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Energy-Conserving Distributed Topology Control Algorithm for Low-Power IoT Networks

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ABSTRACT

Topology control is one of the topics discussed widely in traditional wireless networks. Its primary purpose is to ensure the connectivity of the wireless nodes participated in a network. In, ***EXISTING SYSTEM*** *Low-power IoT communication networks looks like a wireless network environment in which the major communication devices are those wireless devices having limited energy like battery. In* ***PROPOSED SYSTEM****, we use a distributed topology control algorithm by combining multiples of 2 with the combinatorial block design. This is made possible by means of a design theory. The proposed technique focuses mainly on asymmetric and asynchronous neighbor discovery. The block design concept serves its use by generating the neighbor discovery schedule when a target duty cycle is given. Addition to that, the multiples of 2 are applied to support asymmetric operation and also to overcome the challenge imposed by the block design. In* ***MODIFIED SYSTEM****, we propose to consume the same data repeated and elect a single secure route for packet transmission and also saving the system's energy. As well as to having connection established to the nearest node with less capacity, it connects to the alternate route elected under those remaining data and only transmits till it reaches the destination. Within transmission of packet transferred based on time, it increases the packet size with threshold value verifying under (+1 or -1) condition the node switches over automatically from active to sleep or sleep to active mode condition.*

I.INTRODUCTION

One of the most important aspects of topology control is ensuring connectivity between the nodes in general network environments. Furthermore, low-power IoT communications require an obvious energy-efficient solution. IoT communication networks consist of Machine to Machine (M2M) communication. The M2M communication is likely to happen between the wireless sensors in sensor networks. Usually, the sensor network assumes the wireless devices to be stationary during their lifetime in the network, but this assumption might not work in low-power IoT communication networks. Many a times nodes frequently join into the network and leave at any time in IoT networks. To make matters worse, each node only has limited battery power in low-power networks. So, a network topology should deal with the energy constraints efficiently. When physical devices join the network, one of the jobs they might be performing is making a connection between neighboring machines. We call this process neighbor discovery. Low-power communication networks have their own power-saving mechanism. If nodes cannot connect with their neighbors within a certain amount of time then the communication channel of nodes cannot be established properly which results in topology being unsuccessful. Non-power-saving mechanism could be used for faster neighbor discovery, but physical devices could die before finding their neighbor. One of the key challenges of topology control in low power IoT platforms is to manage limited energy efficiently in a distributed manner. As mentioned before, data exchange is one of the expensive activities in low-power network environments. Traditional neighbor discovery uses time synchronization between nodes. However, the exchange of periodic control packets leads to the wastage of limited energy. Therefore, we introduce asynchronous methods to reduce energy consumption. In asymmetric situation, two nodes perform neighbor discovery with different cycles. Here a cycle represents a time duration with which each node conducts neighbor discovery and a duty cycle clearly indicates how many times a node wakes up within a cycle. The asymmetric duty cycle makes the neighbor discovery problem harder, but this is practical in a distributed network environment. After being enlightened by the combinatorial block designs from design theory, we proposed a distributed neighbor discovery algorithm for topology control in low-power IoT communication networks. The main idea of our solution is to combine the concept of the combinatorial block design and the multiples of 2 for fast neighbor discovery and energy efficiency. Under our neighbor discovery, nodes wake up and sleeps continuously according to the discovery schedule. Based on the result of our numerical analysis, we were able to achieve neighbor discovery asynchronously and asymmetric operation efficiently. The combinatorial block design has the minimum value of cycle when the same duty cycle is given among existing neighbor discovery protocols. In addition, the combination of block designs and multiples of 2 guarantee the minimum wake-up slots when various asymmetric cases are presented. As well as to having connection established to the nearest node with less capacity, it connects to the alternate route elected under those remaining data and only transmits till it reaches the destination. Also, within the transmission of packet transferred based on time, it increases the packet size with threshold value verifying under (+1 or -1) condition the node switches over automatically from active to sleep or sleep to active mode condition

II.GENERAL WORKING OF IoT

The Internet of things (IoT) is the network of physical devices, vehicles, home appliances and other items embedded with electronic sensors, software, actuators, and connectivity which enables these objects to connect and exchange data**.** It consists of all the web-enabled devices that collect, send and act on data they acquire from their surrounding environments using embedded sensors, processors and communication hardware. First, sensors or devices collect data from their environment. This could be as simple as a temperature reading or as complex as a full video feed. Next, that data is sent to the cloud. The sensors/devices can be connected to the cloud through a variety of methods including: cellular, satellite, Wi-Fi, etc. Once the data gets to the cloud, software performs processing on it. Next, the information is made useful to the end-user. This could be via an alert to the user (email, text, notification, etc.)

