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An Adaptive Scheduling Algorithm for Collecting Data in Wireless Body Sensor Networks

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Abstract: Recent developments in the communications and electronic industry have provided the stage for producing multi-purpose, cost-effective sensor nodes with low energy consumption in small dimensions and the ability to communicate in short distances. This paper is aimed at improving the efficiency of sensor networks in the body sensor networks by using the learning automata smart method and a new data aggregation technique. The data is transmitted from clusters to the base station by a data aggregation technique and a scheduling algorithm (vital signs written in C++). Now automata data is sent inside a random environment. According to the learning algorithm with a variable structure LRI in which penalty is zero and reward is given to the vital signs considering their type, the random environment returns data to automata so that automata uses it for selecting its next action. If critical signs have received the maximum reward after N repetition, it is determined as the best action of automata. Then this data is sent to the physician after being transmitted to the sink node (base station) via the internet, and the physician diagnoses the disease and returns the treatment result. To examine the performance of the proposed protocol, we studied its behavior through simulation. NS-2 simulator environment has been used for simulating protocol. The scenario has been implemented by OTCL, and we used files created by this language and the C++ programming language in NS-2 space. The results of the simulation show that the proposed protocol has had a better performance.

INTRODUCTION

The wireless sensor network is a particular type of ad hoc network. It includes a set of small nodes that can sense the surrounding environment with a specific purpose, process, store, exchange information with other nodes, and adapt to changes (topology, etc.). Usually, all nodes are identical, and they fulfil the general goal of the network in cooperation with each other. The main goal in wireless sensor networks is to supervise and control

climatic, physical, and chemical conditions and changes in an environment with a specified area[1,2].

The prototype of the body sensor network is an individual area network that T. G. Zimmerman proposed in March 1996. The body sensor network is a small sensor network to monitor different information for different purposes and achieve communication between machines and humans by changing information by external tools. The main objective of body sensor networks is to develop wireless technologies of research and development for body sensor networks; also, it is applicable for treatment, health care, entertainment, army, and flight into space. Remote health monitoring is one of the applications of body sensor networks. In March 1999, IEEE created 802.15. In 2001, body sensor network theory and the related concept were presented. in 2006[3] presented the concept of body sensor network that includes processing and communication with very low power and achieving power and receiving automatically and gaining information and distributed interference and smart sensor processing, and a small wireless integrated sensor system. In 2007, IEEE created IEEE 802.15.6 for body sensor network and this standard is an optimized communication standard for tools with low power and it is used on or inside or around the human body for various applications including medicine. The communication standard of body sensor network for IEEE 802.15.6 has been published in 2010.

The body sensor network is an example of a wireless sensor network. A body sensor network is a special wireless sensor network that measures the body's biological parameters by using wireless sensor nodes and provides the stage for remote health monitoring. It is available in two wearable and implant types. These systems monitor physical activities like environmental parameters. Furthermore, by providing such services as medical supervision, pharmaceutical and medical information, improving memory of individuals, controlling home machines, and communicating in emergencies, these systems may help individuals considerably[4].

Advancement of Body Sensor Network Technology: Continuous monitoring of body sensor networks increases the probability of an early diagnosis of an emergency in patients with high health risks. It provides a wide range of health services for people with different degrees of conceptual, sensory, and motor disabilities. These networks include several sensors on or inside the body or on the cloth, providing the stage for receiving, processing, and communicating. A base station receives data from sensor nodes in these networks and sends it to remote centers. This technology is one of the latest technologies in diagnosing and managing health care. Sensors existing in this network are portable and very small. Each sensor node can usually receive one or more vital signs, process these signs, store the processed data, and transmit data to other sensor nodes or a wireless body sensor network server. The body sensor network has smaller nodes compared to a wireless sensor network. Smaller nodes have smaller batteries and this is considerably effective on the reduction of energy consumption and processing and storing and communication resources and accuracy and delay of transmission. In body sensor networks, some sensors (like motor sensors and electro cardiogram sensors) are installed on the patient body to supervise the patient's vital signs or diagnose the movement. The body sensor network has been comprised of several biological sensors. Using body sensor networks in the medical areas is a unique opportunity that these networks have created for transmitting medical care from the hospital environment to the patient home. This has led to more optimal use of hospital resources, earlier diagnosis of medical signs, and finally, medical care costs. The use of body sensor networks has a remarkable effect on health and improves life quality and patient comfort. This technology is progressing day by day and is aimed at helping patients, physicians, and treatment groups[4].

