem whose purpose is to detect changes or events in the environment and broadcasting information. Harvesting energy from the environment is not new and has been in use for Decades.

A sensors together with a sunk undertakes the tasks of identifying the bandwidth constrain at each sensor nodes by a single information allows exchange of information, sensor nodes to repeatedly update their locations with its random position at correct ground temperature like volcanic eruption, atmospheric exchange, smog level in an bio-dimensional position tracking. It is important to a deployed sensor to detect a event, select the technology with a fundamental

feature and compare the measured quantity performed in a signal processing probability of each and every devices deployed outside.

A sensor deployed outside

The environment change observe mostly by a sensor in a survivalence application and a real time application which detects correct robustness of demanding and challenging realization with monitoring and high security with distributed source coding techniques of a random topology in a sensor networks to estimate the gradient of scalar field in used in R-WSNs of a generic smooth transmitted data within a efficient network energy alternatively embedded systems. Efficiency of long network system within a sensor deployed outside. It is particularly important that these power sources can be reused friendly and freely. A sensor can operate without disruption due to human intervention to change batteries and operate perpetually by using super capacitors (in the order of a million cycles) to store the harvested energy. In R-WSNs, although the source of energy can be replenished continually, a sensor generally equipped with a limited energy storage device, it cannot be always beneficial to conserve energy when a network can harvest excessive energy from the environment shown in figure. These algorithms encounter critical tradeoffs between data flow and lifetime due to energy constant in r-WSNs; the lifetime is less an issue, which can be maximized by operating in an energy neutral mode for nodes. Consider the characteristics of R-WSNs, several protocols discuss several aspects of power management or MAC schemes to improve energy efficiency and maximum data collection rate. A centralized algorithm with the line programming problem is proposed to compute the lexicographically

maximum data collection rate and routing paths for each node, which is utilized for fair and high-throughput data extraction from all sensors. Sadlapur et al. provide a distribute algorithm for jointly determining the routing structure and amount of flows on each link with flow adjustment to achieve an optimal data collection rate. Prabhakar et al. propose four throughput enhancement schemes from a simple naïve scheme with low complexity to probabilistic probing scheme incorporating advanced methods to appropriately use the harvesting energy values shown in table.

Table Value of sensor nodes

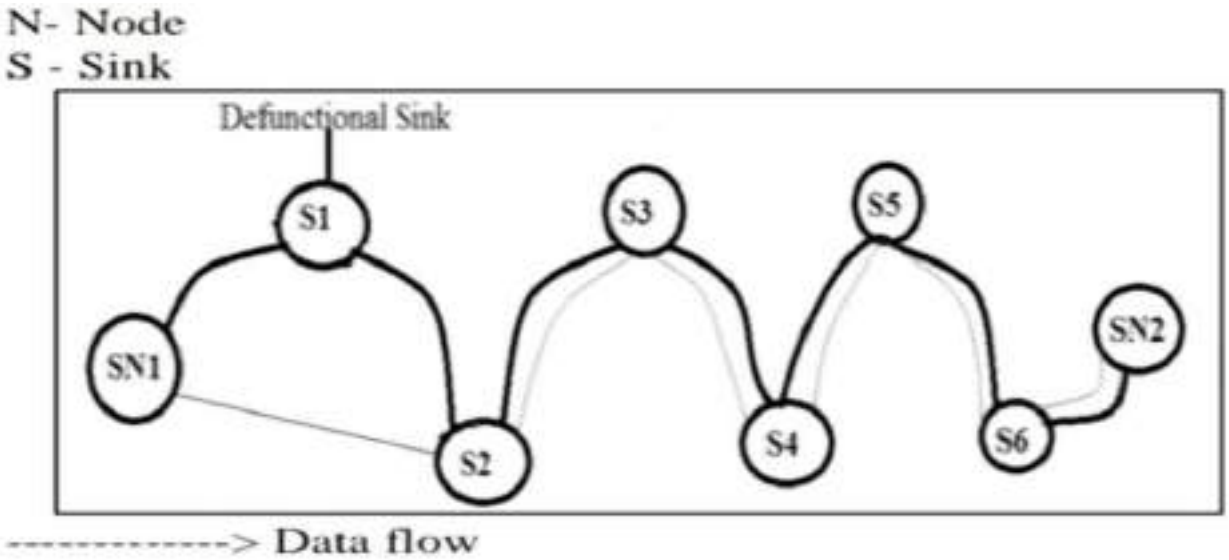
XBEE	ARDUINO
Vcc OR 3.3V	3.3V
TX or D out	RX or 0
RX or D in	TX or 1
GND	GND

However, ideal energy replenished precondition is used and limited power storage capacity hasn't been considered in these protocols. Different from earlier works, which either focus on static battery-powered network or maximizes data collection rate under a fixed routing path, in this work, we formulate the maximum data collection rate of each source sensor as optimization Linear Programming (LP) for calculating the upper bound of data generation rate rather than establishing the realistic transmission paths, in other words, for each sensor, we only obtain the maximum data collection rate theoretically without the care of their details of data forwarding implementation. In summary, on observing the lack of optimization techniques for maximizing data collection rate in existing routing algorithms for data generation rate algorithm with LP technique in R-WSNs with multiple sinks.

RECHARGEABLE WIRELESS NETWORKS:

Harvesting of energy from ambient energy to power electronic devices are recognized as promising solutions have gained worldwide attention by monitoring the many sources. The major hindrances of the "deploy and forget" nature of WSNs are their limited energy capacity. Therefore the power requirement for sensor nodes continues to decrease from a few milliwatts to a few microwatts and sustainable energy-harvesting wireless sensor networks(EH-WSN). For recharging wireless sensor nodes from ambient environment some possible energy sources followed by vibration energy, flow energy, thermal energy, photonic energy and kinetic energy are

elaborated by the sensing nodes with harvested energy. Energy harvesting for recharging wireless sensor nodes carries major technologies and protocol designs to enable harvesting energy from alternative energy sources such as wind, vibrations, solar, temperature variations, passive human power and bio-chemical energy shown in figure.



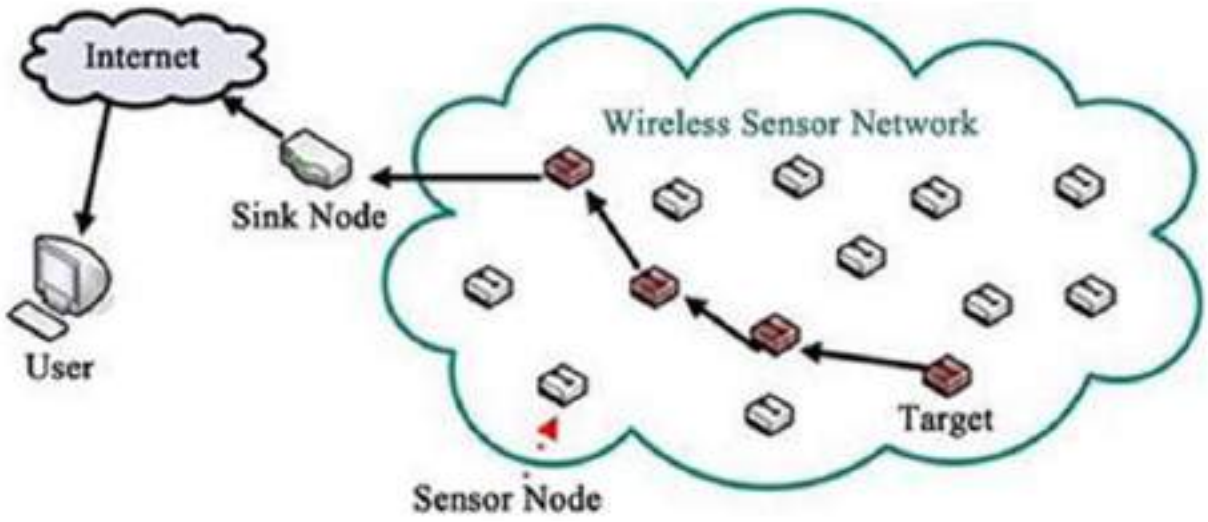
Data flow in rechargeable sensor networks

