International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

WIRELESS SENSOR NETWORKS TO RESOLVE THE ENERGY SOURCE CONSUMPTIONS DUE TO TRANSMISSION OF HEALTHCARE DATA

MARUTHAVENI.R[1*], ARAVINDH.S[2], GANESH.K[3] AND MOHANRAJ.G[4]

1: Assistant Professor in Computer Science at Dr. SNS Rajalakshmi College of Arts and Science, Coimbatore, India

2: II M.Sc. in Computer Science at Dr. SNS Rajalakshmi College of Arts and Science, Coimbatore, India

3: II M.Sc. in Computer Science at Dr. SNS Rajalakshmi College of Arts and Science, Coimbatore, India

4: II M.Sc. in Computer Science at Dr. SNS Rajalakshmi College of Arts and Science, Coimbatore, India

*Corresponding Author: Maruthaveni.R; E Mail: dhanuveni1@gmail.com

ABSTRACT

The need for Wireless Sensors Networks (WSNs) in real-world applications like mobiles multimedia for medical institutions is skyrocketing. Nevertheless, one of the major impediments to increased investments in this innovation is the power issue. They suggest a novel approach in this study to overcome challenges caused by restricted power sources. Rather than a binary transmitter, that uses amplitudes/ phases, modulators /demodulators units to enhance the number of bits transferred per symbol, some quaternary transceivers (in the design on the nodes of a sensor) is used. Because of the additional bits communicated by each symbol, the systems will use less power during transmitting. Furthermore, for energy-constrained WSNs, Neural Networks Statics Randomly Accesses Memories (NN-SRAM) solution in some clustered-based systems is provided. During the data's dissemination procedure, the technique minimizes overall

energies usage in storage and transmissions. These neural network statics randomly accesses memory solution in some clustered bases systems decreases the energies consumptions of total systems by roughly 76.991 percent, according to simulated findings based on MATLAB as well as Spice software's tools.

Keywords: Wireless Sensor Networks; Neural Network; energy-constrained; Simulation; Healthcare

INTRODUCTION

The overall relevance of WSN technologies originates from the wide range of applications they may be used for. WSNs were networked devices that are used in civil and clinical uses. The multimedia for mobiles healthcare apps is an instance of clinical applications, in which WSN may be used to remotely monitor clients' activities to instruct rescue operations **[1]**. Some real-time systems are required in medical applications to observe the patient's behaviors by installing sensors immediately on the bodies of the patients. This is also utilized to detect unforeseen circumstances such as abrupt collapses, heart disease, oxygen deprivation, and/or temperatures by sending encrypted messages, photos, and/or videos to a trusted device. A few more moments may prevent deaths **[2-4]**.

As a result, real-time surveillance necessitates the use of energies for data gathering, analysis, transportation, and receiving. Furthermore, because all sensors in WSNs run on charges, there seems to be an energy constraint in practically every implementation of wireless sensors networks **[5]**. Reduced sensors node energies consumption lowers the overall channel's overall energy consumption, extending the channel's lifespan. The proposed method, which compressed information before transport and decompresses it after receipt, is a typical method for accomplishing this. Clusters, in which the WSN is partitioned into a clustering, within each Clusters Head (CH) **[6]**, is yet another's prominent strategy. These CHs then connect to transfer the information acquired by the individual devices to a Base Station (BS), that subsequently interacts with the servers. Every one of the methods of communications shown, nevertheless, uses a binary transmissions technique.

Related Works

Implementing a quaternary transmissions strategy rather than a binary method would undoubtedly outcomes in more efficient energy use. In other words,

they would describe an energy-efficient wireless sensors network systems design that employs multi-valued reasoning rather than binary thinking **[7]**. We need to change the way Sensors Networks (SNs) are designed so that each one may manage 4 signals rather than 2 **[8]**. Either 2 bits would be manipulated as 1 symbol during delivery, as well as the sign would be decrypted at the receiver ends, yielding the actual 2 bits **[9]**.