III.METHODOLOGY

A distributed topology control algorithm by combining multiples of 2 with the combinatorial block design. This is made possible by means of a design theory. The proposed technique focuses mainly on asymmetric and asynchronous neighbor discovery. The block design concept serves its use by generating the neighbor discovery schedule when a target duty cycle is given. Addition to that, the multiples of 2 are applied to support asymmetric operation and also to overcome the challenge imposed by the block design. We analyze the worst-case discovery latency and energy consumption numerically by calculating the total number of slots and wake-up slots on a given duty cycle. It implies that our proposed method has the smallest total number of slots and wake-up slots among existing neighbor discovery protocols. The numerical analysis continues to show that in the proposed technique the neighbors connect quickly with minimum battery power compared with to the other protocols for distributed topology control. We can perform a simulation study or real experiment to investigate the best parameter for choosing the multiple of a certain number. We also modify this to consume the same data repeated and to elect a secure single route for packet transmission with saving energy. As well as to less capacity having any nearest node for connection establish then it connects to the alternate route elected under those remaining data only transmitting till to reach the destination. And further, within transmission of packet transferred based on time to live then increasing the packet size with threshold value verifying under (+1 or -1) conditions then it switches over automatically from active to sleep or sleep to active mode condition.

ADVANTAGES:

- **I.** Saving the energy based on threshold
- **II.** Reliability of path can be predicted
- **III.** High data transmission rate during each cycle.
- **IV.** More effective active or sleep mode selection
- **V.** Increased network performance
- **VI.** High security based on alternate route selection

IV.FIGURES AND GRAPHS

Network Formation:

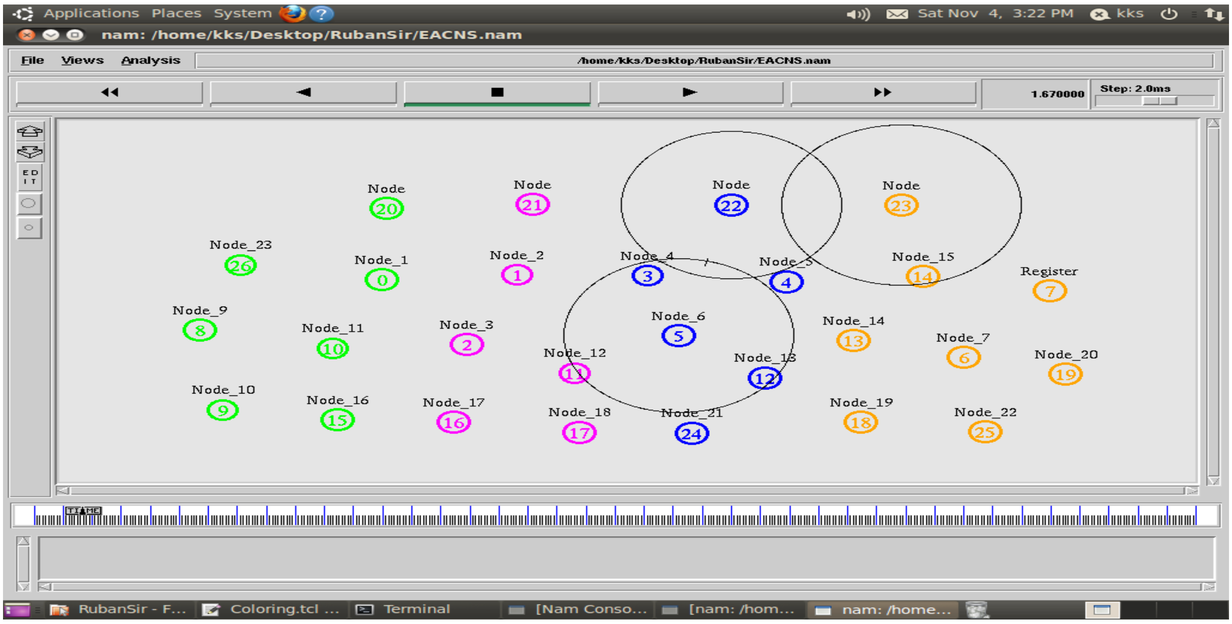

Fig1.1 Using Network Simulator 2, the network is created as shown. Then comes the step of energy initialization where the energy is initialized to the nodes of the network.