OVERVIEW OF WIRELESS SENSOR NETWORKS:

In wireless sensor networks or in rechargeable or energy harvesting wireless sensor networks(R-WSNs or EN-WSNs) have noticed and more attention beneficially the lifetime extension sensing nodes were being equipped with rechargeable technologies, sources can be converted by finger strokes, body heat, solar into electricity and foot strike. In this paper we have to calculate the upper bound of data collection rate by the way of resolving linear programming [LP] with in it, which is formulated as the optimization problem in a multiple sinks scenario. In R-WSNs, although the source of energy can be replenished continuously, by a sensor generally equipped with a limited energy storage device. However determination in deployed sensors are practical at sometimes impossible for large scale deployments in areas of harsh environments and battle fields in a irregular terrains, maximize network connectivity coverage of a function in a sensing range are being widely deployed by number of power consumed nodes, increasingly WSN needs regular transmission of power to cover its lifetime impact in comprehensive performances, based on metrics and a ideal solutions approached by optimizing the place of available sensors to achieve its persistence level moderate at any locations are in effect of radio signal propagations under the methods of efficient designing and planning of prediction. Moreover

incorrect propagation model yields useless sensors which are deactivated by human itching and animals, worst environment in fog and smog. The realistic achieving goals of the supported frameworks in WSN. Therefore, surplus energy of a node can be utilized for strengthening packet delivery efficiency and improving data generation rate. A sensor can operate without disruption due to human intervention to change batteries and operate perpetually using high and super capacitors to store harvested energy. In other words, reducing the power consumption below energy neutrality will not increases the life time further, but decreases the efficiency of a node utilization.

Hence more and more energy can be strictly extracted by the ambient environment, the harvested energy should be consumed as soon as possible in rechargeable wireless sensor networks shown in fig, to the best of our knowledge this is the first generic work that studies about the data collection rate problem using distribute algorithm and sub gradient algorithm based on linear programming in rechargeable wireless sensor networks.



Overview of wireless sensor networks

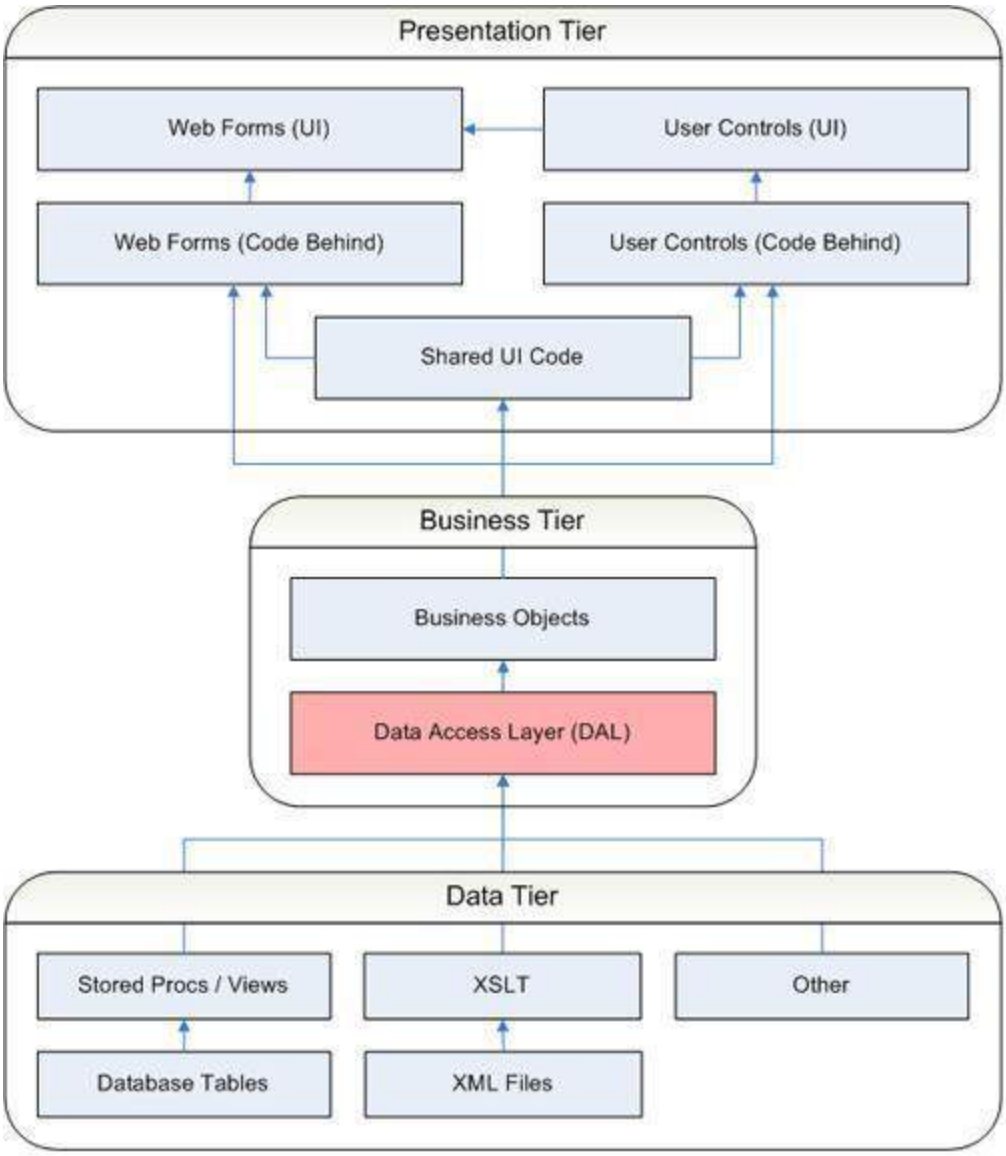
SUMMARY

ARCHITECTURAL DESIGN

Architectural design represents the structure of data and program components that are required to build a computer-based system. It considers the architectural style that the system will take, the structure and properties of the components that comprise the system, and the interrelationships that occur among all architectural components of a system. Fig shows the architecture diagram that is common for any web application. Any application is divided into three main parts, which are as follows:

- Presentation Layer
- Middleware – Business Logic Components
- Database Layer

Presentation Layer forms the user interface of the application. Presentation layer must be developed in such a way that it can be changed without doing any changes to the business or the database layer. The presentation layer must be independent of the database and the business layers. Also the presentation layer should be made in such a way that changing the presentation to the user will take less time and effort. Business logic layer contains the logic of the application. Like the database layer this layer is not exposed to the users directly but a user interface is provided to do so. The middleware forms the heart of the any application. It includes the business logic components and the software needed to deploy the system. Database acts as the data processing unit of the system. It holds all the application data in the form of tables, which are modified through the source code present within the business logic.