Whenever constructing a wireless sensor network (WSN) for mobiles multimedia as well as clinical care applications, power consumption is becoming one of the main significant considerations **[10]**. In wireless sensors networks, various strategies are utilized to decrease power consumptions **[11]**. To regulate & minimize the power consumptions of WSN, multidimensional detection automated sensors nodes as well as decreases reaction delay. Researchers used this technology inside 2-tier WSN'stowards cameras/video monitors software's using low-energies infrared sensors nodes replacing high-energy consuming sensors. **[12]** A concept of a heterogeneity multitier Wireless Multimedia Sensors Network (WMSN) made out of low-power hardware devices. The networks architecture used in

this model has 3 operational modes: wake-ups, shut-downs, as well as sleep.

Based on the medical Internet of Things (IoT) as well as big data, the researchers suggested a large health application system. Researchers presented a cloud-based large health applications systems architecture to stop fusing. That framework comprises several levels, including observation, transportation, and a large health cloud server. Power consumption is one of the key issues among such levels, particularly in short-range wireless communications **[13]**. Information transmitter and receiver account for the majority of power consumptions in WSN **[14]**. The preceding methodologies ignore the transceivers and memory's energy usage, which are crucial in wireless sensors networks used during healthcare applications. Furthermore, the power consumption in the transmitting, as well as storage phases, would be reduced by our suggested designs.

Proposed work

There would be 8 voltages levels if you use an 8-bit numbered system. For instance, splitting 6 volts (0.0 technically equals a voltage among 0.0& 3V, whereas 1 technically equals voltages among 3.5V & 6V, hence allowable maximal voltages are 6V) across 8 levels implies that perhaps the levels would be in calculations, resulting in

additional inaccuracies. As a result, some quaternary numbered systems are the most appropriate. Bits are used rather than one in quaternary Quadrature-Amplitude Modulating (QAM), with 1-bit representing Phases Shift Keying (PSK) and then the other representing Amplification Shifts Keying (ASK). As a result, the number of amplitudes would be reduced, as well as the chance of inaccuracy would be reduced. This truths

table for the Quaternary quadrature amplitudes modulations is shown in **Table 1**. A binaries-to-quaternary modulation technique and quaternary-to-binaries demodulators are the 2 basic components that may be used to transform a binary interlinking connection into a quaternary one. **Figure 1** depicts the link's converting method, whereas **Figure 2** depicts the WSN structure (which may be utilized for mobiles healthcare systems).

Table 1: Truth table

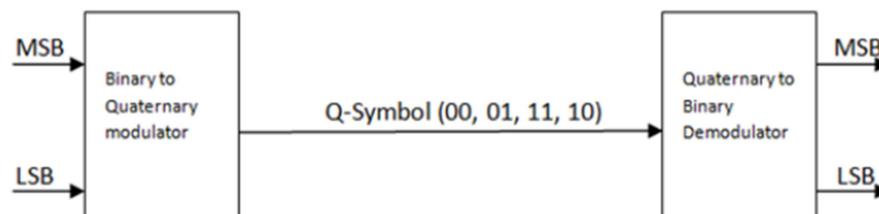| Phase shift key	Amplitude shift key	
0	0	Refer Fig.3
	1	Refer Fig.3
1	0	Refer Fig.3
	1	Refer Fig.3

