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Research paper

Energy efficient scheduling mechanism using wireless sensor networks

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Abstract

Wireless sensor networks are an electro mechanical system which is used to transfer information to the base station from the beacon node. The objective of our project is to increase the lifetime of a beacon node, parallelly decreasing the energy using WSN by using appropriate scheduling mechanism. Each sensor performs different types of operation such as collecting the information from the sensors, processing it and communicating the source information when required, so energy consumption of these nodes is high. This can be reduced by using centralized approach and average consensus based Distributed algorithm. The lifetime of sensor is first increased by modifying M2CIC into multimodal set coverage problem and using this to produce NP-completeness. Another problem here is the network utility maximization problem which consists of Mixed Integer programming. This is solved by splitting the multi period problem into a single period problem. It is future reduced to Pure Integer programming. This Pure Integer programming can be solved by a centralized way.

Keywords: *Wireless Sensor Networks; M2CIC; Dynamic Time Slot MAC; NS2.*

1. Introduction

In mission-critical applications, such as battle-field reconnaissance, fire detection in forests, and gas monitoring in coal mines, wireless sensor networks (WSNs) are deployed in a wide range of areas, with a large number of sensor nodes detecting and reporting some information of urgencies to the end-users. As there may be no communication infrastructure, users are usually equipped with communicating devices to communicate with sensor nodes. When a crucial incident like gas leak or fire occurs in the observing area and is detected by a sensor node, an alarm needs to be strewed to the other nodes as soon as possible, then, sensor nodes can warn users nearby to flee or take some response to the event.

Distributed Intelligent Sensing System for

- Factory automation
- Process Control
- Real-time monitoring of machinery's health
- Detection of liquid/gas leakage
- Remote monitoring of contaminated areas
- Real time inventory management.

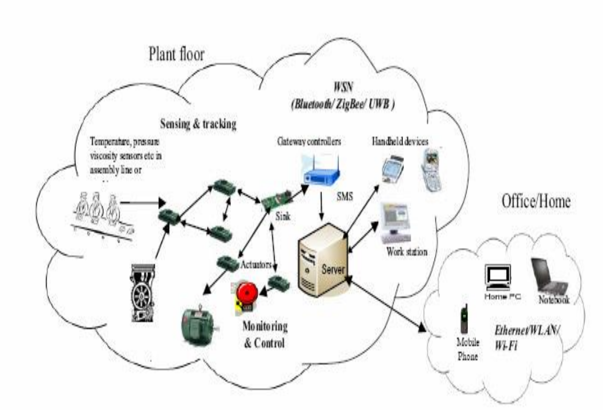

Fig. 1.1: Wsn Industrial Applications.

1.2. Motivation

MAC protocol gives birth to many protocols. The procedures of this protocol are compact and well coped with multimodal sensor environment. This paper presents Dynamic Time Slot MAC (DTS-MAC), a novel MAC protocol unambiguously designed for wireless sensor networks. The three constraints of the design for reducing energy are consumption ,good scalability and collision avoidance capability and it is done by using combined scheduling,contention scheme. To achieve the primary goal of energy efficiency, we need to identify what are the main sources that cause inefficient use of energy as well as what trade- offs we can make to reduce energy consumption.

In existing paper, they are heuristic algorithm as centralized heuristic algorithm and distributed heuristic algorithm. In this algorithm, they are using small amount sensor nodes it can't be used for the large real world application they did not with stand large no of sensor nodes and there may collision problem can be occurring in base station. Our main is to increase the network life time and reduce the coverage information problem. To solve the above problem, we propose enhancement of MAC protocol. i.e. Dynamic Time Slot MAC (DTS-MAC).

2. Research method

2.1. Existing system

An effective way to extend network lifetime by maintaining the network coverage requirement in a densely availed WSN is sensor activity scheduling. If the area occupied by one sensor is already occupied by the other then this sensor is subjected to energy saving sleep state without losing its network coverage,by dividing the time line into unique intervals. So that network coverage is guaranteed in different intervals.Motivated from the precision agriculture applications and based on the ordinary kriging, we have proposed a novel coverage model, termed confident information coverage (shorted as CIC or F-coverage), in our previous study from the perspective of field reconstruction. Field reconstruction is to estimate some spatially distributed physical attributes with a given reconstruction quality for the whole sensor field.