Architecture Diagram

The database layer contains the tables, views and stored procedures which deal with the database. Usually this layer is created before making the other layers. Database layer is also the most important layer in the application architecture that's why most of the time is spent making the database layer solid so, the pillars of the application are strong and scalable.

SYSTEM FLOW DIAGRAM

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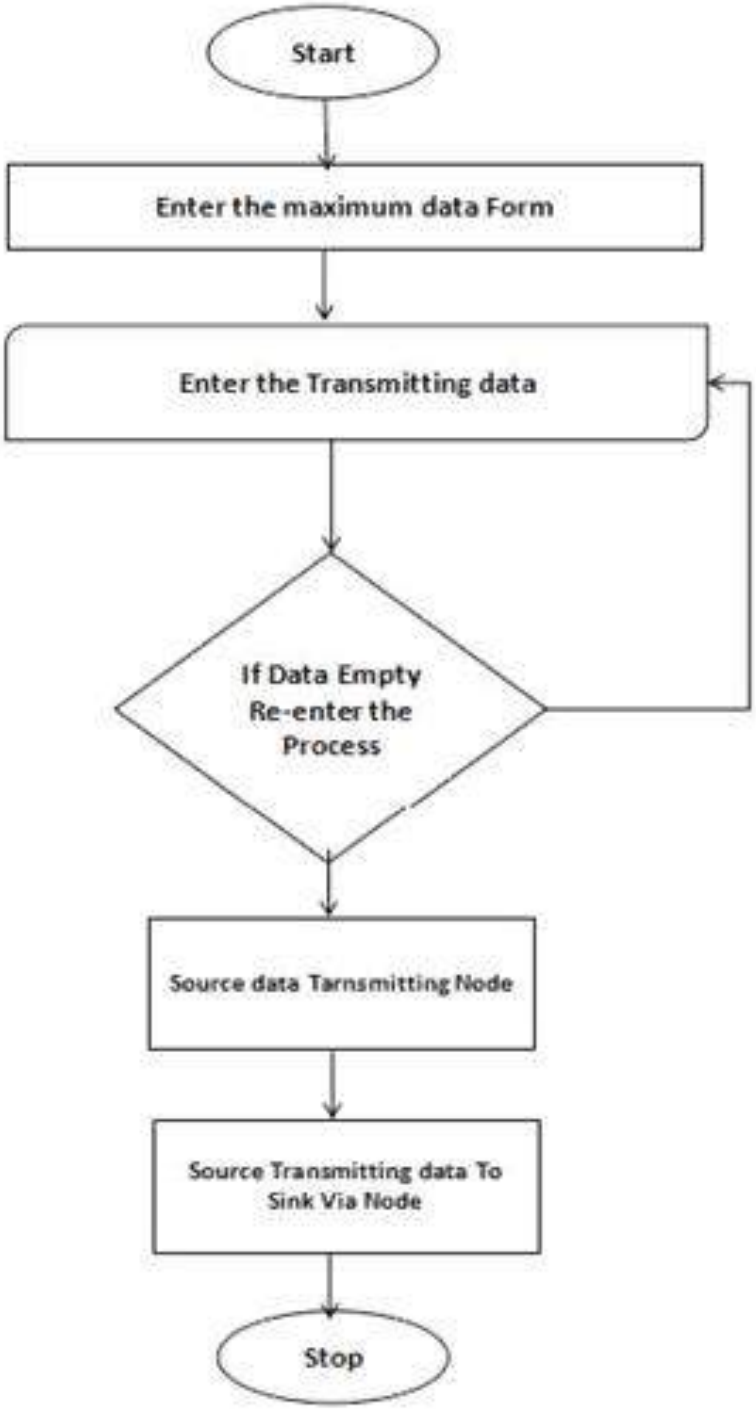


Different numbers of node are deployed over a simulated transmitter of antennas which connected to a receiver, deployed demonstrated with the connected nodes in step by step process from first node till the end of multiple nodes within the sink. A sink consists of a multiple node that propagates within the multiple nodes randomly. The connectivity of nodes are plotted by the framework in initial propagation recognize the energy in a continuous approach between the significant sinks. The optimization of this scenario being implemented in wireless sensor network that done in system flow. Overall sensing and connectivity coverage between the frameworks have more node-node connectivity respectively. When number of nodes increases energy increases of a replenished network. By observing the trend of network connectivity in the proposed framework involves optimized WSN deployment approach with a multi hop kernel based algorithm for large number of nodes in a very slow manner with thousands of kilometer squares being simulated connectively

INPUT DESIGN

Input design is the method by which valid data are accepted from the user. The valid data turn is stored as operational data in the database. Incorrect input data are the most common cause of errors in the data processing. The input design is carried out in such a way that the input screens are user friendly. The goals of designing input design are to make input data entry as easy and error free. Input screen takes care to filter the valid data from being becoming an operational data at data entry phase.

This is achieved by providing proper checks and validation procedures and certain features to users. Input design is the part of the overall system design that careful attention and is the most expensive phase. It is the point of most contact for the users with the system and so it is prone to errors.

OBJECTIVES OF INPUT DESIGN

- Produce close effective method input.
- High level accuracy.
- Free of ambiguity.

SEVERAL STAGES OF INPUT DESIGN

- Data recording
- Data verification
- Data correction
- Transmitting data to the system

The input design involves in converting the originated inputs into a system based format. The aim of input design is to make the data entry easier, logical error free. It helps to filter errors in the input data or otherwise it would enter into the database. It involves procedures for capturing data, verifying it and then passing them on to the further processing. After choosing the input medium, attention is given to the careful design of the input stages for error handling and validation procedures.

OUTPUT DESIGN

The output design defines the output required and the format in which it is to be produced. Care must be given to present the right information. The outputs generated can be classified into three main categories:-

- Screen Output
- Output to be stored as files in storage media.
- Hardcopy of the output.

The screen output displays the generated output on the screen. The results of most of the queries are displayed on the screen. The provision of generated output to be stored in the file is for future reference and to take hard copies of the same and it is used to provide the information to the management and whenever situation demands. Sample report is referred in appendix.

The output is the most important and direct source of information to the user. Efficient, output design should improve the systems relationship with the user and helps in decision making. A major form of output is a hard copy from the printer. Printouts should be designed around the output requirement to the user.

The standard that is maintained for output design is clear. Output provides a permanent copy of the results for the later consultation.

SYSTEM DESIGN

System analysis is done in order to make a feasible study about the existing problems and to formalize the organization's requirements. This process forms the basis of software development and validation by understanding the domain for the software as well as required function, behavior and performance The essential purpose of this phase is to find the need and to define the problem that needs to be solved .This chapter gives a brief discussion about the detailed study of the proposed system.

EXISTING SYSTEM

Consider the characteristics of R-WSNs, several protocols discuss several aspects of power management or MAC schemes to improve energy efficiency and maximum data collection rate. A centralized algorithm with the line programming problem is proposed to compute the lexicographically maximum data collection rate and routing paths for each node, which is utilized for fair and high-throughput data extraction from all sensors. Sadlapur et al provide a distribute algorithm for jointly determining the routing structure and amount of flows on each link with flow adjustment to achieve an optimal data collection rate.