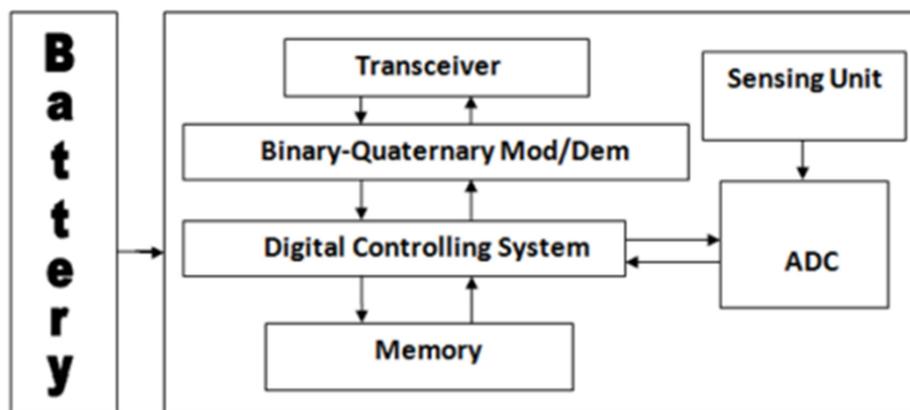**Figure 1: Proposed work**

Figure 2: WSNs architecture

This modulation is employed in the program's construction. A 2-bit binary sign is converted to quaternary symbols using this circuitry. this binary input data to the modulators are the outcomes of an SN, and then each modulator has 2 inputs bits (Least Significant Bit (LSB) & Most Significant Bit (MSB)) as well as 1 output decided to name Q0, that is the quaternary symbols towards being passes here on the internet among SN's, from such an SN's towards a BS's, as well as then from the BS to servers.

Table 2 shows the code method, with logics levels 0, 1, 2, & 3 being the 4 logics levels to be communicated via the suggested quaternary connection. It is made up of 3 customized transistors using quaternary symbols as inputs data. This quaternary into binaries demodulators is made up of 12 transistors that are powered by the same source as the modulators. The amplifiers are driven by Q0 quaternary signals, which allows isolating of the 4 quaternary numbers necessary to reassemble the binaries symbols supplied by the sources SN.

Performance Measure

This suggested design's practicality is determined by simulations using the SPICE simulators for the hardwares devices. **Figure 3** shows the binary demodulators simulation results. In addition, **Figure 4** shows the Matlab simulated results of the suggested quaternary design. It shows clearly that as compared to binaries systems, an SN consumes around 41% less energy. And comparing the suggested quaternary links system to binaries links schemes to determine the degree of similarity.

When comparing the suggested quaternary links scheme to binaries ones in terms of energies usage, it was discovered that the links save 41%. Furthermore, because quaternary methods employ both amplitudes and phases shifting modulating, the chance of mistake is lower than in binaries systems. The basic artificial neurons may be used to create the fundamental structures of NN-SRAM cells, binaries data storing neural networks. The NN-SRAM cells are designed with 3 nodes, all of which may be represented by a transistor. As a result, NN-SRAM cells may be built with only 3 transistors, although standard SRAM requires four to six transistors. Because NN-SRAM has 2 artificial neural networks nodes which may function simultaneously, it has a quicker reaction time than traditional SRAM. sA selection controls signals are used to enable the NN-SRAM inputs. Choose is equivalent to 0, then recorded information is kept, and if choose is equivalent to 1, then saved information is decided by D variables.

Table 2: Binary modulating

Least Significant	Most significant	Q0
0	1	U3
0	0	U2
1	0	U1
1	1	Lower ground

(a)   (b)
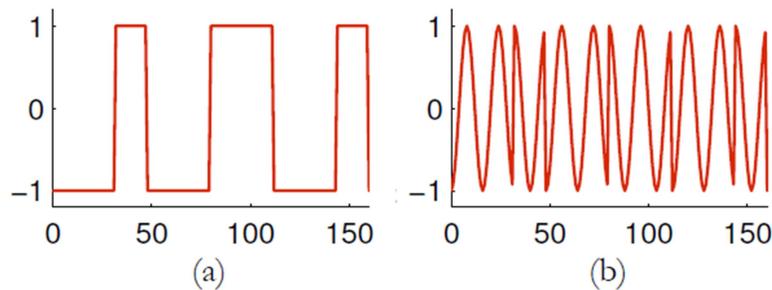
Figure 3: Simulation of the Binary demodulator
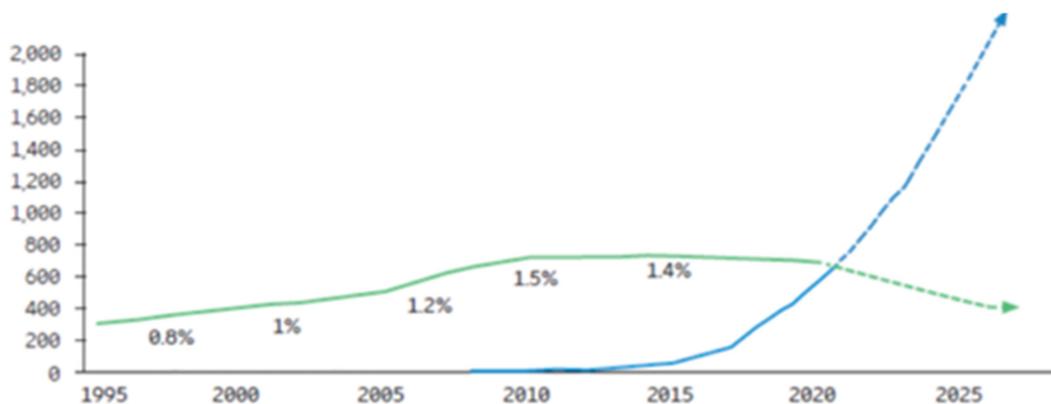
Figure 4: Energy consumption

