REVIEW OF RELAY SELECTION TECHNIQUES IN MULTI-HOP WIRELESS SENSOR NETWORK WITH IOT

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Abstract: Relay selection is the process of investigating the best partner/s to achieve the goal within given constraint. Goal and constraint are depending on the type of the wireless network. Wireless networks have variety of architectures from cellular to sensor and infrastructure based to infrastructure less, from high profile devices to low cost low power tiny nodes. Different applications have different constraints like for sensor network, power is most important while for cellular voice communication has real time constraint and for data networks, throughput is of main concern. Infrastructure based networks are centrally controlled while ad-hoc networks have distributed control. Considering variety of wireless networks, there cannot be a single technique of relay selection. Vast variety of techniques in literature for relay selection in WSN for IOT has been highlighted in this paper. Analysis and comparisons of the techniques and algorithms have been discussed.

Index Terms: IOT, Energy, Multi-hop, Relay Selection, WSN

I. INTRODUCTION

The growing Internet of Things (IoT) is increasing wireless sensor networks (WSNs) for different applications. Energy efficiency and reliability are key factors for multi-hop path source to sink. When relay runs out of battery it may cause network failure in WSNs of IoT. A relay selection in multi-hop transmission can play an important role to increase the network lifetime. A stable, WSN is the fundamental requirement for IoT data gathering in multi-hop networking from source to sink. Sensor node connectivity is also one of the major concerns during data transfer from source to sink. Mobility is also one of the major problem in IOT based WSN, that leads to failure in the overall Network. Frequent packet drops also a problem during data transmission. One classification of research on sensor systems has concentrated on the vitality administration issues after arrange has been sent, i.e. it considers that the arrangement of hubs is settled by organization, and after that plans to limit the vitality utilization with the goal that the lifetime of the system is augmented. Another classification of research has concentrated on the position of sensor hubs in a sensor arrange some time recently its organization. The target of this classification of research is to address the hub position issue in sensor systems, which is to decide an arrangement of areas for the sensor hubs inside a sensor organize to such an extent that, if sensor hubs are put at these areas, the system may stay operational with the accessible vitality assets, for a time of wanted lifetime, utilizing a base number of hubs however guaranteeing high scope of the detected territory and in addition flexibility to disappointment [1]. Surveys of these productions might be found in [2][3][4]. Despite the fact that multi-jump correspondence may lessen general vitality utilization, a few hubs can be over-burden and deplete out their vitality all the more rapidly (beyond words), contrasted with some different hubs in the system. This may deliver unfortunate impact on the usefulness of the systems, notwithstanding causing the system to wind up noticeably inoperable. Many examinations have been directed to address this issue and different techniques have been proposed to limit the impact created by the passing of such troubled hubs. One of the procedures that has been proposed to decrease the weight on the over-burden hubs is to convey some uncommon hubs, known as relay nodes, inside the system with the goal that they can share some of the heap with the over-burden hubs. Notwithstanding load sharing, impact of the sending of relay nodes in sensor systems, alongside their position issue in both level and progressive design, has likewise been examined in various distributions. These examinations have concentrated on accomplishing assortments of goals, including adjusted information assembling inside the systems, expanding the lifetime of the systems and influencing a sensor to organize blame tolerant. A few creators have additionally proposed higher vitality provisioning of

the hand-off hubs and utilized them as group heads in a various leveled engineering. Fig. 1 Illustrate the relay selection in WSN-IOT applications.

