Evaluation of Wireless Sensor Networks Module using IoT Approach

L. Anand
Department of Networking and Communications
School of computing
SRM Institute of Science and Technology
Kattanguluthur
anandl@srmist.edu.in

Dr.Padmalal .S,
Professor,
Department of Computer Science and Engineering,Mangalam College of Engg,
Ettumanoor, Kottayam Dist,
Kerala
splaal71@gmail.com

Dr.J.Seetha
Associate professor
Department of Computer Science and Business Systems
Panimalar Engineering College
Chennai
jsvpec@gmail.com

Dr. R. Juliana
Professor, Department of Information Technology, Loyola-ICAM College of Engineering and Technology,
Chennai, India.
julianar16@gmail.com

PS Naveen Kumar
Assistant professor,
Department of
CSE-DATA SCIENCE
St.ann's college of engineering and technology,Chirala,AP
naveenmtech28@gmail.com

Gayatri Parasa
Assistant Professor, Department of Computer Science and Engineering, koneru Lakshmaiah Education Foundation,
Vaddeswaram, Guntur, Andhra Pradesh, India.
gayathriparasa20@gmail.com

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Abstract: - Microcomputers and medical devices with signal transceivers that operate on a specific radio display constitute the backbone of wireless sensor networks (WS Ns) that monitor environmental conditions (temperature, pressure, light, vibration levels, location). It is widely used in WAN sensor networks because of its flexible design and low setup fees. The u200b touch network allows for the connection of up to 65,000 devices, while the Intelligent sensors on other wireless networks are used to transfer data ports and assign wireless networks. Since the price of wireless solutions has been decreasing, and their functional capabilities have been growing, they are gradually replacing wired ones in telemetry data gathering systems and long-distance detecting communication. A deep learning model was used in this investigation to prevent the sensor nodes from manipulating data. Sensor nodes include a lot of parameters and estimations. If these projected data values are altered, network performance will suffer, and the node's lifetime will be reduced. Data security became a priority when the sensor nodes were distributed. This new method is 98.82% more efficient than the previous one.

Keywords: WSN, WAN, U200b touch networks, Data Security.

I. INTRODUCTION

WSNs are very organized at this point [1]. Ten to fifteen years from now, universal Internet access to WSNs with built-in security is a reasonable expectation. It is noticed when the Internet is converted into a real-world network [2]. The potential uses for this technology are many, spanning fields as diverse as medicine, ecology, transportation, the armed forces, the entertainment industry, homeland security, crisis management, and smart cities [3].

ZigBee is the backbone of many modern wireless networks. Expansions in these areas, along with others such as product development, human security requirements, resource management, and the practical application of product-material values, are all part of the present advances. As the technology behind semiconductors has improved, new theoretical and practical questions about the use of emotional networks in commercial and community settings have emerged [4].-[6].

Use as parts of technologies that save energy and resources, keep tabs on the state of the environment, evaluate industrial property, manage a firm property, and more.

Although sensor networks have been around for some time, the notion of building one has yet to be fully enforced and defined across various software and hardware (platform) solutions. The current state of emotional network development is highly dependent on the particular requirements of the industrial issue [8]. Developers interested in a technologically relevant search for potential manufacturers are paying close attention to the rapid advances in architecture, software, and hardware implementation technology.

The term "sensor network" has seen widespread usage recently. It operates independently, automatically adjusts to any changes, is resilient to the loss of any single part, requires no upkeep, and may be used without any special hardware being set up. Various sensors may be used at each terminal in a sensor network to control the radio receiver, the microcomputer, and the surrounding environment. Several tasks are carried out, including taking readings from instruments, processing raw data, and establishing a link to a remote data system. Telecommunication 802.15.4/Gb "sensor networks" (also known as Telecommunication 802.15.4/Gb WSN - Wireless Sensor Network) are one of the latest methods for developing distributed self-regulatory error-tolerant systems of resource management and operations monitoring. Wireless technology is the only option for monitoring and managing problems that significantly impact the sensors' working lifetime in wireless sensor networks. Data collection, processing, and dissemination capabilities are provided via a geographically dispersed self-regulatory system enabled by sensors connected to a wireless sensor network. The primary use case is keeping tabs on things in the real world and the characteristics of the places they inhabit.

II. Literature Review

D. Griffith et al. [1] created the DCC algorithm to focus on dispersed networks with relay devices, often known as dynamic congestion control. Each information is saved on these devices for a while before being permanently erased.

IEEE 802.11 CSMA/CA was studied by L. Song et al. [2], who used a chain-based Markov model with a random accessing protocol. Different channel access modes and the protocol's energy efficiency in Bluetooth networks were analyzed. Each frame's transmission window is established with a time allocation according to the work of Bridgelall et al., and the request to transmit procedure takes place.

P. Phunchongharn et al. [3] created a device dubbed dual-mode BLE to detect traffic-free periods and direct the devices to do separate tasks during such times.