Challenges in wireless sensor networks: In spite of the advantages such technology brings to the society, the body sensor network technology poses several challenges when applied in real-world settings including:

- reliability
- confidentiality and security
- lack of resources[5]

Architecture of Wireless Body Sensor Network: A body sensor network includes one or more body sensor units (BSU) and a central body unit (BCU), and a sink with a long-range network. Different body sensor units collect data about respiration rate, pulse, glucose rate, ECG, and other (physiological) vital signs. Each body sensor unit transmits its data to the central body unit. Sensors may have different behaviors for communicating with the central body unit. In the first selection, they may send the measured information continuously. In the second selection, information is sent periodically, which reduces energy consumption by the sensors. In the third state, a log file is sent one time per day. Information is measured and recorded in a file. In the fourth state, warning message whenever the signs are abnormal needs high energy[6].

Requirements of Wireless Body Sensor Network Systems: The major requirements for a wireless body sensor network system to function with an optimal performance are enumerated as below:

- low energy consumption

- low weight
- small size
- error tolerance
- low power consumption
- flexibility for adapting to the user state and changes in the environment

MATERIALS AND METHODS

Data Collection in the Sensor Networks: Among advantages of minimizing the rate of redundancy, reducing number of posts, saving energy, rapid and efficient response to the queries, reducing energy consumption and bandwidth, etc. can be mentioned. Data aggregation technique combines interrelated data with each other, prevents from sending redundant packets in the network, reduces number of packets, reduces energy consumption, and increases the network lifetime[7].
The objective of this issue, i.e. collecting and combining information gained from different resources is to remove redundancy, reduce number of posts, and save energy. There are several optimal structures for this purpose:

- nearest source to the center (CNS)
- shortest path (SPT)
- greedy method (GII)
-

The collector usually has a wide set of resources and powerful energy compared to body sensor network nodes. It is a bridge for communication among nodes. Data collection has two main issues: 1) energy savings, 2) rapid and efficient response to the queries which is vital for performance and maintenance of vital network.

Since direct transmission of data to the base station is not efficient in terms of energy consumption, it uses data aggregation technique which reduces energy consumption and bandwidth. Data collection in the sensor networks is divided into two groups in terms of time and event. In this state, information of nodes is aggregated by the collector node periodically and is transmitted to the sink node rapidly in each collection cycle which is called periodical aggregation.
Data collection function:
$Y(t) = f(d1(t), d2(t),\ldots,dn(t)) = \sum f(di(t))$

In data aggregation technique, the interrelated data packets are combined with each other in the middle nodes and compose one packet. So the number of packets sent in the network will be reduced and lower energy is consumed.

A wireless body network provides the stage for small smart sensor nodes with low power to supervise over functions of body and the surrounding environment. A smart node is able to process and send information to the base station for diagnosis and prescription (treatment). A wireless body sensor network provides the stage for supervision over long term health of patients under physiological states without limitation in the daily activities. The wireless body sensor network is used for developing a smart and proper health care system in terms of treatment costs. It also may be considered as a part of process of diagnosis and maintenance of patients with chronic disease for improving health situation after the surgery and may be also used for managing emergency events.

Media Access Control: MAC protocol in a wireless self-organizing sensor network must achieve two objectives. The first objective is creation of network foundation; because thousands of sensor nodes have been scattered in a sensor field. MAC structure must establish communication links for data transmission. These main fundamental forms need hop by hop wireless communications and give the ability of self-organization to the sensor network. The second objective is to share resources among sensor nodes fairly and efficiently. Traditional MAC structures may be classified based on mechanisms of resource sharing.

Main Objective of Mac Layer, Body Sensor Network: Maximum Permittivity and minimum delay and maximization of network lifetime are achieved by controlling main resources of energy waste like collisions, idle listening, random hearings, and packet costs.

IEEE 802.15.6 is an international wireless body network standard that supports communications around or inside the human body. This is used for various medical and non-medical applications. This standard defines MAC which supports several physical layers. The format of general MAC frame includes a 56-bit header, variable body frame length and 18-bit frame check sequence. Maximum body frame length is 255 octets[8]. One important feature of a good MAC protocol for a wireless body sensor network is the energy efficiency. Task cycle techniques are flexible and efficient in terms of ability to minimize idle listening, random hearing, and collisions of packet and controlled packet overhead. So, nodes with low task cycle must not receive repetitive time schedule and control information (of Beacon frames) if they do not have information for sending or receiving. This MAC protocol of wireless body sensor network must permit simultaneous action on the channels inside the body (MICS) and on the body (ISM or UWB). Other important factors are scalability and adaptability with the network changes, delay and permittivity and use of bandwidth. Changes in the network topology, human body situation, and node density must be managed rapidly and successfully. MAC protocol for a wireless body sensor network must consider electrical features of human body and various traffic natures of nodes inside and on the body[9].