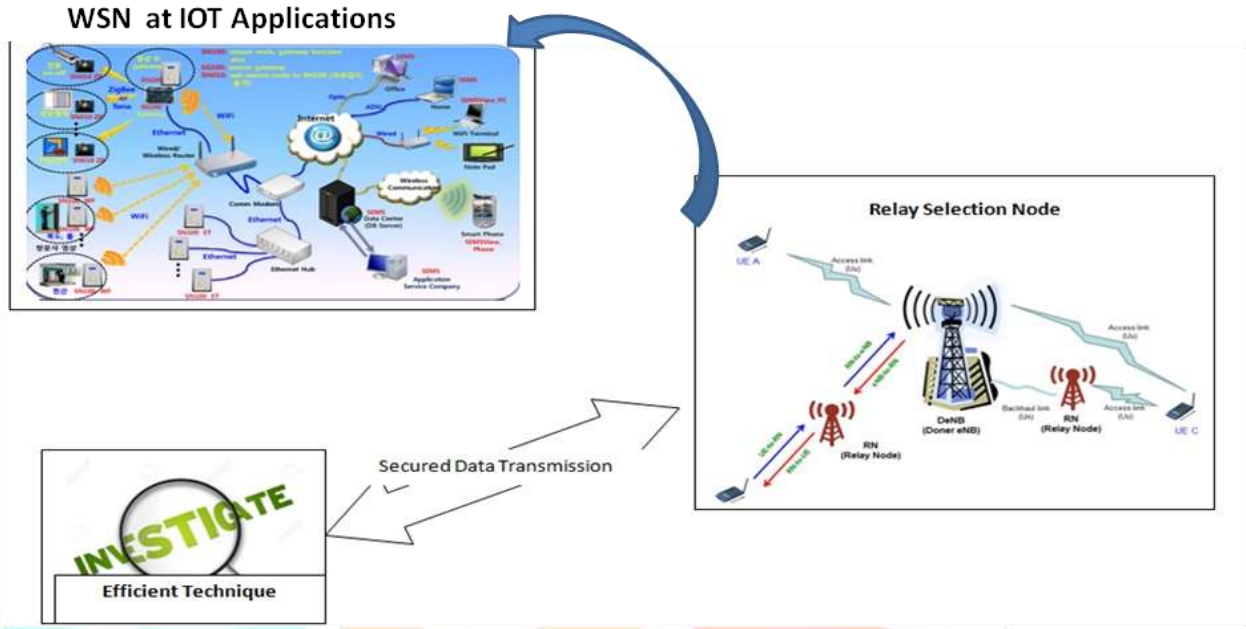

Figure 1: Overview of Relay selection in WSN-IOT

Many research works provides enhancement in terms of energy consumption; decreased node failure and increased security and prolonged network lifetime by using efficient techniques with IOT based distributed networks. Diversity obtained through multi-hop transmissions is usually referred to as cooperative diversity [5][6]. Assorted variety is a capable strategy to expand power against channel blurring. Helpful assorted variety is sorts of spatial decent variety that can be acquired without different transmit or get reception apparatuses. It is particularly valuable when time, recurrence, and spatial assorted variety through various receiving wires are not achievable. The principal cases of viable agreeable assorted variety conventions were contemplated by Laneman et al. [7]. It was demonstrated that assorted variety handing-off can possibly enhance end-to-end (e2e) execution in moderate blurring situations in spite of the punishment of transferring as far as transmission capacity development. Many transfer choice procedures have been talked about in writing [8]-[11].

This paper has been organized in following manner: section II describes the survey on existing techniques and methods. Section III represents the applications & discussion. Section IV concludes the paper with future enhancement.

II. SURVEY ON EXISTING RELAY SELECTION TECHNIQUES AND METHODS

These sections describe the relay selection techniques and relay selection algorithms in table 1 and table 2 respectively.

Table 1: Relay selection techniques

Sl.No	Relay Techniques	Advantages	Disadvantages
1	**Threshold based relay selection**	In this protocol best SNR is selected to compare with threshold value and selection of neighbor with best channel from S to D is selected.	Cost effectiveness threshold selection which misuse of technical issues
2	**Multiple relay beam forming**	As the selection of more relay ,energy of data reduces and multiplicity increases	Imprecise channel information due to either limited feedback or channel estimation error
3	**Cross layer relay selection**	It improves buffer capacity of relays with throughput gain and decrease in average transmission delay	Here relay selection is based on timer that affects performance
4	**Distributed relay**	It improves performance by selecting fixed	requires channel information

	selection	priority as outage probability reduces	between each node pair and the same is to be communicated to all the nodes which increase the overheads
5	**Delay optimized relay selection**	Transmission time and end-end delay is used in relay selection which reduces overhead and optimization is improved	If channel is not good to transmit data, more time is needed to interpret message.
6	**Joint relay selection &resource optimization**	Pricing variable is introduced for optimizing power and bandwidth along both with relay selection	Increased interference in network due to channel capacity
7	**Joint up-down relay selection**	Reduce in overhead by selecting relay in such a way that channel gain of link is strong enough	More traffic while communication between the uplink and downlink