Its propose four throughput enhancement schemes from a simple naive scheme with low complexity to probabilistic probing scheme incorporating advanced methods to appropriately use the harvesting energy However, ideal energy replenished precondition is used and limited power storage capacity hasn't been considered in these protocols.

Disadvantage:

- Maximum data collection rate problem.
- Doesn't considering the energy to be replenished continually for each sensor,

- Centralized system to compute data generation rate which makes computation complexity.

PROPOSED SYSTEM

- In this proposed system, we formulate the maximum data collection rate of each source sensor as optimization. Deployments of sensor which are placed in a network traffic and forcing to various paths which are enable and flexible in a dynamic service of a real time network demands, where nodes have enough residual capacity where sinks have more residual computational capacity, moreover the parameters of the maximum data collection rate have end-to-end latency between network model and sub-gradient algorithm illustrated for instance specific nodes.

- Linear Programming (LP) for calculating the upper bound of data generation rate rather than establishing the realistic transmission paths, in other words, for each sensor, we only obtain the maximum data collection rate theoretically without the care of their details of data forwarding implementation. The position in the network of operation between the nodes rationally bound at the linear level of programming section, embedded security services and realistic constrains with physical network model, by placing the wired connection placing between two nodes by end to end propagation to minimize the physical source.
- At a time two or more nodes deploying under a same sink earns the maximum data to the

  abnormal level of datas relieve under ambient technology used by underground sources.

  Hence least data and maximum physical work maintained under this proposed system.

In summary, on observing the lack of optimization techniques for maximizing data collection rate in existing routing algorithms for R-WSNs. we introduce the first generic maximal data generation rate algorithm with LP technique in R-WSNs with multiple sinks.

ADVANTAGES:

- Reduce Maximum data collection rate problem.

- Considering the energy can be replenished continually for each sensor.

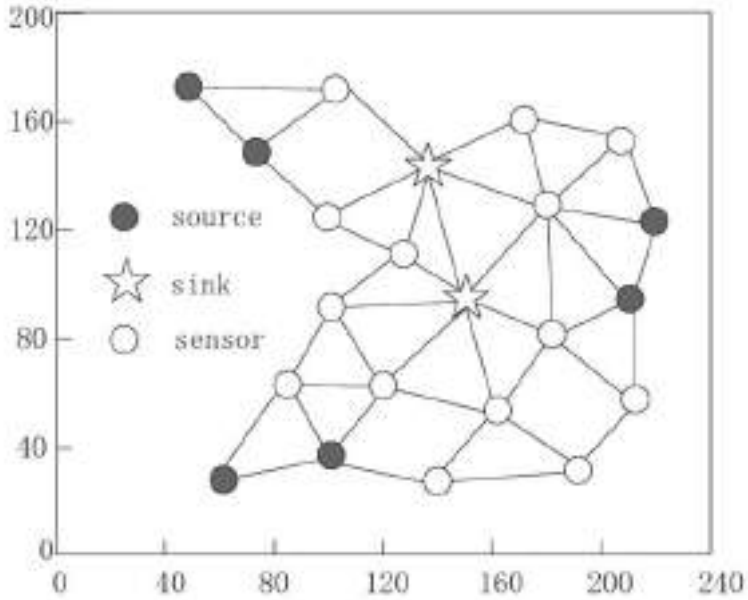
Distribute algorithm to compute an optimal data generation rate to improve sensor usage efficiency

SYSTEM IMPLEMENTION

When multiple sinks were deployed in the monitoring field, the performance for all algorithms is evaluated. Due to limited available energy, it is common to deploy multiple sinks for collecting information in realistic application, which brings at least two advantages comparing one sink.

Firstly, in multiply sinks environment, since packets generated by sensors are only needed to be forwarded to anyone sinks, which is closest to it generally, the degree of routing path from source node to sink will be shorted due to higher sinks density. Secondly, a limited number of sensors is distributed around the sink and it often represents a bottleneck for data transmission because all packets from sources have to be forwarded to these sensors before

Through all common nodes in the network area and the communication energy consumption will be balanced to all nodes in order to improve sensor utilization efficiency.



source nodes of cross path

Emergence of application like compact field networks with security issues decades have been potential border protection for large number of harsh environments and disaster management in a sensor decade, sensor nodes are remotely sensed deployed under a large number of protocols to communicate other protocols for energy efficient routing which satisfies the need of proposed routing protocols by a typical sensor node architecture and potential effects established by a interior sub categories with a data centric, routing data transmission node redundancy.

TEST DATA AND OUTPUT

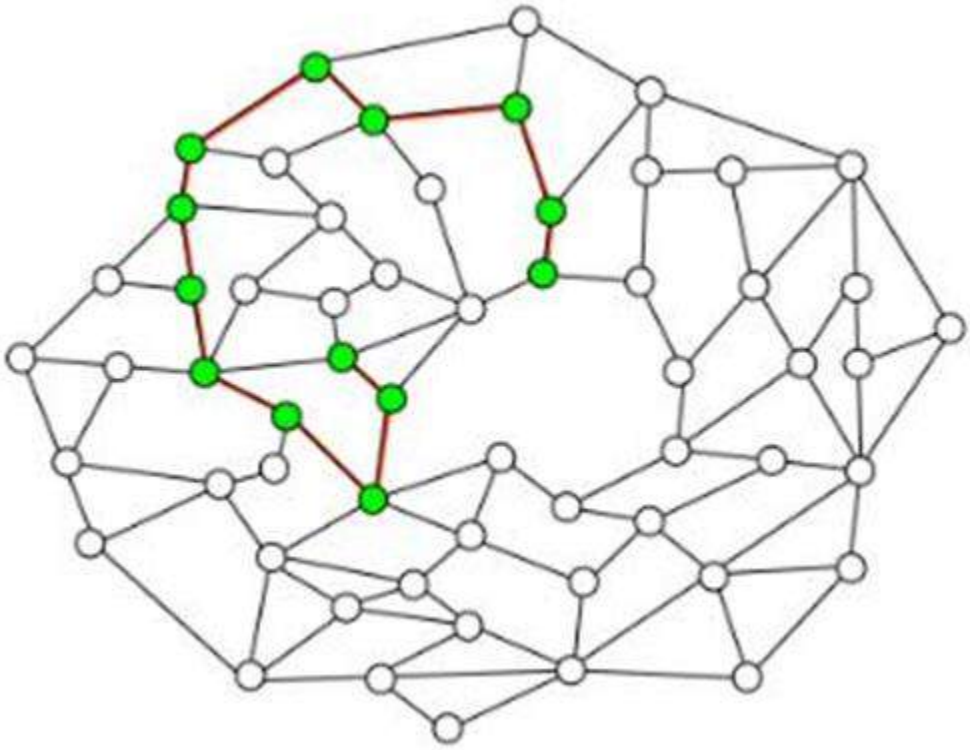
Test data is data which has been specifically identified for use in tests, typically of a computer program.

Some data may be used in a confirmatory way, typically to verify that a given set of input to a given function produces some expected result. Other data may be used in order to challenges the ability of the program to respond to unusual, extreme, exceptional or unexpected input.

Test data may be produced in a focused or systematic way (as is typically the case in domain testing) or by using other, less-focused approaches (as is typically the case in high-volume randomized automated tests). Test data may be produced by the tester, or by a program or function that aids the tester. Test data may be recorded for re-use, or used once and then forgotten.

