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The Secure and Energy Efficient Data Routing in the IoT Based Networks

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ABSTRACT

Over the course of the last few years, a great number of studies have been carried out in the field of IoT. It has been found that there is an issue with the performance of the secure data transmission that takes place between sensor nodes and IoT devices. There is an urgent need for inventive strategies that can increase the amount of data that can be sent. In addition to this, a strategy that makes better use of energy should be put into action as soon as possible. Research is now looking at both IoT and a deep learning approach as part of the preparation for the next set of activities. In addition to the energy consumptions, there are a number of other aspects that have the ability to impact both the performance and the throughput of the work that is now being provided. A few examples of these considerations include the geographical distance, the rate of motion of the sensor nodes, and the calibre of the transmission devices. Make a recommendation for a method that can combine data compression with machine learning in order to develop a system that is both efficient in terms of energy consumption and has a high throughput. There is now research being conducted on IoT-based systems to study their degree of performance and safety, in addition to the amount of energy they save while routing data.

Keywords : IoT, Data routing, Energy Efficient, Performance, Security

I. INTRODUCTION

Numerous studies have been conducted on the topic of safe and energy-efficient routing in IoT. It has been shown that there is a performance issue with the data transmission that occurs between sensor nodes and IoT devices. There is a pressing need for ingenious means of increasing the capacity of data transmission. In addition, a more energy-efficient approach must be adopted. For next projects, researchers are investigating both energy-efficient routing in IoT and a DL technique. In the study that was recommended, there are a number of factors that have the potential to influence performance and throughput, in addition to energy consumptions. These factors include distance, the movement speed of sensor nodes, and the quality of transmission devices. Create a plan for combining data compression with machine learning in order to build a system that is both high-throughput and efficient with regard to the use of energy. IoT-based technology that is both energy efficient and secure is now the subject of research for both its performance and potential.

1.1 Applying Energy-Efficient System in IoT

It is essential to the success of Internet of Things networks that an effective system protocol that minimises the amount of power used be implemented. For these tasks, a knowledge of energy use is necessary. As a result of this, it is feasible for a protocol to become more intelligent if it is aware of and able to convey the limits of its specific nodes. The use of less energy to accomplish the same or a similar level of work is the definition of the concept of energy efficiency. In houses that are more energy efficient, the amount of energy required to heat, cool, and operate appliances is far lower than the amount of energy required by businesses to manufacture things. Facility managers may utilise smart thermostats and lighting systems to monitor energy use in real time and adjust use patterns to decrease demand during peak hours. These capabilities allow for significant cost savings. Due of the limited energy resources available, an important concern for Internet of Things devices is the rising cost of electricity. SSL is a protocol that consumes the least amount of electricity possible while yet giving the proper degree of security that is required for the work that we discuss here. A monitoring system for electricity and other energy indicators that is based on IoT maintains track of real power use.For the purpose of making an accurate comparison of the quantities of energy that are utilised in each. If there are any discrepancies between the actual power consumption of your equipment and the power consumption that is reported for it, make a note of them.

1.2 Comparison of Energy-Efficient Algorithms

WSN has a primary emphasis on achieving high levels of energy efficiency. As the size of a network increases, the quantity of data it gathers also increases. This causes it to need an increasing amount of power, which, in the end, causes a node to crash and die. Several different procedures have been established specifically with the intention of reducing the amount of power that is required for the process of data sampling and gathering. The following are some examples of systems that are efficient in their use of energy:

1. LEACH “Low-Energy Adaptive Clustering Hierarchy”

As a direct consequence of this, the majority of nodes engage in hierarchical protocol communication with cluster leaders (C.H). There are two steps to this process:

- The process starts with a rating of the clusters and the selection of the CH. CH is responsible for a variety of tasks, including the collection of data, its packing, and its transmission to the station (Sink).
- During the first phase of "LEACH," the nodes and CH are set up. During the second phase of "LEACH," data is sent from the nodes to the base station (Sink).This portion will take the most time out of the whole process. As a result of the increased time that has been allotted to this level, it will be easier for you to complete. In order to communicate with the base station, the CH collects data from the various nodes in the network and then uses that data to devise a strategy for communicating with the base station.

2. PEGASIS “Power-Efficient Gathering in Sensor Information Systems”

The "LEACH" system that was used before has been replaced with this protocol's "chain-baseds" structure. The "PEGASIS" network only allows its nodes to share data and instructions with their immediate neighbours. Alternating between sending data from the BS and receiving data from it allows for each cycle to use less energy. They may be able to achieve their objective by using an algorithm in conjunction with a distributed sensor node network. Nevertheless, the BS is able to calculate this sequence and then broadcast it to each of the sensor nodes in the network. As is customarily the case, all of the nodes in the system will have access to the information contained inside the system, and gluttonous algorithms will be used to accelerate the expansion of the chain. The structure of the chain will be built backwards, starting with a node that is farther along in the chain than the one at the beginning of the chain. When reassembling the chain in the same way, a dead link in the chain is not included and is thus skipped over.

3. TEEN "Threshold sensitive Energy Efficient sensor Network protocol"

A hierarchical structure is provided by the TEEN protocol for dealing with situations in which a measurable parameter, such as temperature, is prone to rapid variations. Since it was first developed, TEEN has been the only protocol that was created with the express intention of being used in an environment that is reactive. If nodes are only permitted to broadcast when the detected property is within the range of interest, then a hard threshold might potentially minimise the overall number of broadcasts. A soft threshold cuts down on the amount of communications that take place by completely halting them if the observable property undergoes even the slightest of changes. TEEN is a wonderful technique for decreasing the amount of energy that is used and accelerating reactions in circumstances when time is of the essence. The user is in total command of both the precision and the amount of power used.