Proposed Protocol of Intensive Care Unit: This is a unit in which patients are treated by physicians and other personnel under the best conditions by using the newest and the most equipped available tools. In general, supervision in ICU must be done continuously and precisely. Use of new surgery and treatment methods without ICU is not complete. Patients hospitalized in ICUs are very unwell, they are not able to take care of themselves, and their body vital systems do not work well. Among patients hospitalized in ICU, an important group of patients has respiratory disorders and need artificial airway and ventilator.
These patients include:

- Respiratory failure after surgery
- Strokes and accidents
- Cerebro Vascular Accident (CVA)
- Ribs fracture
- Chronic Vascular Arterial (COPD) besides respiratory disease such as asthma or emphysema
- General diseases that cause respiratory problems like Poliomyelitis, myasthenia gravis, Gillian-Barre and tetanus. Other patients that are hospitalized in ICU are patients with neurosurgery, cardiac surgery, organ transplant (kidney, liver, heart, and bone marrow), patients with severe burns, patients with severe infection (sepsis), patients with severe hemorrhage and shock, medical patients requiring intensive care, kidney patients and special case studies

This group of patients is usually hospitalized in the related specialized ICUs. The rate of death in the general ICU is high (near 50%). Nevertheless, ICU must not be regarded as a place for patient death. So, selection of the patient for being hospitalized in ICU is important; since costs of hospitalization in ICU are very high, patients must be selected for this unit who really need special care.

Sensors Used in Simulation: ECG sensor: electrocardiogram sensor is aimed at recording electrical potentials of heart graphically.
Pulse sensor: this sensor is used for measuring pulse (rhythmical dilation of arteries).

Respiration sensor: this sensor includes a combination of several sensors like pressure sensors, accelerometers, and gyroscope which obtains respiration parameters indirectly by identifying expansion and contraction of the chest or abdomen based on their sensors. These sensors are used for treating respiratory diseases and supervising disease signs continuously. This sensor is aimed at exchanging oxygen and carbon dioxide between body cells, i.e. diffusion of oxygen from the alveoli into the blood and diffusion of carbon dioxide from the blood into the alveoli, giving oxygen to the body cells and taking carbon dioxide from them.
Pulse oximetry sensor: it is aimed at measuring pulse oximetry.
Blood pressure sensor: it is used for measuring systolic and diastolic blood pressure in humans.
ABG sensor: it refers to arterial blood gas sensor.
Temperature sensor: this sensor is aimed at measuring body temperature based on a certain scale.
Glucose sensor: this sensor measures the blood sugar. The blood sugar is an Aldo-hexose which is also known as dextrose and it is found in fruits, other plants, and natural blood of all animals in the form of free monosaccharides. Moreover, it is found in Glucosides, D-loligo, and Polysaccharide. The final product of metabolism is carbohydrate and it is the main energy source for living organisms and its consumption is controlled by insulin. The surplus glucose is converted into glycogen and is stored in the liver and muscles for consumption when necessary and the excess amount becomes fat and is stored in adipose. Glucose is seen in urine in Diabetes Mellitus.
GCS sensor: this sensor determines GCS in the patient.
EEG sensor: it refers to electroencephalogram sensor. In fact, this sensor records electrical discharge of brain cortex in electroencephalography.
EMG sensor: it refers to electromyography sensor. It records and studies the electrical features of the skeletal muscle.

ECG, Pulse, Respiration, Pulse Oximetry, Blood Pressure ABG, Temperature, Glucose, GCS, EEG, EMG and exterior view of patient room and sensors on the patient Shown in fig. 1 :

The Proposed Algorithm: The proposed protocol is a self-organizing clustering protocol that distributes the energy load on the network sensors. In this protocol, nodes organize themselves in the local clusters. In the proposed protocol, the head of clusters do not have energy problem and has indeed no sensor unit, they only receive data from body sensor nodes and send it to the base station. Moreover, data is aggregated locally so as to reduce data that must be sent to the base station and consequently energy consumption and to increase the network life time. In this method, cluster head phase occurs only one time and special nodes we have already selected become cluster head. These cluster heads inform other network nodes about their situation. Each node selects a cluster head based on the minimum communication energy and becomes member of that cluster. When all nodes are organized in the clusters, each cluster head makes a time schedule for its nodes. Based on this time schedule, nodes that do not belong to the cluster head turn on their radio hardware only when it is time to send them and they are off at the rest times and