INCREASING LIFETIME IN MULTIPLE SINKS

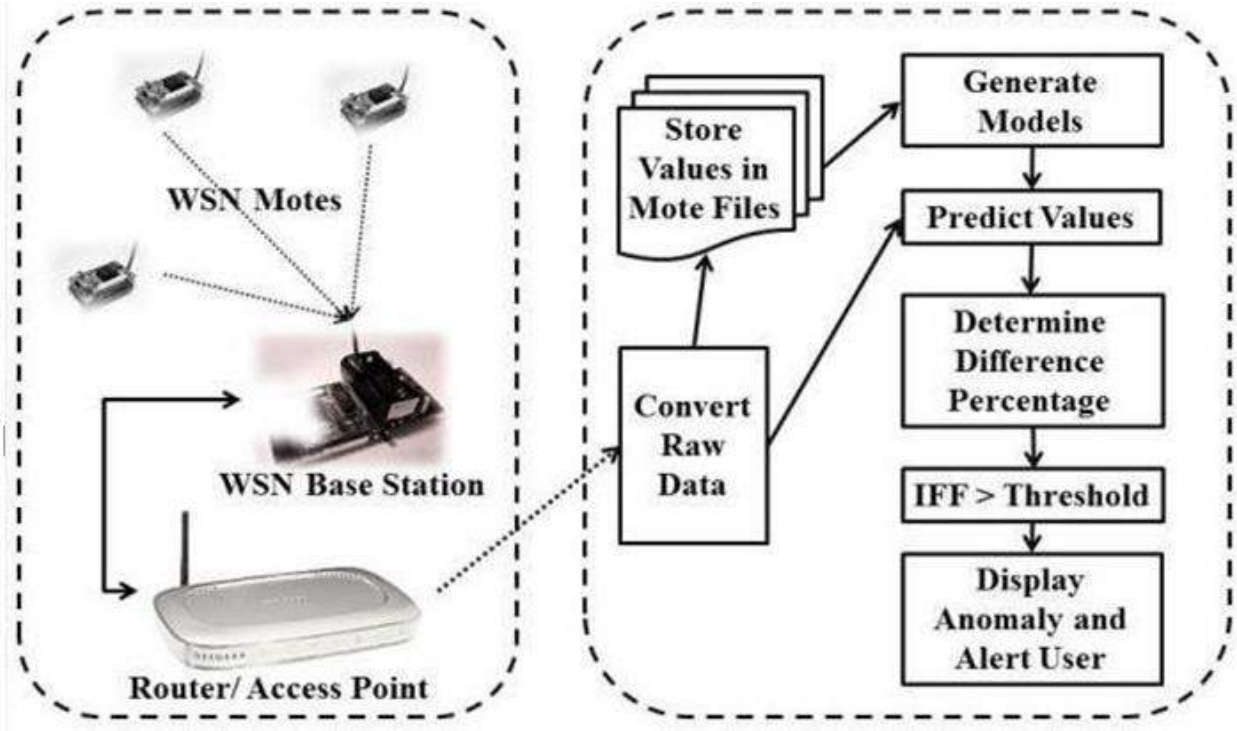
The lower data delivery due to congestion in single sink with the multiple sinks as the end of delay is high in single sink, whereas quiet low process in multiple sinks, the more data can be successfully delivered to the sinks so the chances to such nodes dying with the single node closer to the sink shown in figure.



Multiple sinks on a path

A congestion on a single node closer to the node in transmitting data directly to the sink when the data entered inside the path being cycled with multiple paths and harvesting energy with a single node to a multiple nodes.

Frequency based on wireless sensor networks provides a convenient means to the travelling path between the magnetic resonant points under a light weight technique. We take the initial step to investigate the potential benefit from considering the data communication within the charging levels of the sensor which are deployed or non-deployed only when a travelling path based polynomial interface concerns on the model outlays. The optimal travelling path relaxes energy constraints with original problem like equally relaxed problem determined by a practically charged elements.

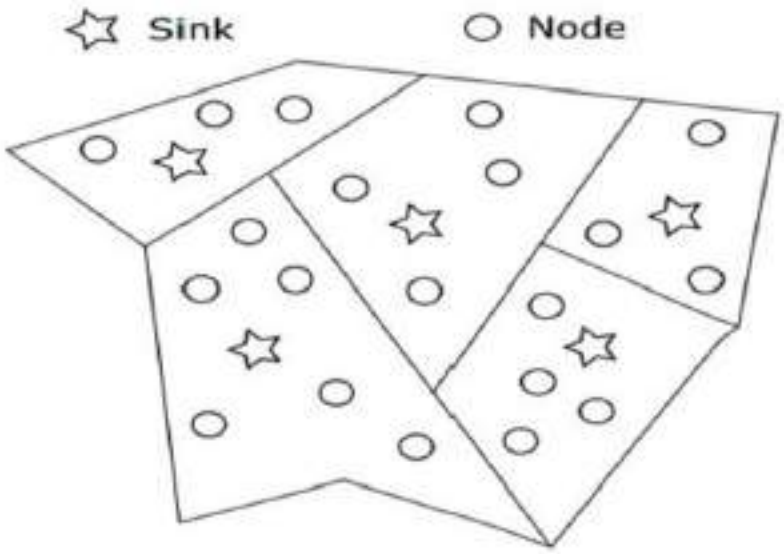


Wireless sensor base network

Basically in rechargeable sensor techniques of wireless sensor conservation adoption are maintained by power flows comparing the max-flow of a resonant couples in digital analyzer. The ultra-low power requires such sensors to complete the charging facility at any time by a while the lifetime may also considerably increasing by each and every second by the nodes which get posed by the another in a way of platform goes one by one for a large coils in each furnace so it is like a simple thing about its lifetime and full computation of the wireless sensor schemes in networking.

FINDING SINK LOCATION

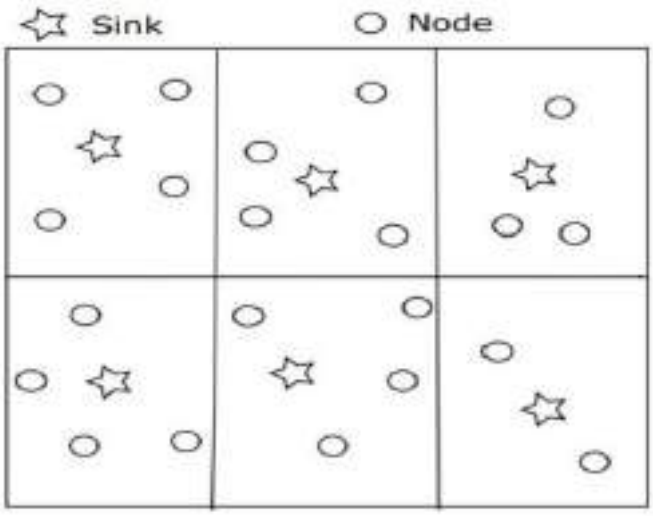
Finding the sink location by viewing the link capacity is small when a limited amount of the routing path towards the anchor point while clusters and sinks in a rectangle region is easier to find out the optimum route path shown in figure



Sinks in irregular region

In this relativity energy harvesting in rectangular region is much easier than in irregular region. Network utility is reduced by low consumption with small fluctuations whereas the network utility involves with a migration nodes at each and every anchor point shown in figure. WSN's designs involves a wide range of aspects and consideration with connectivity issues jointly by a low power complexity device in medium access control nodes of sensor are assumed to be disturbed accordingly in a dimensional method of energy conservation and estimation causes which perform the organized way of the clustering node in an unidirectional path and network energy efficiency is compared through a novel technology in the terms of re sampling the nodes relevant impact under mentioned Condition to be tested according to the different climate issuer in the sensing topology, the sky gazes where changing day to day in ability to a sensor a dual problem faced by networks.