4. APTEEN "Adaptive Threshold sensitive Energy Efficient Sensor Network"

The "APTEEN" concept is an expansion on the "TEEN" idea, which aimed to acquire data in shorter bursts and react to crucial circumstances more quickly. The "APTEEN" concept aims to gather data in shorter bursts & react to critical situations more quickly. The C.H. Once the BS has completed the construction of the clusters, it will begin broadcasting features, threshold values, and a transmission schedule to all of the nodes. The accumulation of information beyond this point is what ensures the continued strength of C.H. The reduced overall energy usage of APTEEN's nodes is the primary competitive advantage it has over TEEN. APTEEN, on other hand, has a number of drawbacks, the most significant of which are the complexity of the system and the added time it produces.

5. Directed Diffusion

The collecting and distribution of WSN data should preferably be done using a process called directed diffusion. As a consequence of this, data moves in both directions between the sink and the sensors whenever the sink requests a specific piece of information from the sensors. It is of the utmost importance to save a significant amount of energy in order to ensure the continued operation of the network. In order to do this, it is necessary to confine communication between nodes to a constrained and strictly controlled space. This protocol is the only one of its kind in the industry since it enables multipath distribution within a restricted contact space. A significant quantity of energy is conserved as a result of this feature and the nodes' capacity to reply to the requests made by the sink.

II. LITERATURE REVIEW

According to Subramania Ananda Kumar, et al. (2018), precision agriculture is an interdisciplinary approach to farming that makes use of cutting-edge information technology in order to improve agricultural productivity and quality. Specifically, the goal of precision agriculture is to pinpoint exactly where and when to apply inputs in order to achieve optimal results. 1]

Quoc Hung Ngo and colleagues (2018) came up with the idea for an agriculture ontology as a result of their research on the function of intelligent agricultural systems. With the help of this ontology, it is straightforward for anybody to see the connections between the many different kinds of agricultural data.

This ontology imports nation, sub-country, and disease entities in order to facilitate the creation of datasets that are related agriculturally. [2]

Arun M. and colleagues (2018) created an architecture for a precision agricultural system that makes use of a wireless sensor network to monitor many metrics at the same time simultaneously. All of these different factors, including soil moisture, relative humidity, sprinkler water flow rate, and others, are shown in this way. [3]

When it came to the design, development, and implementation of IoT systems, TagyAldeen Mohamed et al.(2018) was taken into consideration at every stage. This study proposes an intrusion detection system (IDS) service for Internet of Things (IoT) platforms that is based on ML approaches. The results of the experiments shown that while this model is able to recognise intrusions, the classification of such intrusions has a low level of accuracy and a significant amount of bias. [4]

A group that is being headed by Berat A. Erol (2018) Because this book does not have GPS, case-specific procedures are necessary in order to direct a mobile robot wherever it chooses to go. In this chapter, we utilise CNNs and pattern recognition to detect objects or markers in photographs and movies. [5]

In recent years, Seon Ho Oh et al.(2018) released VIOT, which has garnered a lot of attention due to the fact that it can find an object in a setting by utilising photographs of the environment and then transmit that location information to the network. This ability has caused VIOT to garner a lot of attention. [6]

Going in the direction of the Middle East According to the findings of a research conducted by Pajouh et al., the use of IoT devices is growing across a variety of industries and for a number of different reasons. [7]

Because the system proposed by Sohail Jabbar et al. (2019) used the most power of any communication architecture, it was not chosen to be implemented. We provide here an innovative approach to the study of WSN systems, which has not been covered in any previous academic literature. [8]

By automating and mechanising the whole agricultural process, precision agriculture was able to better control crop yields, increase income, and have a less negative influence on the surrounding environment. [9]

Researchers were able to limit the amount of data that was sent back and forth between the many parties involved by using Raquel Gómez-Chabla, et al. (2019). [10]

This paper by Angel D. Sappa, et al. (2019) provides a straightforward method for identifying motion in video sequences captured by a stationary camera. [Citation needed] [11]

III. PROBLEM STATEMENT

There is a performance issue with the data transmission that occurs between sensor nodes and IoT devices. There is a pressing want for ingenious ways to boost the capacity of data transmission. In addition to this, an approach that utilises energy more effectively is required. In addition, there is a need in IoT for the protection of data together with the implementation of energy-efficient routing.

IV. NEED OF RESEARCH

There is an original approach to increasing the speeds at which data may be sent. Additional steps need to be performed in order to decrease the amount of energy used. In next research, we will look at energy-efficient routing, the internet of things, and a way of deep learning. There are a number of aspects that have the potential to effect the performance of the work that has been presented, such as the distance that exists between sensor nodes, the pace at which they move, and the quality of the transmission devices. Combining safe data compression with machine learning may result in the production of a system that has a high throughput and is efficient in its use of energy. IoT-based secure routing is currently being researched for its potential in terms of both performance and energy efficiency.

V. SCOPE OF RESEARCH

IoT solutions are developed with the intention of assisting users in bridging the gap between supply and demand by ensuring exceptional yields, increased profitability, and the preservation of the environment. IoT technology is used in the context of routing in order to maximise the safe and efficient routing of data while also lowering operational expenses. When it comes to routing, the Internet of Things' capacity to instantly adjust to changing circumstances is one of its many advantages.

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