Neighbor Discovery:

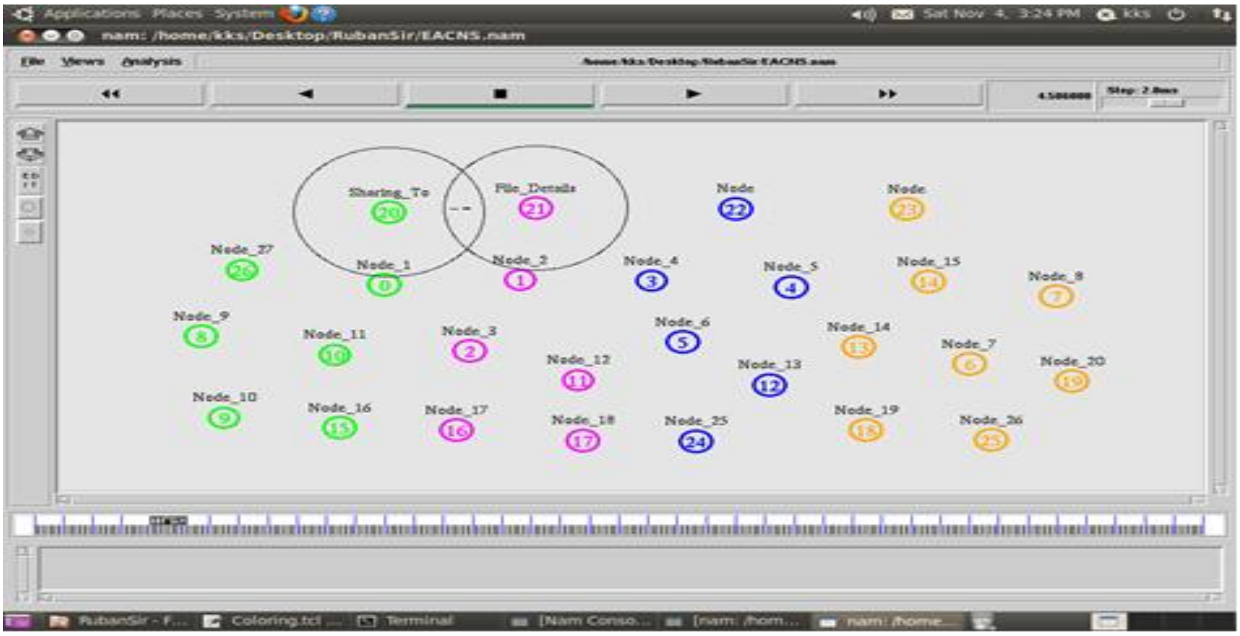

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Fig 1.2 This shows how a neighbor is discovered in the network and also depicts the forwarding algorithm.

Verifying under (+1 or -1) condition:

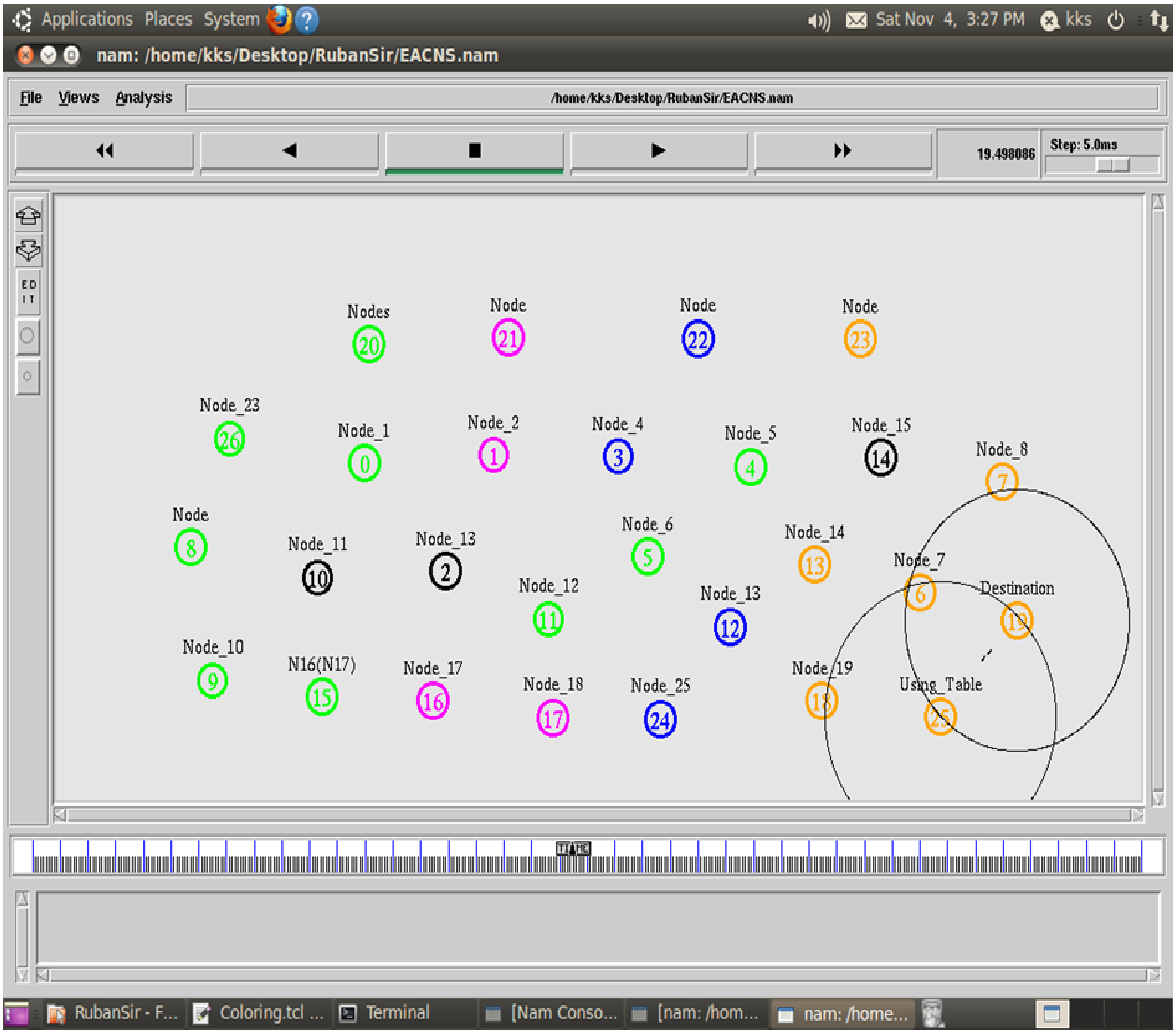

Fig 1.3

This shows the multicast of node selection under +1 and -1, where +1 is node uniquely added. Here the -1 is used to denote the removal of a node and is depicted in the diagram by black color. After the packet has reached the destination the network doubles the packet size (multiples of 2 are used) and are sent.