Hence suffers a large by its complication through multiple sinks associated here by different parameters referred in the collecting data from the external user to the platform which has been designed to test for agricultural monitoring or physical parameters in a real-time control of different microbial issues placed under single side track to be cleared and maintained correctly for the energy accessing techniques under the rechargeable batteries.



Sinks in rectangular region

The placement of the nodes in a rectangular region have enough residual capacity and where nodes have placement problem within the sinks, by an adversary communication further more communication medium between the sensor nodes where lacking, since node compromise specific of transmitted data within a transmitted node on multiple path and maintains on nodes by viable solutions by target tracking formed by sets of distributed networks in WSNs. The node insures that obtained sinks are intelligently computed by considerable number of certain sensors with provided area within the limited transmission path.

OPTIMAL NUMBER OF SINKS

When the sensors get recharged frequently calculating their data rate higher or lower with the parameter required for energy consumption, end to end delay, connectivity, data delivery, scalability, data aggregation, cost that are shown in table.

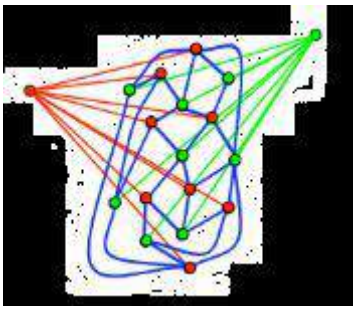
.

Table 6.1 Comparison between single and multiple sink

Parameter	Single Sink	Multiple Sink
Energy Consumption	Higher	Lower
End to end delay	Higher	Lower
Connectivity	Lower	Higher
Data Delivery	Lower	Higher
Scalability	Lower	Higher
Data Aggregation	Required	Not Required
Cost	Lower	Higher

In the optimal number of sinks, data rates are scheduled and routed. Therefore a proper sitting sensors are being balanced to the trade of between sensors, get timely recharged, shown in figure.

WSNs are low cost sensor nodes, which are equipped with transmit data by the grouping of nodes in a cluster heads within the base station, the cluster head functioned by the performance like transmitting data, clustering data, pocketing data. Thereafter sense a response back to network topology according to the uniformity of the deployed sensor nodes.



Reduction to a single source sink

To avoid energy depletion in the reduction sinks are placed eventually within the single hop energy harvesting has an edge over multiple hops, while energy consumption level

organized perfectly. Cluster based sensor network often provide many nodes deployed under a single and powerful node which may equipped under the radio link range data which is forwarded by the intermediate node which are realistic in the photo voltaic panels. Hence being working with possible and punctual monitoring, during the activity mode, the node wakes up deploying under the clustering data increases the quality assuring the periodic nodes with sink on one or many may be deployed under the panels to the information sink node. In case of sink node the link is forwarded by a node 1 to node 3 by a clustered sink to function avoiding the death nodes in a sleeping node which can't able to function in many ways may need or require correct time to be occurred.

INTEGRATION TESTING

Integration testing is a systematic technique for construction the program structure while at the same time conducting tests to uncover errors associated with interfacing. i.e., integration testing is the complete testing of the set of modules which makes up the product. The objective is to take untested modules and build a program structure tester should identify critical modules. Critical modules should be tested as early as possible. One approach is to wait until all the units have passed testing, and then combine them and then tested.

The major error that was faced during the project is linking error. When all the modules are combined the link is not set properly with all support files. Then we checked out for interconnection and the links. Errors are localized to the new module and its intercommunications. The product development can be staged, and modules integrated in as they complete unit testing. Testing is completed when the last module is integrated and tested.

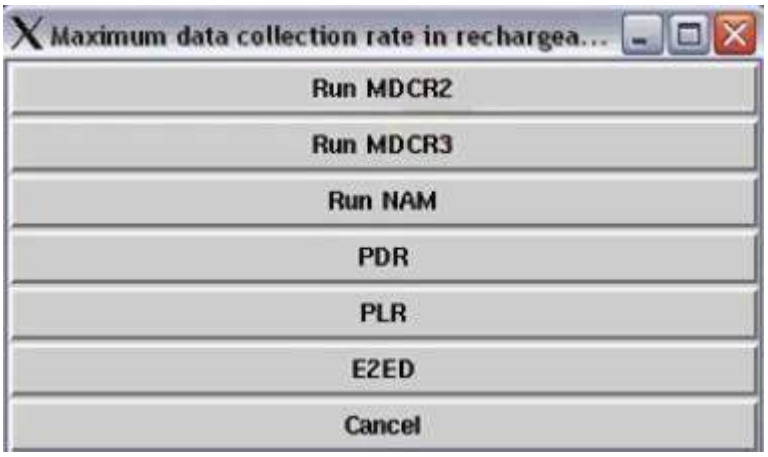
The three main integration testing strategies are as follows:

- Big Bang: Involves integrating the modules to build a complete software system. This is considered a high-risk approach because it requires proper documentation to prevent failure.

- Bottom-Up: Involves low-level component testing, followed by high-level components. Testing continues until all hierarchical components are tested. Bottom-up testing facilitates efficient error detection.

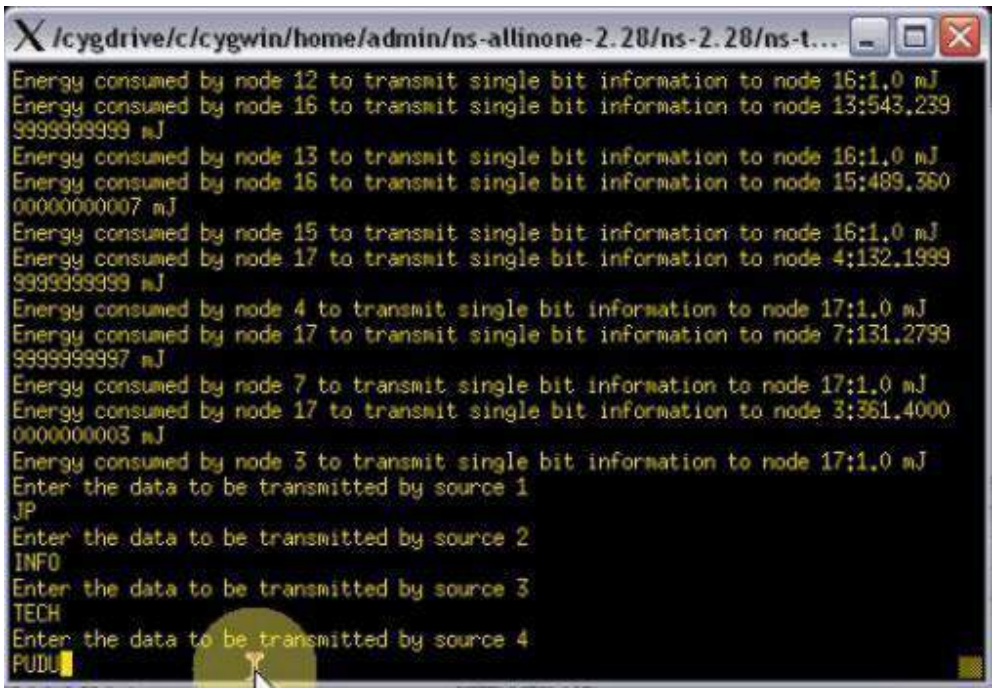
- Top-Down: Involves testing the top integrated modules first. Subsystems are tested individually. Top-down testing facilitates detection of lost module branch links.