Table 3: Truth table

R	T	E	ne	NV	Next R	Activity
1	1	1	1	0	E to R	Set
0	1	1	1	0	E to R	Set
1	1	0	0	0	E to R	Re-set
0	1	0	0	0	E to R	Re-set
1	0	1	0	1	H	ND
0	0	1	0	0	H	ND
1	0	0	0	1	H	ND
0	0	0	0	0	H	ND

Table 3 summarizes the overall procedures. If S = 1, D is selected. When D equals 1, the Q outputs equals 1, placing NN-SRAM's inside of sets state. Q would be 0 if D is 0.0, placing the NN-SRAM's inside of resetting mode. The NN-SRAM's latching can be used as a storage unit for information. Whenever the controller parameters S is

activated, the binaries information contained at the inputs files D is transferred to the Q outputs. As long as the choose controls input is active, outputs Q follows various in the input information. When the chosen controls input is deactivated, the binaries data in inputs D couldn't be latching, as well as the result of Q outputs are retained until the chosen controls input is activated normally. The NN-SRAM cells and their related networks for operations controls. A chosen message enables the latching inputs. All saved information is kept when S=0. R/W determines the recorded quantity when S=1. Every NN-SRAM cells inside internal structures of an m& n NN-SRAM's chips are the major storages element, as well as the 4 4 NN-SRAM consists of 4 rows & 4 columns, producing a grid of 16 cells. **Figure 5** depicts the simulated results of NN-SRAM cells,

whereas **Figure 6** depicts the sensors node's final layout.