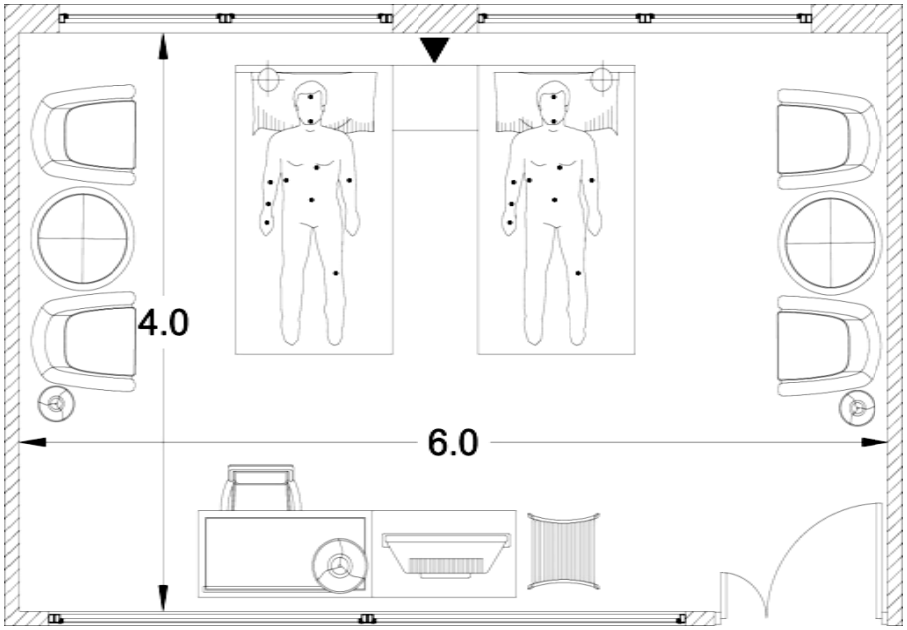

Fig.1: Exterior view of patient room and sensors on the patient

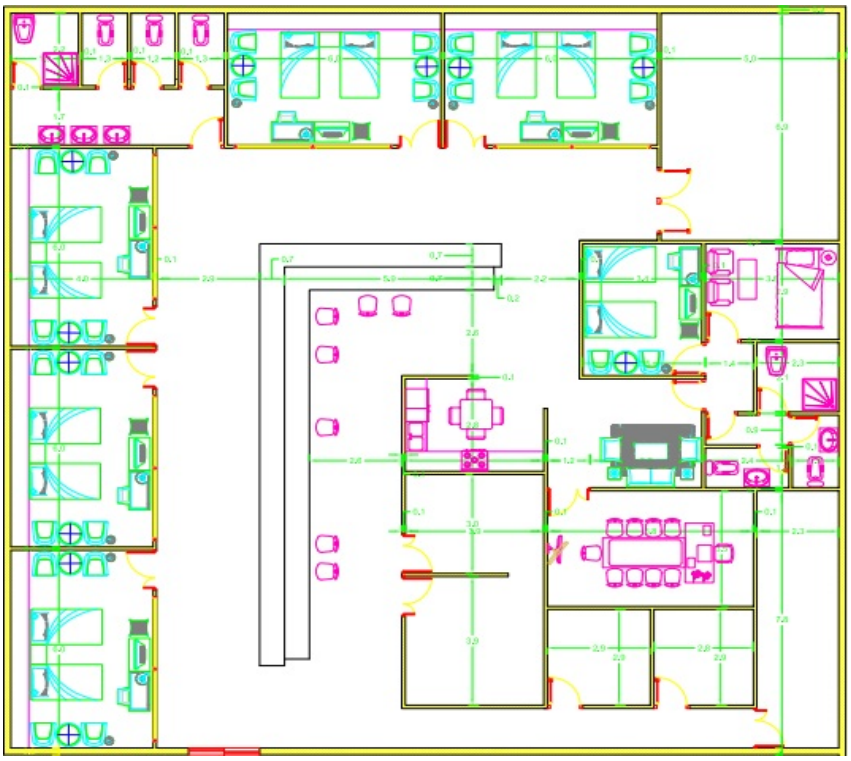

Fig. 2: ICU room

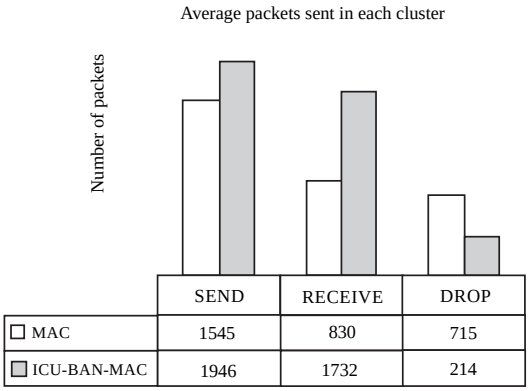

Fig. 3: The average sent packets in each cluster

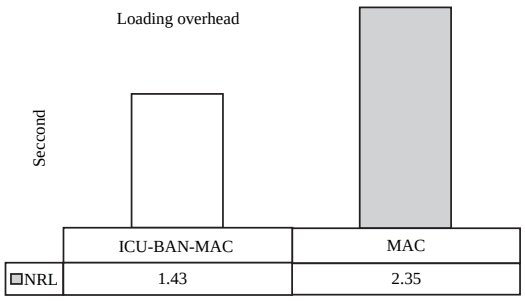

Fig.4: Loading overhead

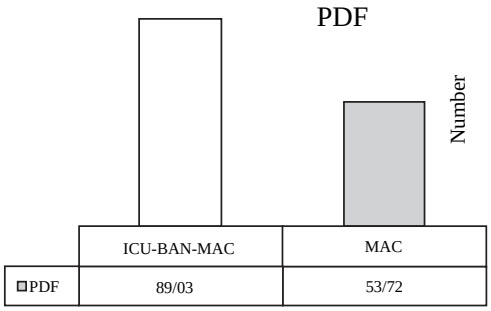

Fig. 5: PDF

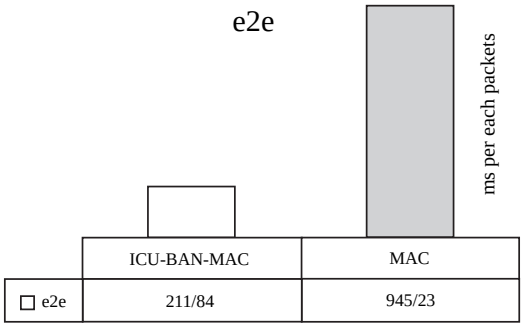

Fig.6: End to end delay

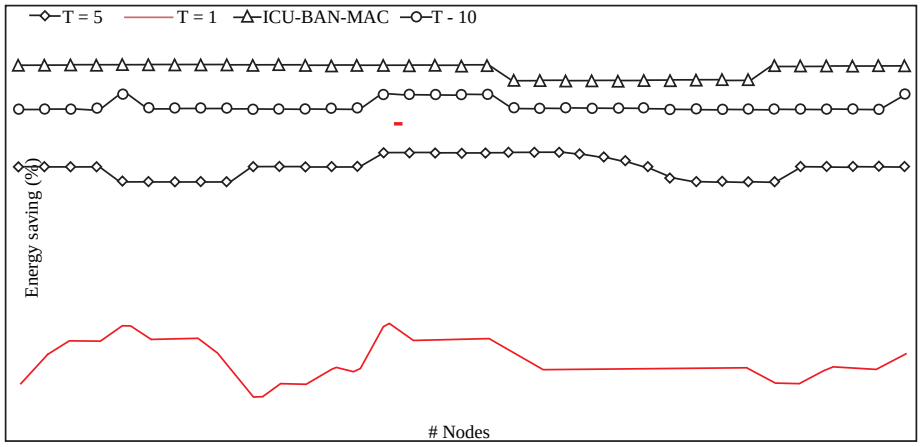

Fig. 7: The saved energy

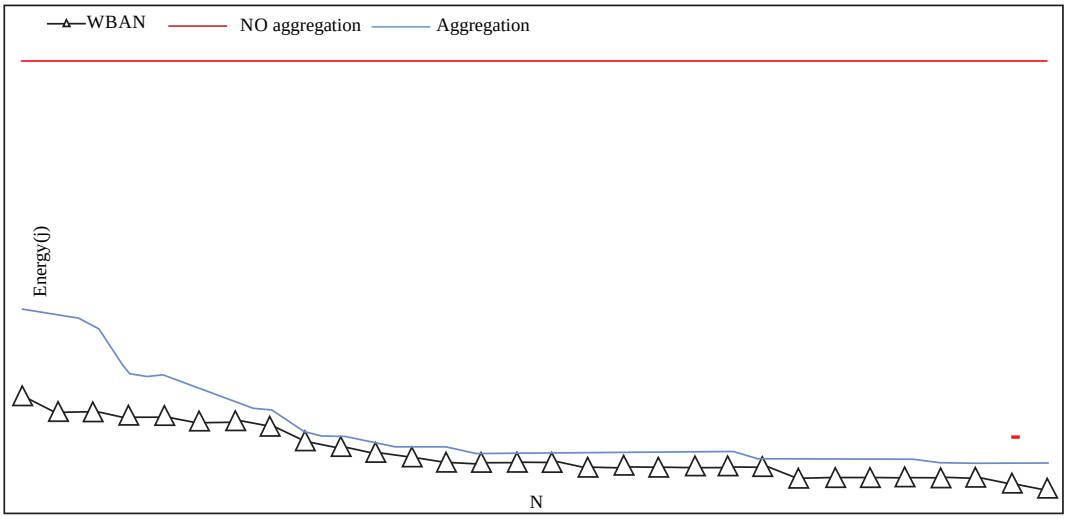

Fig.8: The consumed energy

this will lead to savings in energy consumption. But it must be noted that sensor unit of the nodes is on at all times and they will turn on or off their radio unit.

When the cluster head node collects data of all the members, it aggregates data and sends compact data to the base station.

Features of this protocol are namely:

- Self-configuration: the network nodes in this protocol form cluster without the aid of any external factor or a particular node in the network and this helps to the scalability of this protocol
- In the proposed protocol, data is transmitted from nodes to the cluster head and from cluster head to the based station by a local control and there is no need to an external factor or a particular node in the network for data transmission

Evaluation of the Proposed Algorithm Efficiency: There were some problems in implementing the proposed algorithm in the simulator NS2 which are mentioned in brief in the following.