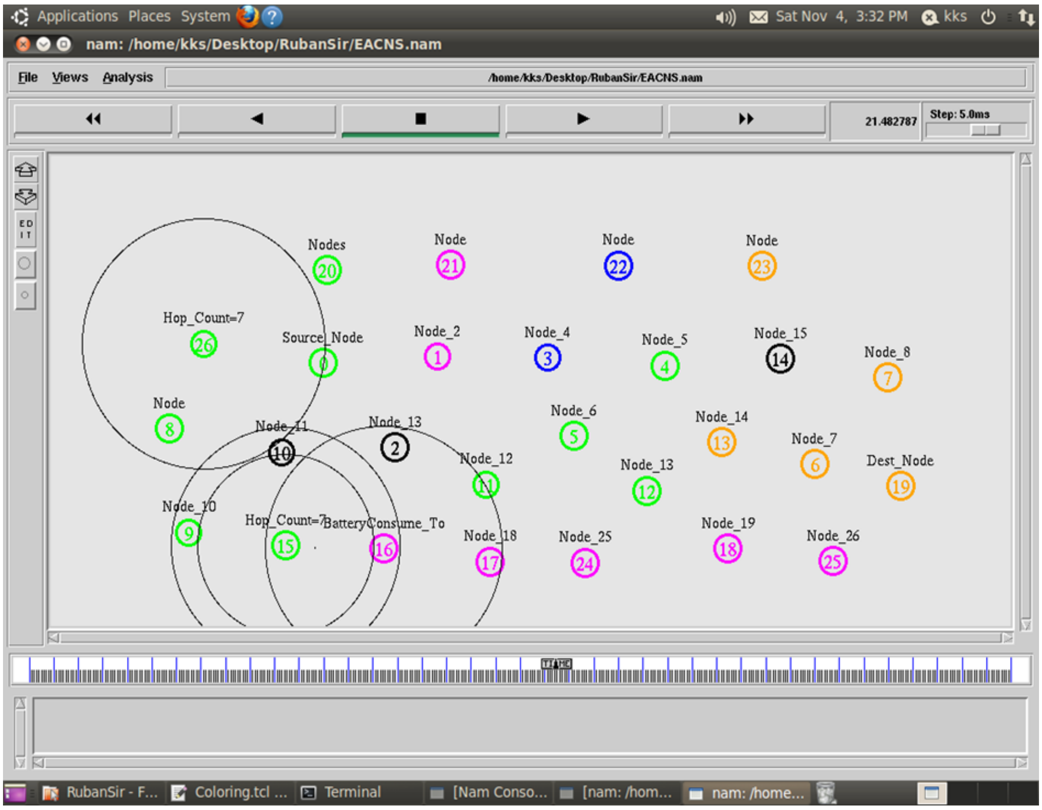

Fig 1.4

From Destination to source node, level-based election under Energy consumption, Battery Reserve Life Time and Multi Scope of the networks along with hops.

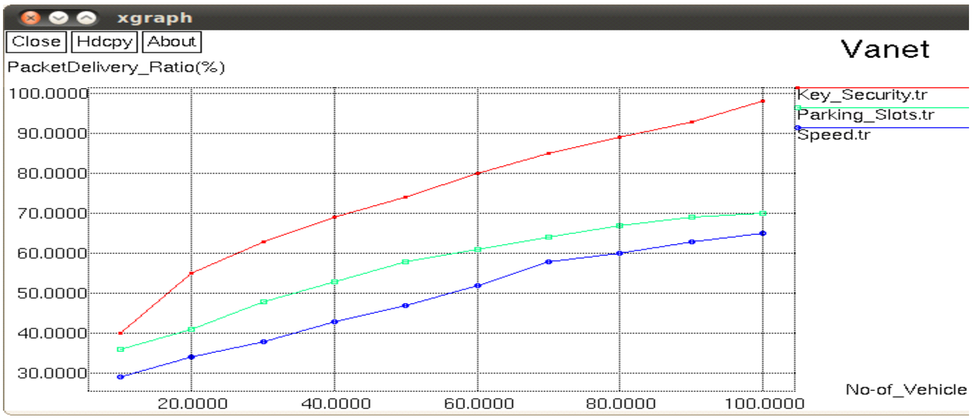

Fig 1.5 This graph shows the variation of Packet Delivery Ratio with that of the number of vehicles.

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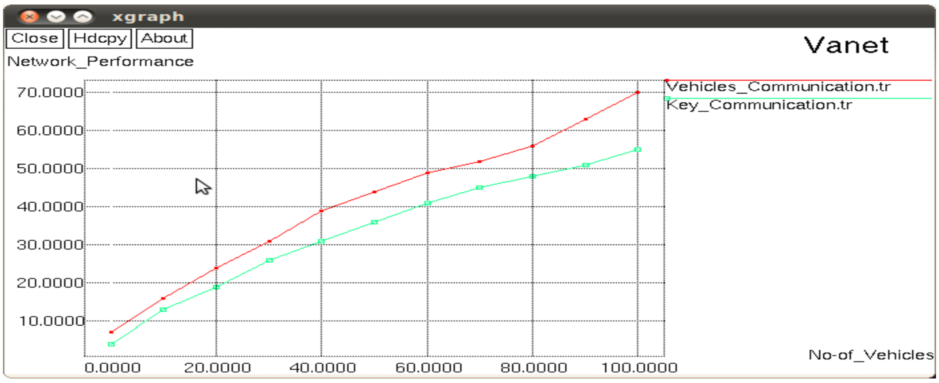


Fig 1.6 This shows the changes in the network performance.