Main form



Placing of nodes

Entering the Transmitted Source data on Sink



Data entry by source

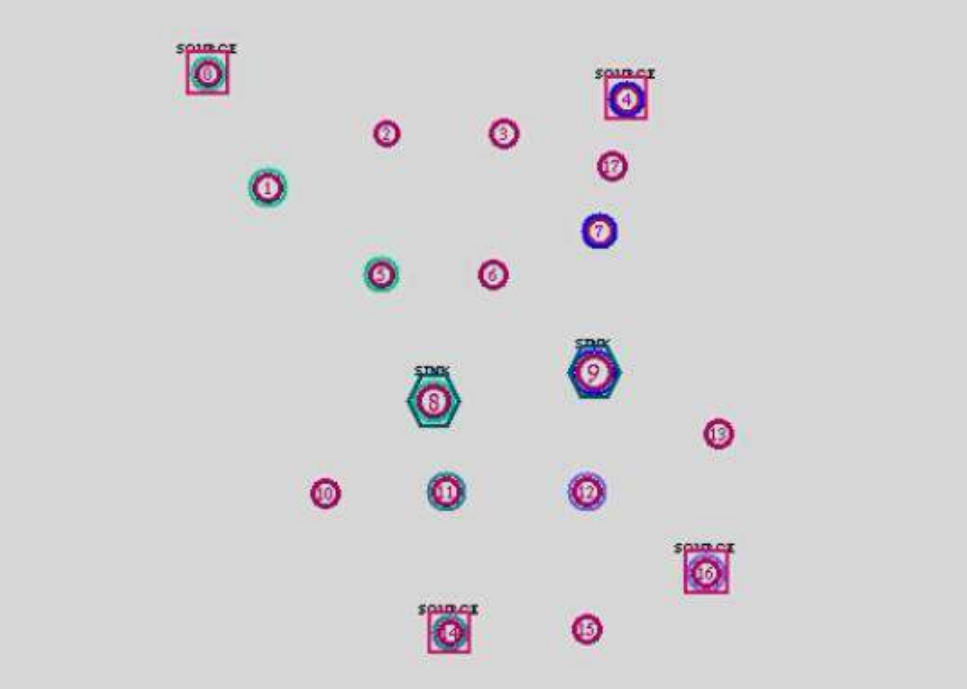
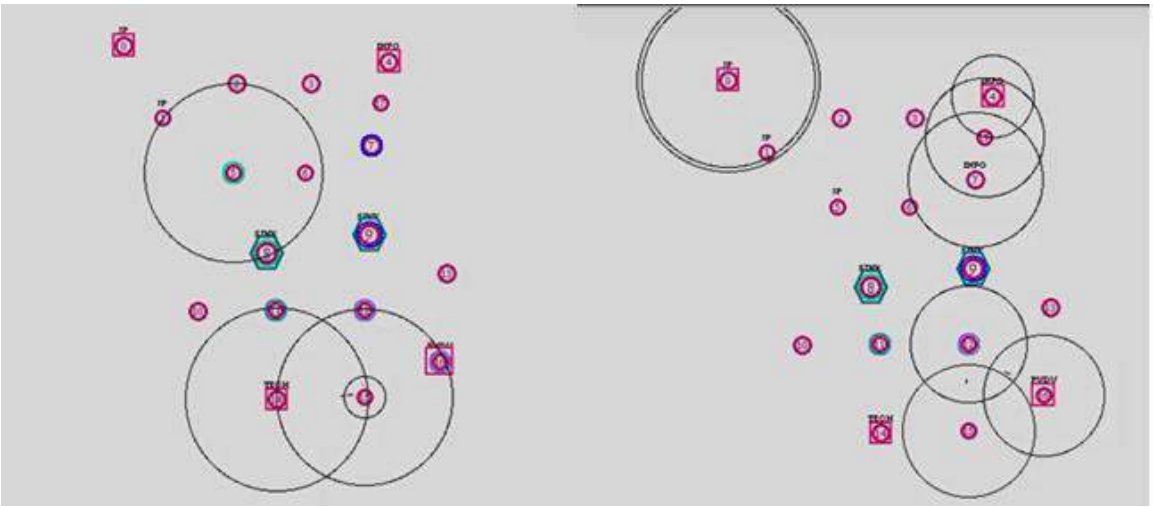


Figure A3 Sinking of nodes

The Source node 0 transmitting the data JP to the 9 Via 4 7 9 and the node 4 Transmitting the data INFO to the node 4 at time 1.5



Transmission of data to a sink

This work, for addressing the maximum data collection rate problem, considering the energy can be replenished continually for each sensor, which generally equipped with limited power storage device, we propose a distribute algorithm to compute an optimal data generation rate to improve sensor usage efficiency. We formulate a linear programming problem for maximum data generation rate with energy extracting rate and data flow constrained. Since it is NP-hard, the original linear programming is converted to a dual problem by introducing Lagrange is constructed and sub gradient algorithms are used to solve it in a distributed manner. The resulting algorithms are guaranteed to converge to an optimal data generation rate. We first define the network system and energy consumption model. Hereafter, the energy replenished and routing schemes are analyzed. Finally, the optimization techniques with linear programming for maximum data generation rate are illustrated by an example in which an optimal flow is computed for a network of randomly distributed nodes and minimizing the energy consumption is introduced as the secondary optimization problem. Through extensive simulation and experiments, we demonstrate our algorithm is efficiency to maximize data collection rate in rechargeable wireless sensor networks.

CLAIM (S)

1) The rechargeable wireless sensor network, a sensor cannot be always beneficial to observe energy while harvesting a networks excess energy try an environment due to its energy replenished continuously by limited capacity of energy storage.

2) According to claim 1,wherein the surplus energy of a node may be used for strengthening packet delivery efficiency occurs improved data collection rate.

3) According to claim 1,wherein the maximum data collection rate of each source sensor as optimization. Deployments of sensor which are placed in a network traffic and forcing to various paths which are enable and flexible in a dynamic service of a real time network demands.

4) According to claim 1,wherein the nodes have enough residual capacity where sinks have more residual computational capacity, moreover the parameters of the maximum data collection rate have end-to-end latency between network model and sub-gradient algorithm illustrated for instance specific nodes.

5) According to claim 1,wherein the position in the network of operation between the nodes rationally bound at the linear level of programming section, embedded security services and realistic constrains with physical network model, by placing the wired connection placing between two nodes by end to end propagation to minimize the physical source.

6) According to claim 1,wherein the two or more nodes deploying under a same sink earns the maximum data to the abnormal level of datas relieve under ambient technology used by underground sources. Hence least data and maximum physical work maintained under this proposed system.

7) According to claim 1,wherein the the lack of optimization techniques for maximizing data collection rate in existing routing algorithms for R-WSNs. This invention proposes the first generic maximal data generation rate algorithm with LP technique in R-WSNs with multiple sinks.