Simulations Performance

They utilize a WSN with a dimension of 200 m x 200 m and 200 nodes, with the BS outsides the system. Its dimension could be used to symbolize some hospitals, rehabilitation centers, or fitness rooms wherein WSN were dispersed randomly. Its radios speed is 1 Mbps, while the computation latency is 82 seconds. **Figure 7** shows 3 systems that were modeled using the Matlab applications tools on a Core i5 platform. firstly systems communicate directly, the secondly utilizes the LEACH protocols, as well as the thirdly, employs the NN-SRAM-CBEES protocols. NN-SRAMCBEES was found to utilize 76.99 percent of the energy used by LEACH & 64.2 percent of the energy used by direct communications.
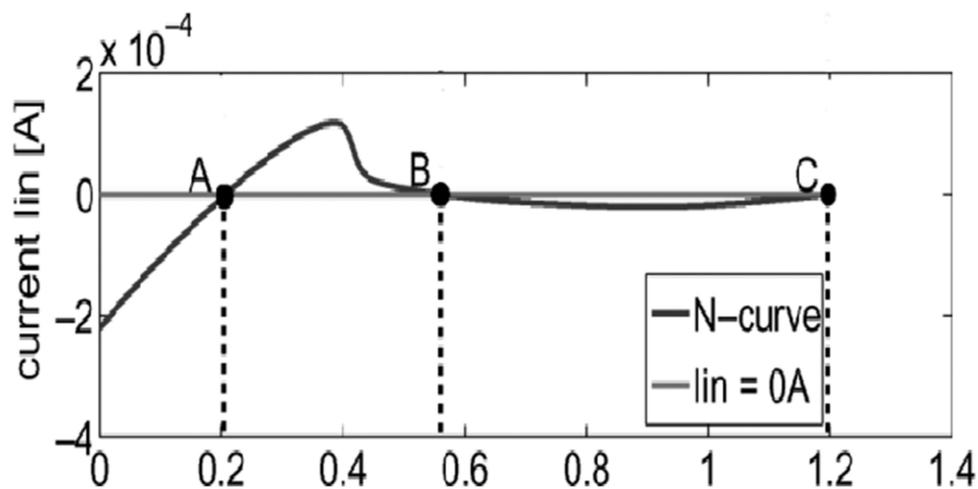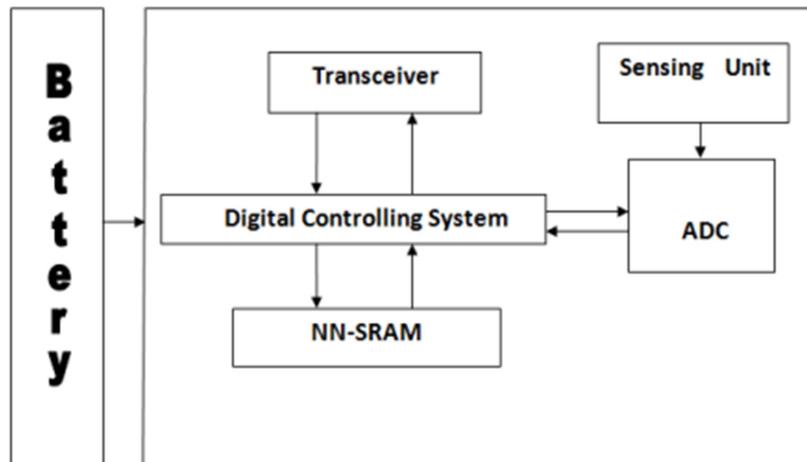

Figure 5: Simulation result
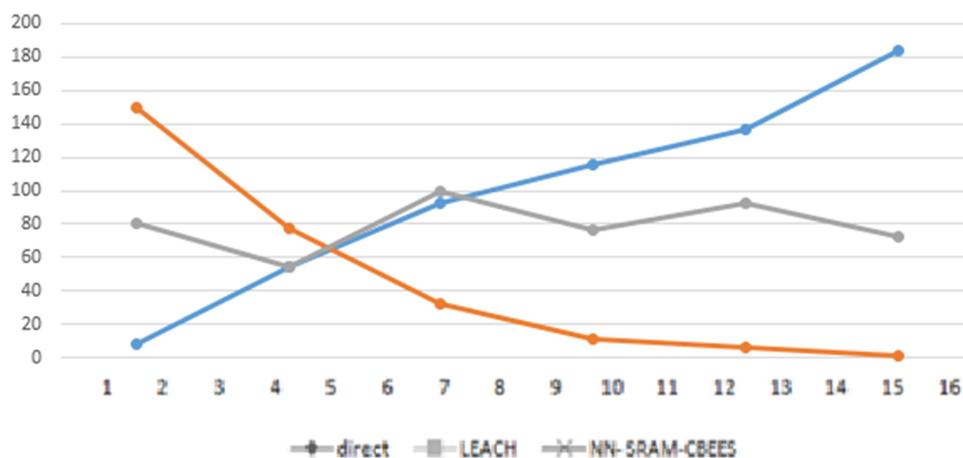
Figure 6: Node architecture

Figure 7: Comparision of the Energy

CONCLUSION

At extended lifetimes of wireless sensors networks utilized inside mobile medical systems, 2 improved energy efficient architectural solutions were developed. There was a novel quaternary connection mechanism introduced. This technique converts binaries symbols to quaternary symbols for transmits of data in a WSN. Every pair of bits is modulated as a single symbol during transmitting, as well as the symbols are demodulated upon receiving, yielding the originals binary bits. That technique has been modeled using SPICE, as well as the outcomes demonstrate that it can extend the life duration of a WSN. s This drop in the symbols rates for the same transmitting rate is responsible for the increase in life's spans. When contrasted to binaries transmitting signaling methods, power consumptions are reduced by 41%,

utilizing just 59 percent of the original binaries scheme.