1- This simulator does not support wireless sensor networks by default. So we installed NS-based sensor network supporter (mannasim). This supporter had also many problems. Having removed the existing problems, we finally succeeded to install it properly.
2- Another problem was that mannasim was only able to generate two environmental parameters of temperature and carbon dioxide while we had several parameters including blood pressure, respiration, glucose, GCS, temperature, pulse oximetry, ABG, and pulse and we needed to add these parameters.
3- The most problematic part was to find the related medical standards. The effect of parameters on each other had also added to the work difficulty. These parameters include:

- Any thing that affects respiration is effective on pulse
- Change in pulse oximetry is effective on pulse
- Change in Pulse oximetry is effective on ECG
- Change in blood pressure is effective on pulse
- Change in ABG is effective on pulse and respiration
- Change in temperature is effective on pulse
- Change in glucose is effective on GCS
- Change in glucose is effective on ECG
- Change in GCS is effective on EEG

Intervals in Order of Preference

- Pulse, ECG: Once every 1ms or 1sec in a continuous manner
- Respiration and pulse oximetry: Once every 1ms in a continuous manner
- Blood pressure: at the beginning of hospitalization once every 15 min (0.9 ms) and then once every 2 h (7.2 ms)
- ABG: it is controlled if there is respiration problem and ABG is reduced; once every 6 h (21.6 ms)
- Temperature: once every 2 h (7.2 ms)