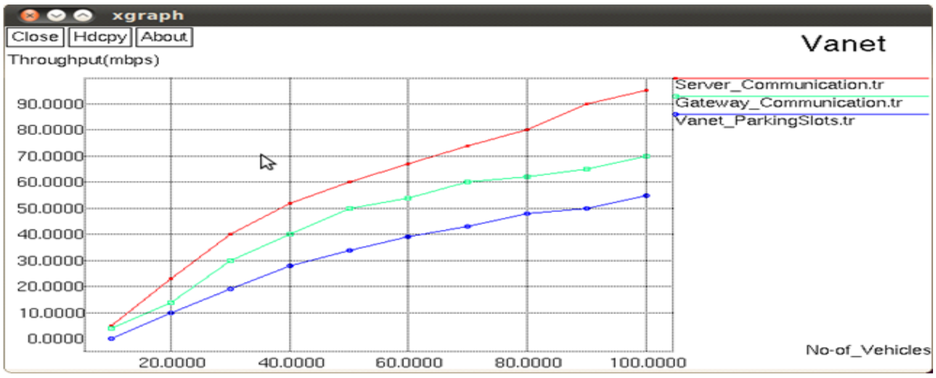
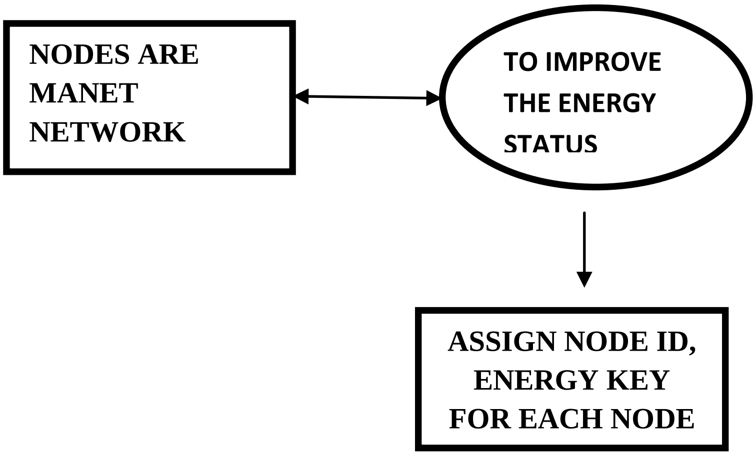


Fig 1.7 This shows the variations in throughput.

V.SYSTEM ARCHITECTURE



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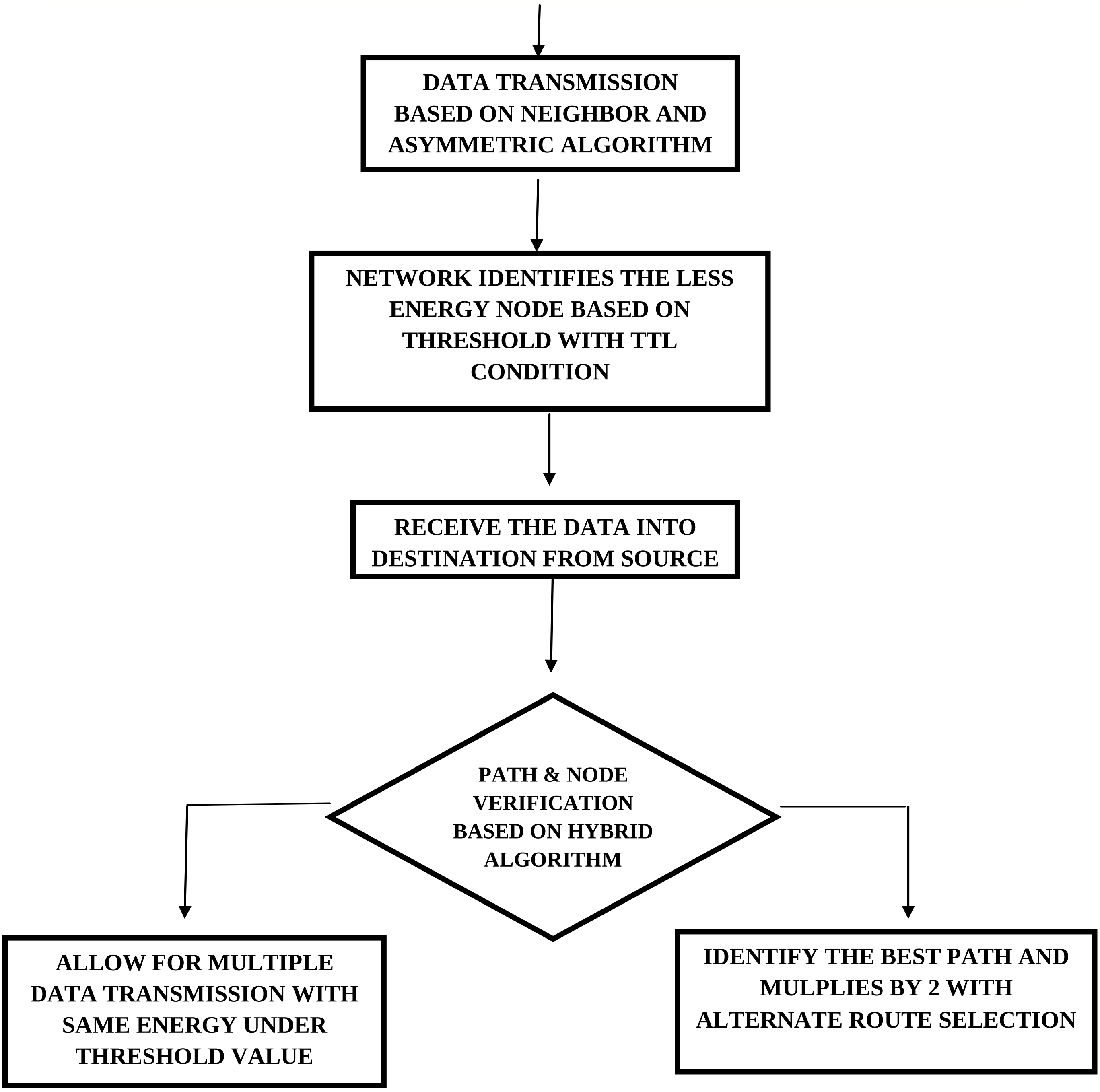