Segmentation was initially described in a paper by Z. Liu et al. [4]. This is derived from the first iteration of the scattered, in which loads are often traded. Then, the likelihood of each packet being received is calculated, and the best packets are chosen based on this probability. [5,6]

M.S. Ramdev et al. studied different methods of distributing bandwidth for inter-device communication [7]. Here, we saw how two nameless gadgets work together and what kind of data they produce. Data manipulation problems inspired the development of these specialized gadgets. In this scenario, a technique was developed to identify unknown devices, which should help alleviate data integrity worries associated with such gadgets.

III. Proposed System design

TSDMA is a data-altering method that uses touch sensors. The hardware and software it employs are standard throughout communication nodes. These are the parts that make up the sensor. An analogue device for storing such values and an analogue-to-digital converter make up a standard part of the idea subsystem. The communication subsystem is optimized when the data processing subsystem has access to a central processor and memory for storing sensor data and service data. Humidity, temperature, pressure, magnetic field, and air chemical analysis are all environmental data that the sensor monitoring subsystem might gather. The addition of an accelerometer and gyroscope to the sensor would further help in the creation of a custom-tailored system.

The minimum requirements for the CPU frequency, RAM size, and data transfer rate depicted in figure 1 are 20 MHz, 4 KB, and 20 Kbps, respectively. The sensor's price may go higher, but its size will decrease if the technology is improved. Both the CPU and OS must be compatible with one another. Because of memory and storage constraints, the operating system's ROM is made active. Tiny OS, an open-source OS that enables more versatile administration of sensors from different manufacturers, is gaining popularity. The sensors' low power presents significant constraints in the field of networking. One kind of wireless network, a wireless sensor network, consists of a collection of battery-operated nodes or sensors capable of rotation, self-motion, and minimal motorization. Distributed, mobile, battery-operated, embedded devices networked to collect, process, and transport data to operators while regulating computer and processing capabilities are unavoidable in such networks. Small computers working together are called "nodes," and they build networks.

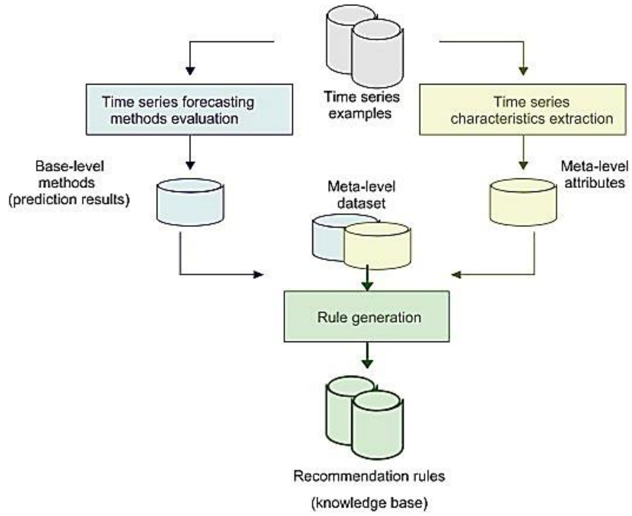

Fig 1: Proposed System design

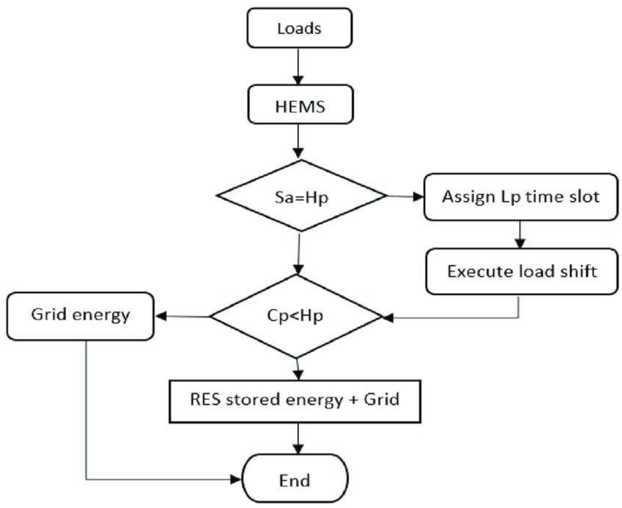

Fig 2: Proposed system flow chart

Due to its unique architectural and system properties, a sensor network has significant limits on the whole system, making the development of data transmission technology a significant task in its implementation.

Limits on available energy and processing power; Operating a large number of nodes all at once in one location; Inherent delays in the client-server architecture that make it difficult to achieve node balance;

Transmission delays occur in both directions, from the controller to the sensor module. Each time the transmit and receive task is finished, the wide variety of prizes offered will shift to reflect the new location-based bundles. The following is only one illustration:

$$B_t = \{ b_1 , b_2 \dots\dots , b_n \} \quad (2)$$

$$b_i = \{ b_{i,t} , b_{i,t-\Delta t} \dots\dots , b_{i,t-N\Delta t} \} \quad (3)$$

Where i = 1,2,3…. n indicates the number of data transmissions, N = the number of information acquisitions in various intervals

$b_{i,t}$ = the information flow rate in the interval ‘a’ at the time of ‘t’, Δt = the information time interval