2.2. Proposed system

Efficient low duty cycle is represented as a periodic dynamic time slot MAC . A node periodically switches between an active communication epoch (regardless if transmitting data, receiving data, or idly listening to a clear channel), and a power-efficient sleep state. Dynamic Time Slot MAC or wake-up protocols are then being built on top of these periodic wake-ups in order to enable RF communication. Although diverse in nature, the main disadvantage of low duty cycle MAC protocols is that even with a balanced duty cycle, the enforced regularity rarely matches an application's needs, compromising energy efficiency or performance. The fundamental uncertainty of when an incoming message is to be expected has a negative impact on all software-based approaches to power management.

2.3. Advantages

Improved Energy Efficiency
In most cases sensors are deployed to remote location without capability to replace battery
Enhanced to Reducing power means increasing life time of WSN
Increase stability period of network, and minimize loss of sensed data.

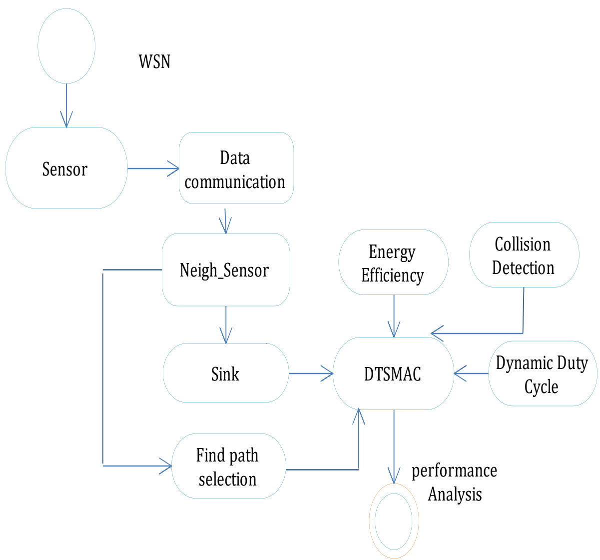

Fig. 2.1: Block Diagram Workflowsarchitecture Diagram

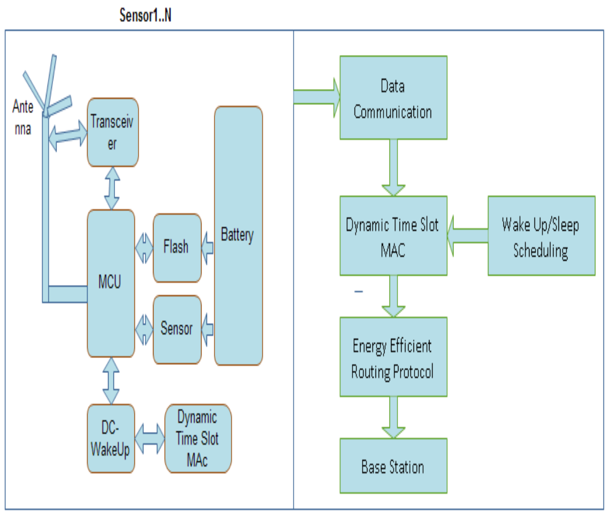

Fig. 2.2: Architecture Diagarm of Mac Protocol.