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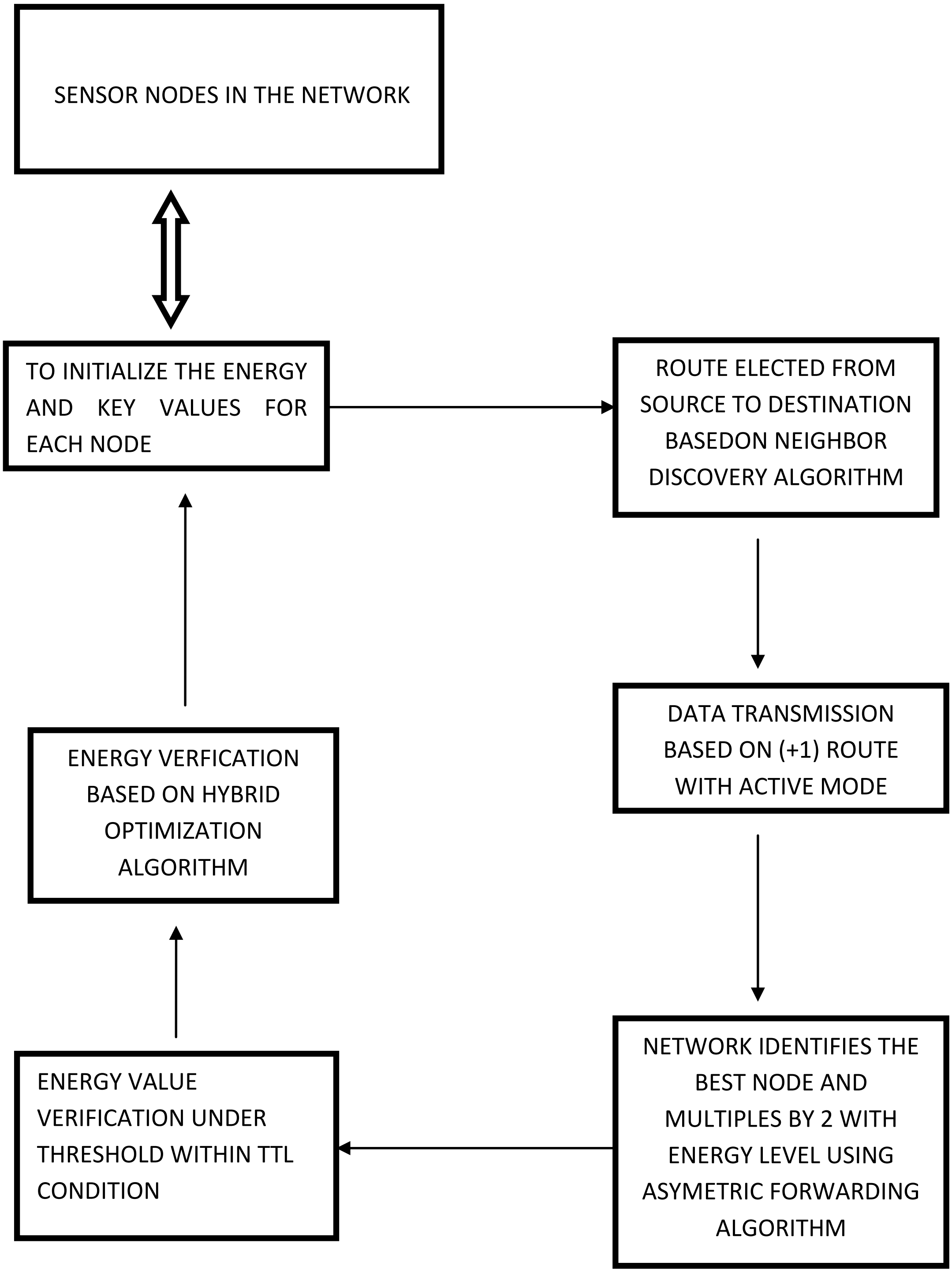
VI.BLOCK DIAGRAM