Since the system's unique architecture and features impose severe constraints on the whole setup, the development of data transmission technology is one of the most critical challenges in constructing a sensor network. [8] The following should become apparent in light of this:

The high number of nodes operating simultaneously, Node balancing due to delays inherent in the client-server design, Low processor performance due to limited energy reserves Transmission delays in both directions occur between the controller and the sensor module. [9] While completing a job involving transmission and reception, the number of trophies earned will change according to the location-specific bundles used. The following is only one illustration,

$$A = \varphi B_d \quad (4)$$

$$b^d_{i,t} = b_{i,t} - b_{i,\ t-d} \quad (5)$$

Where φ represents the subterranean analysis model. [10] The data transmission flow is set to start as per equation (5). Then the non-linear transmission of the bi-directional energy flow network shows the transmission time,

$$f(b) = \sum_{i=1} \alpha_i \beta_i G(b_i + b) + \delta \quad (6)$$

Where α_i = Positive transmission value

δ = threshold value of the transmission network

β_i = Sample transmission instructions sets

$$\text{Then } G(b_i + b) = (\varphi(b_i), \varphi(b)) \quad (7)$$

The equation was used to construct a solar line's transmission for two-way flow. The following section details the algorithm's functional outputs for the suggested system design. [11] The suggested method may be tested and analyzed using modern tools.

IV. Results and Discussion

Current Optimal robust scheduling algorithms (ORSA), detection and classification of power quality disturbances (DCPQD), nature-inspired optimization algorithms (NIOA), bio-inspired optimization algorithms (BIOA), and an enhanced cooperative algorithm were compared to the proposed touch sensor-based data modification algorithm (TSDMA) (ICOA). [12]

A) Energy consumption: -

TABLE 1 COMPARISON OF ENERGY CONSUMPTION (%)

No. of Nodes	DCPQD	NOIA	BIO A	TSDMA
100	82.16	72.73	83.73	42.8
200	85.05	80.06	86.69	46.4
300	89.1	86.02	92.7	50.39
400	89.69	79.4	95.13	56.4
500	93.73	95.02	96.8	59

How much power is used for anything affects how much power is used overall. Table 1 compares the proposed TSDMA systems and the existing DCPQD, NIOA, systems regarding their predicted energy usage. [13]

B) Energy efficiency: -

A comparison of the estimated energy efficiency of the current DCPQD, NIOA, BIOA, and the planned TSDMA may be seen in table 2 below.

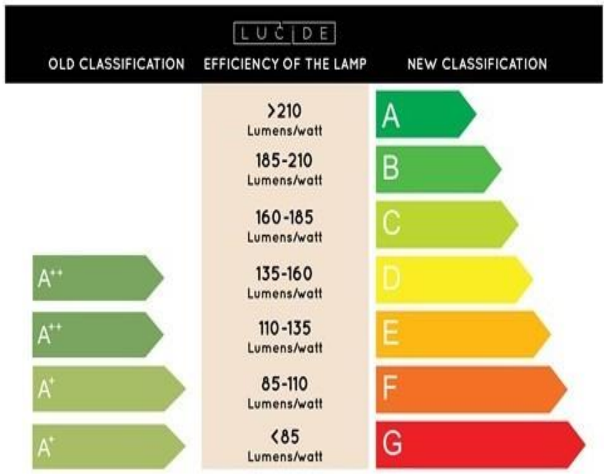

Fig 3: Comparison of Energy storage

C) Energy Storage

Estimated energy storage for current DCPQD, NIOA, BIOA, and the anticipated TSDMA are shown in table 3 below.

D) Power Consumption

All of the power requirements for each device must be met. Below, Table 4 contrasts the expected power consumption of the current DCPQD, NIOA, BIOA, with the proposed TSDMA.

TABLE 3 COMPARISON OF ENERGY STORAGE (%)

No of Nodes	DCPQD	BIOA	NOIA	TSDMA
200	79.81	102.91	90.14	100.48
300	72.68	109.95	87.91	97.59
400	65.54	103.94	84.25	93.54
500	74.35	101.51	79.61	92.95
600	76.53	99.84	77.62	88.91

TABLE 4 COMPARISON OF POWER CONSUMPTION (%)

No of Nodes	DCPQD	NOIA	BIO A	TSDMA
100	80.48	79.91	95.91	61.84
200	77.59	72.58	92.95	58.24

V. Conclusion

Mechanically inspired energy gadgets have gained much popularity in recent years. The main reason for this is how many crucial tasks are completed in factories. As a result of its settings, other devices placed on top of it may conduct input and transmission tasks. The suggested solution allows the gadget to use almost little power while protecting sensitive information. In this way, the machinery may function better while using less power. Because they use less electricity, these gadgets can store more electricity. As a result, the surplus heat dissipated. So, there needs to be more information on what exactly such a temperature-lowering gadget would need to function. Therefore, energy efficiency is rather good. Since surplus electricity is not leaking out of the plants, there is zero energy waste. Considering these factors, the new approach is much more efficient. Direct communication between nodes is planned as a future update. When two nodes are close to one another, the sensor node may make use of the other node's short-range communication. Measures of time and safety are taken at breakneck speeds.

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