Table 2: Relay selection algorithms

SL.NO	ALGORITHM TYPE	PROS	CONS
1	**Relay node selection based on cooperative gain**	It determines number of nodes dynamically and without delay removing redundant	No much gain when node is less in number and complexity increased
2	**Relay node selection based on coding scheme**	Independent channel diffusion and code word block diffusion	It affects complexity of scheme when channel is asymmetric
3	**Relay node selection based on energy consideration**	It saves energy with better adaptability	High intricacy
4	**Relay node selection based on real-time channel state**	Flexibility increases as changes in channel circumstances and good adaptability	Intricate to select at same channel state

III. APPLICATIONS & DISCUSSION

As mentioned before, the use of WSNs varies a lot, and the range of applications is increasing rapidly. The fields and some of the most important applications are:

 Military Applications, for example, combat zone administration, protection frameworks, military order furthermore, control, interchanges. Additionally the region of intrigue degrees from accumulation of data, in general, to adversary following, combats zone observation or target order [3].

 Environmental Applications, incorporate applications predominantly for ecological checking, similar to stickiness and temperature with a specific end goal to watch and record how a rainforest develops. Applications to screen terminated species and even ensure their populace increments or remains enduring (shield them from any sort of threat). To wrap things up application for flame safety measures or counteractive action.

 Traffic Control and Monitoring Applications, a scope of uses all intended to give straightforwardness and accommodation in ventures and the most critical wellbeing in the avenues and roadways. Applications for activity lights checking, movement observing, scaffold and high way observing, which all give a superior attention to the drivers.

 Commercial Applications, as said before HVAC frameworks fall into this class. For the most part actualized in the modern and business world. Frameworks ready to screen and control the workspaces; hardware administration benefits that will limit or even forestall upkeep consequently limiting costs.

 Health/Medical Applications, activities and thoughts that have profoundly change and will change the way the doctor's facilities and specialists work. Applications like social insurance, observing of elderly house, checking of ceaseless maladies with particular body worn sensors, similar to heart thump sensors, or sensors, which can gauge and pass data to the specialists in regards to pulse, glucose levels, anyone responses to solution on antibodies and so on., will help show signs of improvement understanding and even avoid diseases and any sort of sicknesses happening.

 Private Applications, a field that is connected with the undertaking displayed in this paper, which incorporates habitant observing, habitant detecting, propelled interruption alert frameworks, applications for vitality control and administration, which will have the capacity to limit the typical cost for basic items (very effective for lodgings too) and some more.

The primary concentration of this paper is the brilliant home service scenario. During the time of improvement, WSNs confront a critical downside that is the vitality utilization and preservation in the sensors. It must be noticed, that the sensors are working with basic batteries and even in the basic situations with single-jump correspondence (where no handling of the information is should have been done), the gathering and transmission of the information can be costly regarding vitality utilization. Despite the fact that, that was and as a rule still is an issue, more issues are confronted, for example, hub arrangement, information revealing strategy, adaptation to non-critical failure, adaptability, transmission media, information total and Quality of Service (QoS) arrangement.

A relay can be useful in the following scenarios:
• Fixed Infrastructure: To enhance scope in shadow regions and increment throughput because of LOS correspondence.

• In-Building Coverage: To fill the "scope opening inside the building".

• Temporary Coverage: Stadiums or social occasions of individuals amid an occasion. Additionally brief substitution to a harmed hand-off.

• Coverage on versatile vehicle: Inside trains and transports. A mind boggling transfer is required that can deal with speedy handoffs.

Lately, the utilization of transfer hubs in sensor systems has drawn a considerable measure of consideration from specialists around the globe. In sensor arranges, the utilization of hand-off hubs has been proposed for expanding the system lifetime, vitality effective information gathering, stack adjusted information assembling and making the system blame tolerant. A large portion of the examination has concentrated on enhancing the execution of sensor systems utilizing hand-off hubs in various levelled models, while some have concentrated on level structures. Likewise, a few papers have tended to the arrangement issue and the computational many-sided quality of the arrangement issue of transfer hubs in sensor systems.

IV. CONCLUSION AND FUTURE WORK

The Energy-efficient relay selection techniques have a substantial role in developing a well-organized IoT. Multi-hop WSN lifetime based on the relay node energy, as energy consumption is one of the most important issues in WSNs. Many techniques and algorithms proposed in literature for the optimal relay selection strategy in multi-hop IoT WSN have been identified and represented. Discussion carried out on different technique and parameters to highlight the existing efficient techniques. Future work proposed to investigate the time and energy efficient relay selection technique with secured data transmission in WSN-IOT applications. It reduce control overhead and improve network performance with reduces energy consumption with prolonged connectivity of the network.

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