REFERENCES

[1] Singh D, Kumar B, Singh S, Chand S. A Secure IoT-Based Mutual Authentication for Healthcare Applications in Wireless Sensor Networks Using ECC. International Journal of Healthcare Information Systems and Informatics. 2021 Apr 1;16(2):21-48.

[2] Kashyap R. Applications of wireless sensor networks in healthcare. InIoT and WSN Applications for Modern Agricultural Advancements: Emerging Research and Opportunities 2020 (pp. 8-40). IGI Global.

[3] Mukherjee P, Das A. Nature-Inspired Algorithms for Reliable, Low-Latency Communication in Wireless Sensor Networks for Pervasive Healthcare Applications. InNature Inspired Computing for Wireless Sensor Networks 2020 (pp. 321-341). Springer, Singapore.

[4] Saleh YN, Chibelushi CC, Abdel-Hamid AA, Soliman AH. Privacy Preservation for Wireless Sensor Networks in Healthcare: State of the Art, and Open Research Challenges.

arXiv preprint arXiv:2012.12958. 2020 Dec 23.

[5] Chanak P, Banerjee I. Congestion free routing mechanism for IoT-enabled wireless sensor networks for smart healthcare applications. IEEE Transactions on Consumer Electronics. 2020 Apr 13;66(3):223-32.

[6] Anitha S, Jayanthi P, Chandrasekaran V. An intelligent based healthcare security monitoring schemes for detection of node replication attack in wireless sensor networks. Measurement. 2021 Jan 1;167:108272.

[7] Kadiravan G, Sujatha P, Asvany T, Punithavathi R, Elhoseny M, Pustokhina I, Pustokhin DA, Shankar K. Metaheuristic clustering protocol for healthcare data collection in mobile wireless multimedia sensor networks. Computers, Materials & Continua. 2021 Jan 1;66(3):3215-31.

[8] Manoja, I., Sk, N. S., & Rani, D. R. (2017, March). Prevention of DDoS attacks in cloud environment. In 2017 International Conference on Big Data Analytics and Computational Intelligence (ICBDAC) (pp. 235-239). IEEE.

[9] Dr. P.Sivakumar and Mr.K Rajagobal, 'Object Based Ring Routing Path Management Algorithm for Energy Efficient Nest Node of Sensor Network', Journal of Computer and System Sciences, Volume 83, Issue 3, ISSN: 0022-0000, 2017, Pages 3-21. (Scopus Indexed))

[10] Dr.P. Sivakumar, 'Efficient Job Scheduling of Genetic Algorithm with Tabu Search and Round Robin', International Journal of Printing, Packaging & Allied Sciences, (ISSN 2320-4387), vol. 4, no. 4, pp. 2864-2878,2016.

[11] Latchoumi, T. P., & Parthiban, L. (2021). Quasi Oppositional Dragonfly Algorithm for Load Balancing in Cloud Computing Environment.

[12] Chinnamahammad Bhasha, A., & Balamurugan, K. (2021). Studies on Mechanical properties of Al6061/RHC/TiC hybrid composite. International Journal of Lightweight Materials and Manufacture.

[13] Pavan, M. V., Balamurugan, K., Srinivasadesikan, V., & Lee, S. L. (2021). Impact and Shear Behavior of PLA/12% Cu Reinforced Composite Filament Printed at Different FDM Conditions. Arabian Journal for Science and Engineering, 1-12.

[14] Latchoumi, T. P., Vasanth, A. V., Bhavya, B., Viswanadapalli, A., & Jayanthiladevi, A. (2020, July). QoS parameters for Comparison and Performance Evaluation of Reactive protocols. In 2020 International Conference on Computational Intelligence for Smart Power System and Sustainable Energy (CISPSSE) (pp. 1-4). IEEE.