3. Results and analysis

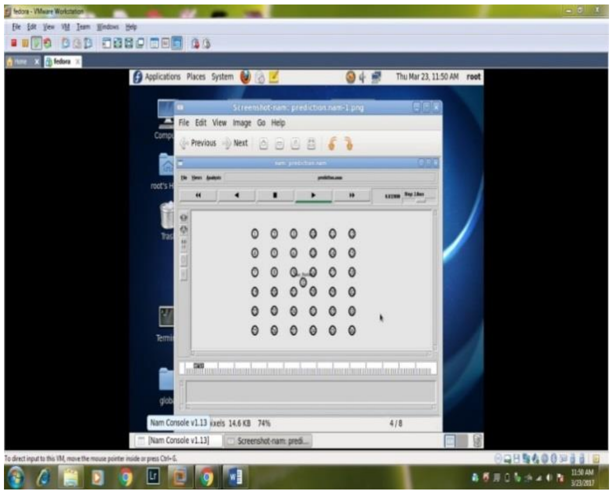

Fig. 3.1: Simulation Output.

Nearly 36 sensors are deployed over a specific area according to geometric co-ordination system, with the base station located at the center. The sensors are used here are temperature and humidity sensors with the coverage range of 200 to 300m. Here the sensors designated as 5, 14, 23 and 32 acts as a net zone.

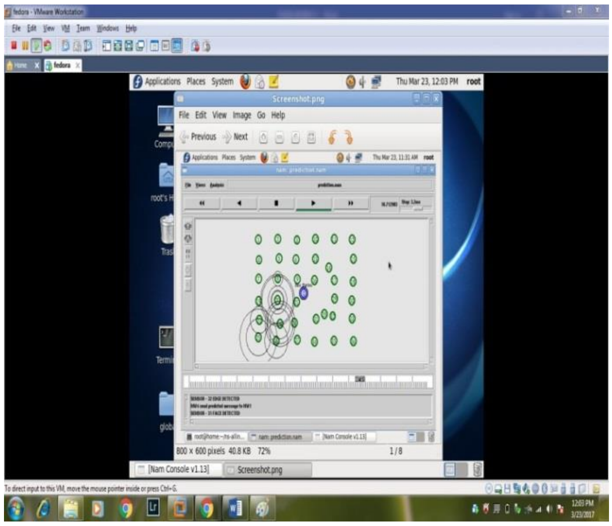

Fig. 3.2: Simulation Output.

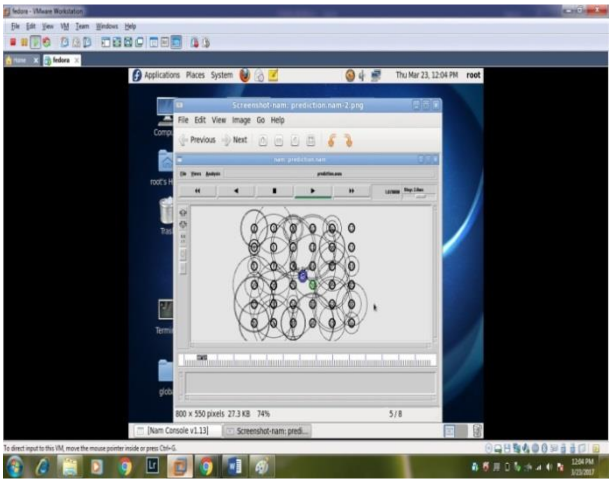

Fig. 3.3: Simulation Output.

Here the connection between the sensors have been established all the sensors will send and receive a common data to know about all the neighbouring sesnors this will clearly show in the Figure 3.2 and3.3

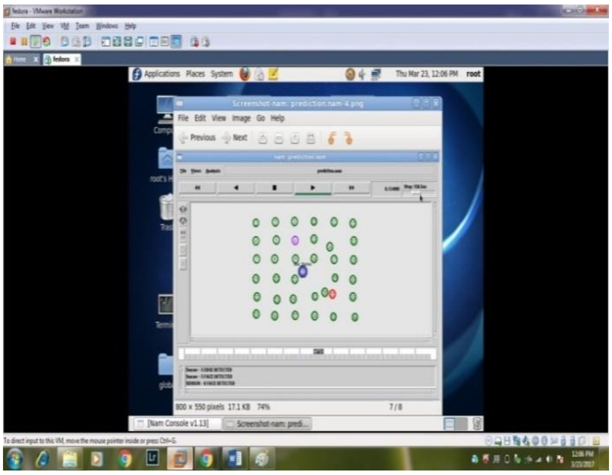

Fig. 3.4: Simulation Output.