- Glucose: in patients with diabetes once every 2 h (7.2 ms) or every 4 h (14.4 ms) or every 6 h (21.6 ms) according to the physician prescription

- GCS: once every 2 h (7.2 ms)
- EEG: 3 to 6 months according to the physician prescription (7776 ms – 15552 ms)
- EMG: 3 to 6 months according to the physician prescription (7776 ms – 15552 ms)

RESULTS AND DISCUSSION

Preparation of Simulation: We used simulator NS2 for simulation and evaluation of the proposed algorithm efficiency. In our scenario, there are automata on the cluster head. This data is transmitted from cluster heads to the base station by data aggregation technique and by using a scheduling algorithm (that vital signs are written in C++ according to the time parameters). Now automata data is sent inside a random environment with a variable structure L_{RI} according to learning algorithm in which penalty is zero and reward is given to the vital signs with regard to the data type. If the vital signs receive the highest reward after n repetition, it is determined as the best action of automata and then this data (vital signs with the highest reward) is transmitted to the sink node (base station) and is sent to the physician via internet. Then the physician diagnoses and evaluates these vital signs of the patient and returns the treatment result. The purpose of these measures is to teach automata to select the best action from among its actions. In fact, the best action is the one that maximizes the probability of receiving reward from the environment.

Automata type: it is S- L_{RI} learner automata in which penalty are zero.