SYSTEM SPECIFICATION

Hardware Requirements

- Processor : Core i3/i5/i7
- RAM : 2-4GB
- HDD : 500 GB

Software Requirements

- Platform : Ubuntu
- Front End : NS 2 - 2.34

IX.CONCLUSIONS

We propose a new distributed topology control algorithm for low-power IoT communications. IoT communication networks consist of a variety type of physical communication and sensing devices. These devices try to connect with each other and finally establish a network. Originally, the characteristic of IoT is based on device to device communication in a distributed manner. One of the biggest challenges of the block design cannot guarantee proper generation of neighbor discovery schedules when a desired duty cycle is presented. In order to solve this, we use the block combination technique merged with the multiples of 2. Future research should focus on a simulation study or real experiment with physical devices. This study can give us more realistic performance results.

REFERENCES

[1] A. Bassi, M. Bauer, M. Fiedler, T. Kramp, R. van Kranenburg, S. Lange, and S. Meissner, Enabling things to talk. Springer, 2013.

[2] D. Miorandi, S. Sicari, F. D. Pellegrini, and I. Chlamtac, "Internet of things: Vision, applications and research challenges," Ad Hoc Networks, vol. 10, no. 7, pp. 1497 – 1516, 2012.

[3] Energy-Efficient Distributed Topology Control Algorithm for Low-Power IoT Communication Networks Gangman Yi; Jong Hyuk Park; Sangil Choi IEEE Access Year: 2016, Volume: 4 pp: 9193 – 9203

[4] P. Phivou, A. Panousopoulou, and P. Tsakalides, ''On realizing distributed topologycontrolinlow-powerIoTplatforms,''inProc.IEEEWorldForum Internet Things, Milan, ITALY, Dec. 2015, pp. 14–16.

[5] A.A.Aziz,Y.A.Sekercioglu,P.Fitzpatrick,andM.Ivanovich,''Asurvey on distributed topology control technique for extending the lifetime of battery powered wireless sensor networks,'' IEEE Commun. Surveys Tut., vol. 15, no. 1, pp. 121–144, 1st Quart., 2013.

[6] C. Anton-Haro and M. Dohler, Machine-to-Machine (M2M) Communications—Architecture, Performance and Applications. Cambridge, U.K.: Woodhead Publishing, 2015.

[7] P. Santi, "Topology control in wireless ad hoc and sensor networks," ACM Comput. Surv., vol. 37, no. 2, pp. 164–194, Jun. 2005.

[8] I. F. Akyildiz, X. Wang, and W. Wang, ''Wireless mesh networks: A survey,'' Comput. Netw., vol. 47, no. 4, pp. 445–487, Mar. 2005

[9] Y.-C. Tseng, C.-S. Hsu, and T.-Y. Hsieh, ''Power-saving protocols for IEEE802.11-basedmulti-hopadhocnetworks,''inProc.21stAnnu.Joint Conf. IEEE Comput. Commun. Soc., New York, NY, USA, Jun. 2002, pp. 200–209

[10] S. Choi and G. Yi, ''Asymmetric block design-based neighbor discovery protocol in sensor networks,'' Sustainability, vol. 8, no. 5, pp. 1–11, 2016.

[11] Y. Qiu, S. Li, X. Xu, and Z. Li, ''Talk more listen less: Energy-efficient neighbor discovery in wireless sensor networks,'' in Proc. 35th Annu. IEEEInt.Conf.Comput.Commun.(INFOCOM), SanFrancisco,CA,USA, Apr. 2016, pp. 1–9.

[12] G.Revathi, V.R.Sarma Dhulipala,2012,Smart Parking Systems and Sensors: A Survey, International Conference on Computing ,Communications and Applications(ICCCA),IEEE.