After certain amount of lifetime every device as its dead end in the same way the certain amount of time period the sensors completely wants and off dies. At this stage, the operation performed by the dead sensor will be taken over by its nearby sensor if these sensors engaged in some specific work then the operation will be pass to the second sensor, that will be nearer to the dead node.

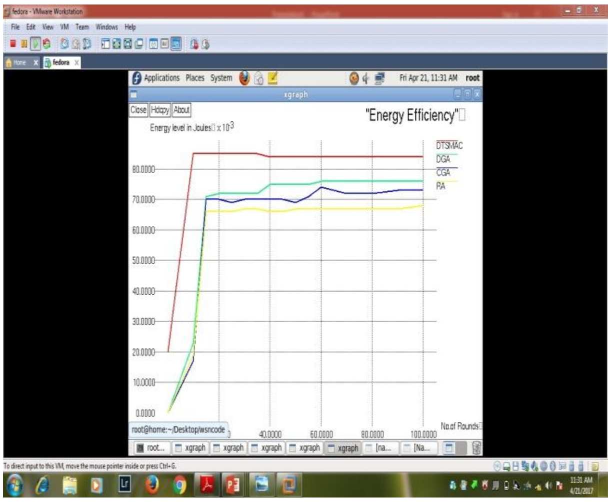

Fig. 3.5: Simulation Graph.

Energy efficient, is the goal to reduce amount of energy required to provide product and service. As compared to the existing paper this method give more energy efficiency.

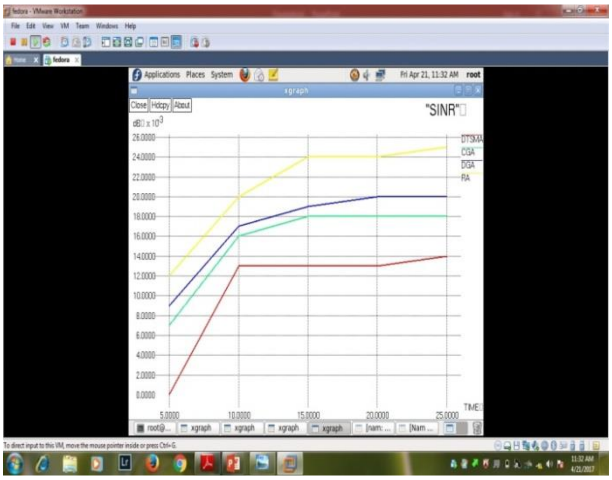

Fig. 3.6: Simulation Graph.

During delivery of packet to base station the amount of noise and unwanted signal

Should be as low as possible. In our proposed system signal to noise ratio is low as compared to the existing method.

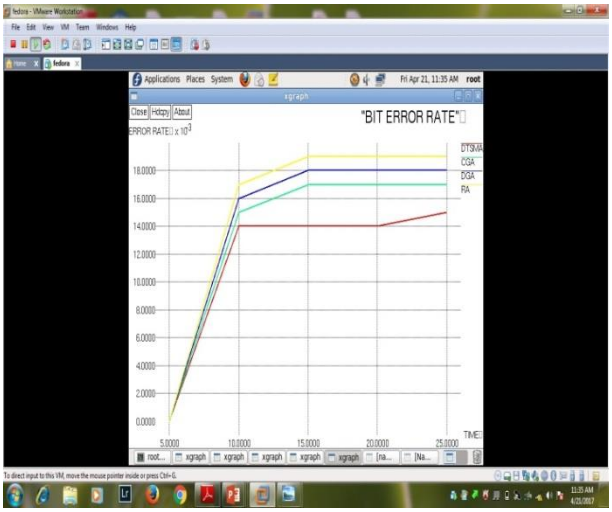

Fig. 3.7: Simulation Graph.