In this scenario, ICU, as shown in figure 2, has 4 beds, i.e. 4 patients on whom there are several sensors. For every two beds, one cluster head has been installed on the wall. The cluster heads are in contact with the base station that collects and schedules information. The base station is located at the nursing station.

Simulation Parameters: To examine the performance of the proposed protocol, we studied its behavior through simulation. Simulator NS-2 has been used for simulating the protocol. The scenario has been implemented by OTCL and we have used files created by this language and C++ in NS-2 space.

The criteria used for comparison in the following are namely:

- The rate of delivering packet to the destination which is obtained from the ratio between packets received in the destination to packets sent in the network.
- The average end to end delay which specifies the average time spent for taking data packets from the source to the destination.
- Energy efficiency that determines the amount of energy used in the network for every data frame received in the destination.
- Lifetime that is calculated for sensor networks in different ways and it is obtained from the relation 1-5 in our definition.

$$ALTN = \frac{\sum_{i=1}^{N-m} t_i + (m \times T)}{N}$$

Where,

t_i: death time of ith node

N: total number of network nodes

m: number of live nodes at the end of simulation

T: pre-defined lifetime of the network

Features and parameters of simulation used in the evaluation are presented in table 1.

First we compare scenarios of MAC layer with ICU-BAN-MAC protocol by the mentioned criteria.

One of the studied parameters is the number of packet sent in each cluster. The results of simulation show that our protocol has acted better than the basic protocol and it has an acceptable ability. Also the rate of lost packets is very lower in the proposed protocol which is resulted from a very low collision in the MAC layer of the proposed protocol. fig.3 shows the results of this simulation.

Another studied parameter is the loading overhead. As the value of this parameter is less, it represents faster loading of protocol. The results of simulation show that the proposed protocol is loaded 60% faster than the basic protocol. Figure 4 indicated the loading overhead.

Finally, success percentage of both protocols in sending packets was determined by studying the obtained values. The results of simulation reveal that the proposed protocol has balanced the rate of sending and receiving by using automata learner factor, selecting an accurate action, and making the number of sent packets smart and it has also increased the percentage of successful sent packets by reducing number of collisions in the MAC layer.

Another studied parameter is the end to end delay for each packet sent in the network. The results of simulation show that the proposed protocol has improved this parameter to an acceptable extent by reducing this value near three times compared to the basic protocol.

Then we compare in the application layer:

In this simulation, we study the saved energy for each node. The results of simulation show that how much energy has been used by each node. Our protocol has saved about half of its energy at the time of simulation and has demonstrated a good function.

In this test, we studied the effect of data aggregation. We compared the ordinary MAC protocol in two states by using data aggregation and without using it with our protocol.

Table 1: Simulation parameters

Number of nodes	100
Number of cluster heads	5
Size of simulation environment	M^2 200*200
Time of simulation	2000 s
Channel model	Wireless
Diffusion model	Two Ray Ground
Number of sensors installed on a patient	20
MAC layer protocol	BAN_MAC,TDMA,SMAC-ICU

DISCUSSIONS

Wireless sensor networks are one of the most important developments in recent decades. Their strong behaviors have led to the recording and transmission of data in unsafe and unsuitable environments. This system, due to its inherent features and its numerous applications, is highly regarded today and has a number of advantages and disadvantages over similar systems. The advantages of the wireless sensor network include: resource sharing, cost reduction, reliability, time reduction, development capability, communication, fast setup in emergencies, suitable for environments that should not be jammed and disrupted. Also, the most important disadvantages of the wireless sensor network are: lack of infra structure, use of wireless links, multiple jumps, autonomy of nodes in relocation, security problems, hardware bottlenecks, large number of nodes, high density in node distribution In the operational area, node failure potential, correlation changes, use of public distribution method in node communication, data-driven, reliability, scalability, cost price, environmental conditions, routing, topology, communication media, power consumption Nodes, instantaneous communication and coordination, short network life, unfore seen factors, time-varying characteristics and size in the network, resource limitations noted.

A wireless sensor network is a set of sensors that are set up on their own and are interconnected wirelessly, all of which sense a specific phenomenon. The number of these sensors can be very large and their range can be very wide. The sensors of this network can be manually placed in the desired locations and fixed or they can be randomly scattered in the desired location for sensing. The main purpose of these networks is to collect information after the establishment, and then the life of the network as long as possible. Recent advances in small-scale integrated circuit technology, as well as the development of wireless communication technology, have paved the way for the design of wireless sensor networks. The main difference between these networks is their relationship with the environment and physical phenomena. Traditional networks provide communication between humans and data bases, while the sensor network communicates directly with the physical world. Using sensors, they observe the physical environment, make decisions based on their observations, and perform appropriate operations. Wireless sensor networks are used in many applications today for monitoring activities in different environments due to their low cost and easy communication. One way to reduce energy consumption in wireless sensor networks is to reduce the number of packets transmitted in the network. A data aggregation technique that combines interconnected data with each other and prevents additional packets from being sent over the network can be effective in reducing the number of packets sent over the network.