ABSTRACT

RECHARGEABLE WIRELESS SENSOR NETWORKS WITH MULTIPLE SINKS

In this invention here, we propose a higher data generation rate maximized it as an optimization problem for a network with multiple sinks, to achieve a desirable balance between energy replenishment amount and the data gathering rate is maximized and the sensor can migrates among those root sink nodes, however the low output of energy may cause increase of recharging opportunities in the data collection rate the rapid improvement of wireless sensors are deployed by joint energy and replenish their work more faster and to the maximum extent of data collection in turn as a linear programming problem. Accordingly, a double problem by introducing a language multiplier is build. Sequentially distribute algorithm for maximizing data collection rate and the sub gradient algorithm are used to solve it in a distributed technique. Through extensive simulation and experiment, we demonstrate our algorithm is efficient to maximize data collection rate in rechargeable wireless sensor networks.

FORM 3
THE PATENTS ACT 1970
(39 of 1970)
&
The Patent Rules, 2003
STATEMENT AND UNDERTAKING UNDER SECTION 8
(See Section 8, rule 12)

RECHARGEABLE WIRELESS SENSOR NETWORKS WITH MULTIPLE SINKS
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Hereby declare, We have not made any application for the same / substantially the same invention outside India.

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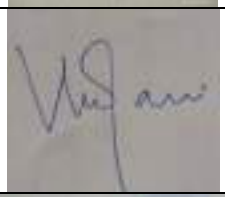
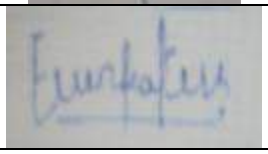
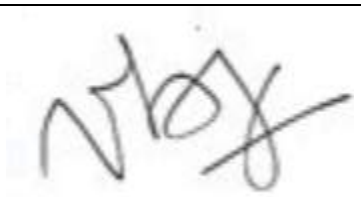
Dr. C.VEERAMANI		05/04/2021
Mr. E.VENKATESH		05/04/2021

Dr B.VEERA JYOTHI		05/04/2021
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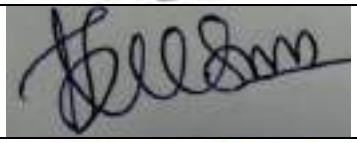
Mrs. T. KALAISELVI		05/04/2021
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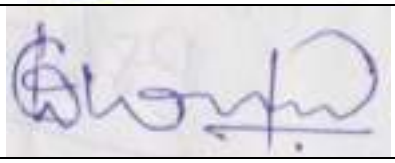
Mr.DHARAMALLA CHANDRA SEKHAR		05/04/2021
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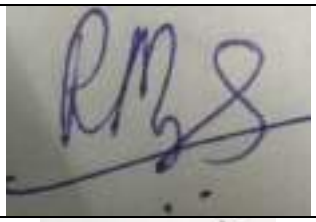
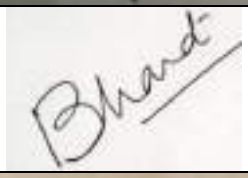
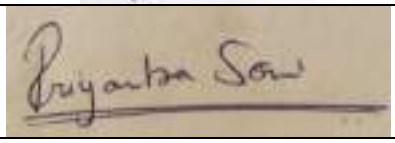
Dr R MURUGESAN		05/04/2021
Dr. BHARAT SINGH DEORA		05/04/2021
Ms. PRIYANKA SONI		05/04/2021

To
The Controller of patents, The Patent office at CHENNAI.

FORM 5
THE PATENTS ACT, 1970 (39 of 1970)
&
THE PATENTS RULES, 2003
DECLARATION AS TO INVENTORSHIP
(See section 8, rule 12)

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Hereby declare that the true and first inventor of the invention disclosed in the complete specification filed in pursuance of my application numbered _____ dated _____

TITLE OF THE INVENTION: RECHARGEABLE WIRELESS SENSOR NETWORKS WITH MULTIPLE SINKS

3.Declaration to be given when the application in India is filed by the Applicant in the convention country: -

I the applicant in the convention country hereby declare that our right to apply for a patent in India is by way or assignment from the true and first inventor.

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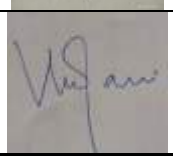
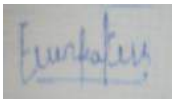
Dr. H.JOSEPH PRABHAKAR WILLIAMS		05/04/2021
Dr. C.VEERAMANI		05/04/2021

Mr. E.VENKATESH		05/04/2021
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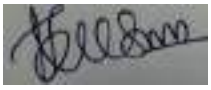
Mrs. T. KALAISELVI		05/04/2021
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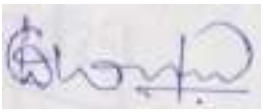
Mr.DHARAMALLA CHANDRA SEKHAR		05/04/2021
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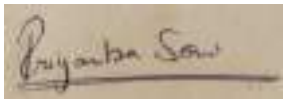
Dr. BHARAT SINGH DEORA		05/04/2021
Ms. PRIYANKA SONI		05/04/2021

To
The Controller of Patents, The Patent office at CHENNAI.

FORM 9
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
REQUEST FOR PUBLICATION
(See section 11A(2); rule 24A)

We (state name, address and nationality of Applicant & Inventors)

TITLE OF THE INVENTION: RECHARGEABLE WIRELESS SENSOR NETWORKS WITH MULTIPLE SINKS

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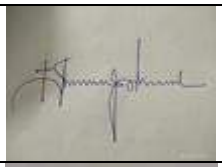
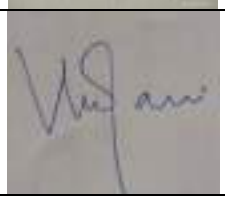
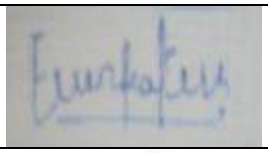
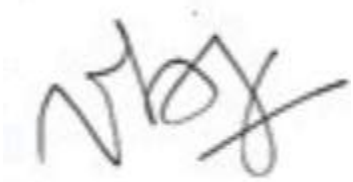
Hereby request for early Publication of our application for Patent No. _____ dated _____ under section 11A(2) of the act.

NAME	SIGNATURE	DATE
Dr. H.JOSEPH PRABHAKAR WILLIAMS		05/04/2021
Dr. C.VEERAMANI		05/04/2021

Mr. E.VENKATESH		05/04/2021
Dr B.VEERA JYOTHI		05/04/2021
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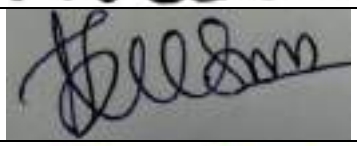
Mrs. T. KALAISELVI		05/04/2021
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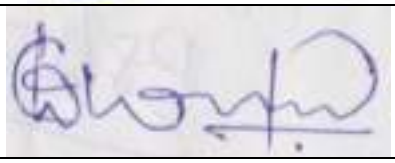
Mr.DHARAMALLA CHANDRA SEKHAR		05/04/2021
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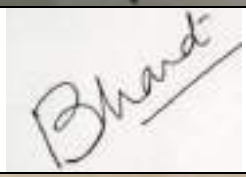
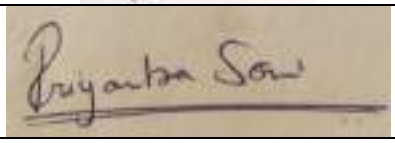
Dr. BHARAT SINGH DEORA		05/04/2021
Ms. PRIYANKA SONI		05/04/2021

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