It is the amount of error present in the received signal as compared to the transmitted Signal. In our prosed system, the bit error rate is low as compared to existing methods.

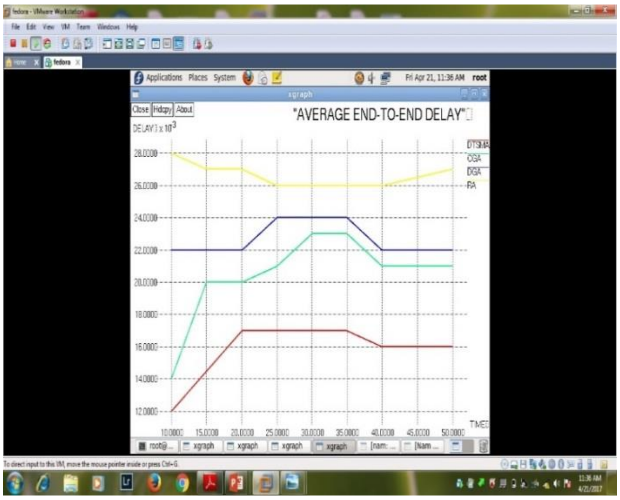

Fig. 3.8: Simulation Graph.

3.1. Result and discussion

we evaluate the effect of DTSMAC on the performance of routing and data transmission. The replication surroundings are produced in NS-2, in that provides maintain for a wireless networks. NS-2 was using C++ language and it has used for an Object Oriented Tool Command Language. It came as an extension of Tool Command Language (TCL). The execution were approved out using a mobile node environment of 50 mobile nodes over a simulation area of 1200 meters x 1200 meters level gap in service for 10 seconds of simulation time [8]. The radio and IEEE 802.11 MAC layer models were used. The network based data processing or most expensive and data communication level on their performance on the network. Hence, the simulation experiments do not account for the overhead produced when a multicast members leaves a group. Multiple sources create and end sending packets; each data has a steady size of 512 bytes. Each mobile node to move randomly on their network, it's more and most expectable on their networks.

Table 3.1: Parameters

PARAMETERS	VALUES
MAC type	802.11
Routing protocol	DTSMAC
Nodes	50
Mobility Model	Random Way point
Mobility Speed	5,10,15,20,25 ms
Pause time	5ms
Propagation Model	TwoRayGround
Number of Attackers	5,10,15,20,25
Traffic Type	CBR
Traffic sources	5,10,15,20,25
Area	1000*1000

4. Conclusion

Although there are various MAC layer protocols proposed for sensor networks, however, there is not one protocol which is accepted as a standard. The choice of this protocol is based on two reasons like it will be application-specific, that is there will not be single standard MAC for sensor networks and the other reason is the lack of standardization at physical layer and the physical sensor hardware. The aspect with more attention is the extended network life based on utilisation of battery with maximal efficiency. Major usage of battery is at the MAC Layer level where radio module is utilized. As it has been shown by various researches that radio transmission needs more power as compared to processing of same amount of data. MAC Layer protocols needs to be developed efficiently. DTSMAC is one of the basic MAC protocol which conserves energy by providing sleep schedules so that all the nodes of a particular area are not active at all times. Only those sensors are activated which are required to sustain full accessibility of network. However, DTSMAC has static sleep schedules that is schedule do not change according to need or changing environment which leads to sleep delay. This particular problem is overcome using dynamic sleep pattern or scheduling as in case of TMAC protocol, which is a derived from DTSMAC protocol. In TMAC according to change in pattern of network like inclusion of new nodes, deactivation of exhausted node, network will adapt itself and have a variable sleep schedule which will increase the battery utilization. However, a new problem creeps in if sensor node sleeps before it completes the transmission which increases latency. In future, an advanced form of these protocols may be realized with emphasis on early sleeping and delay sleeping with improved delay i.e. latency. Strength of DTSMAC is its low power consumption and for TMAC it is better sleep schedule. A combination of these positive aspects of both the protocols may be realized in a single protocol with eradication of disadvantages present in both of them.

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