The issue of data integration is one of the major challenges in wireless sensor networks. Data aggregation means collecting information and data of sensor network nodes in the well node. Due to the constant changes in the topology of sensor networks, the performance of this network environment is highly dependent on the aggregation technique. In recent years, various algorithms for data aggregation in these networks have been proposed, which are often based on common unrealistic assumptions that allow theoretical analysis of algorithms, but on the other hand, their implementation due to limitations. The capabilities of these networks have actually faced many difficulties and challenges.

Wireless sensor networks with hundreds of small sensor nodes allow remote monitoring of many environments, such as military environments. The main challenge in these networks is the limitation of energy consumption, which affects the life of the network. One of the key solutions to this challenge is to aggregate data and prevent duplicate data transmission. The most well-known communication protocols in this field are clustering-based data aggregation and tree-based data aggregation. Clustering on the subject of data aggregation causes energy balance, but sometimes due to the long distance between the eclipse and the central station, the energy consumption in this protocol is high. In a tree structure, due to the short distance between the sensors, the energy consumption is low, but the tree depth is high, and when the number of sensors is large, it is difficult to build an aggregation tree.

New advances in integrated circuits, wireless communication, semiconductor technologies, and downsizing have led to the growth of sensor networks in a wide range of applications, including medicine and the healthcare organization. On the other hand, the increase in diseases and the resulting medical costs have led to the emergence of methods to solve these problems. One of these techniques is the use of WBAN wireless body sensor networks. The Wireless Body Area Network consists of several small electronic sensors that are connected to humans and specifically monitor problems such as blood pressure, blood sugar, limb movement, and

send them to a coordinator. These tiny sensors collect health information and communicate with physicians or medical servers so that they can analyze and monitor a patient's health parameters. The development of physical wireless sensor network technology began in 1995, and the idea came from WPAN (Regional Personal Wireless Networking) technology near and around the human body. About 6years later, the term BAN refers to a system that is completely inside and on the human body.

Applications of WBAN wireless body sensor networks are divided into two general categories, medical and non-medical. Medical applications include collecting vital patient information continuously and sending it to remote stations for further analysis. This large amount of patient information can be effective in preventing the possibility of heart attacks, as well as caring for dangerous diseases such as cancer, asthma, neurological disorders, and so on. There are several uses for WBAN to diagnose and treat the disease.

Due to the different functions of the WBAN wireless body sensor networks, each node can be composed of various components according to the defined tasks, but in general, each node is composed of a series of general components, which are the central processing unit, transmitter-radio receiver. , A power supply that can provide the energy needed by the system through batteries or solar cells or a combination of both, one or more sensors that collect the desired data, types of external memory if needed, GPS if needed and others Components that can be included in each node depending on the different applications. Factors such as the economics of the system, the expected capability, the large number of nodes, and finally the implementation of ideas in the real environment, have caused each node to have a number of hardware limitations. A WBAN consists of a number of sensor nodes and a coordinator, each node consisting of a battery, sensor, operator, processor, memory, and transceiver.

CONCLUSIONS

In this research, we try to improve the efficiency of sensor networks in the field of physical sensor networks by using the intelligent Automata learning method and a new data aggregation technique. This information is transmitted from the clusters to the base station using the data aggregation technique and using a scheduling algorithm written according to the time parameters of vital signs in C ++. The information is now automatically sent into a random environment. The random environment according to the learning algorithm with variable structure LRI in which the penalty is zero and the reward is given to the vital signs according to its type, returns this information to the automaton so that the automaton can use it to choose its next action. If after the N repetition, the vital signs receive the highest reward, it is determined as the best action by the automaton. This information is then sent to the physician via the Internet after being transferred to the node (base station) and the physician diagnoses the disease and returns the treatment result. To evaluate the performance of the proposed protocol, we have studied its behavior through simulation. The NS-2 simulator environment was used to simulate the protocol. Scenario part is implemented by OTCL programming language and we have created files created by this language in C ++ programming language in NS-2 environment.

The results of simulation show superiority of the proposed protocol.

Outputs of simulation reveal that the algorithm has been improved and has acted better than the prior examples.

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