Review of: "Optimized Low-Powered Wide Area Network within Internet of Things"

Ebrahim Elsayed[1]

1 Mansoura University

Potential competing interests: No potential competing interests to declare.

Title:

- The title succinctly captures the focus of the paper, mentioning "Optimized Low-Powered Wide Area Network within Internet of Things".

Abstract:

- The abstract provides a clear overview of the research, highlighting the importance of LPWANs in supporting IoT applications.
- The abstract introduces the research objectives: LoRa power consumption model design, simulation of IoT wireless sensor networks, and implementation of SF allocation.
- It mentions the use of MATLAB for simulation and presents the overall results.

Introduction:

- The introduction effectively introduces the concept of the Internet of Things (IoT) and highlights the significance of LPWANs in supporting IoT devices.
- It mentions the need for improved energy performance in LoRaWAN due to the exponential increase in IoT applications.
- The reference to the research gap in appropriate spreading factor allocation is relevant, indicating the need for further investigation.
- The motivation for the study is clear, providing context for the research objectives.

Motivation of the Study:

- The motivation section emphasizes the need for improved energy performance in LPWANs, specifically LoRaWAN.
- It highlights the importance of addressing energy efficiency challenges due to the exponential growth in IoT devices.

Statement of the Problem:

- The problem statement effectively identifies the need for improved energy performance in LoRaWAN.
- It mentions the research gap related to the allocation of spreading factors and the challenges of energy conservation in IoT devices.
- The statement clearly outlines the problem the research aims to solve.

Aim and Objectives of the Study:

- The aim and objectives of the study are clearly stated, focusing on the development of a framework and evaluation of the proposed model for optimized low-powered wide area networks within IoT.
- The objectives of the study are specific, emphasizing the simulation of spreading factor allocation using a suitable tool.

Significance of the Study:

- The significance section highlights the importance of energy conservation in IoT devices due to the increasing network density and data traffic.
- The study's contribution to reducing energy consumption and optimizing power efficiency is well-explained.

Scope and Limitation of the Study:

- The scope section clarifies that the study focuses on the LoRaWAN protocol within the IoT domain.
- It mentions the use of Particle Swarm Optimization (PSO) algorithm and MATLAB environment for spreading factor allocation optimization.
- The limitations of the study are not explicitly mentioned in this section. It would be helpful to outline any potential constraints or limitations.

Programming Language:

- The choice of MATLAB as the programming language is justified, emphasizing its effectiveness in simulating and analyzing the wireless sensor IoT network.

Overall, the manuscript provides a solid introduction to the research topic and outlines the motivation, problem statement, aim, objectives, and significance of the study. The choice of using MATLAB for simulation is appropriate. However, it is important to address any potential limitations or constraints in the study and provide more specific details on the experimental methodology and results.

Here are some insightful questions on the core and crux of the manuscript:

1. In the section discussing the LoRa power consumption model design, what specific factors were considered in estimating the power consumption of LoRa devices? How accurate and reliable is the developed model?

2. Could you provide more details on the simulation of the IoT wireless sensor networks using MATLAB Simulink? What were the specific performance metrics evaluated in the simulation, and how did the power optimization using particle swarm optimization algorithms contribute to improved results?

3. In the implementation of SF allocation across the wireless sensor network, how was the appropriate allocation of spreading factors determined? Were there any specific criteria or algorithms used to optimize the allocation and enhance power efficiency?

4. The paper mentions the comparison of the proposed model with existing models in terms of throughput, packet loss, delay, data transmission, buffer size, and network density. Could you explain the specific methodology used for this

comparison and elaborate on how the proposed model outperformed the existing models?

5. Considering the significant increase in the number of end devices in the IoT domain, how does the proposed optimized low-powered wide area network address the challenge of energy conservation on a large scale? Are there any practical implications or limitations to the implementation of this model in real-world IoT deployments with a high number of devices?

6. Can you provide insights into the potential trade-offs or implications of the constant open receive windows in Class C end devices? How does the flexibility of downlink transmission impact the overall power efficiency and latency of the devices?

7. The use of MATLAB for simulation and analysis is mentioned in the manuscript. Could you elaborate on how MATLAB specifically contributed to the understanding of the wireless sensor IoT network's performance and provided insights into power optimization strategies?

These questions aim to delve deeper into the core concepts of the manuscript, clarify methodologies, and highlight the practical implications and limitations of the proposed model.

8. In the context of the IoT, the increasing number of devices and data traffic poses challenges for energy efficiency. How does the proposed optimized low-powered wide area network address these challenges and offer a reliable solution for power conservation on a large scale?

9. The research focuses on the allocation of spreading factors within the LoRaWAN network to optimize power consumption. In practice, how feasible is the implementation of this optimized spreading factor allocation across a diverse range of IoT applications and devices?

10. The paper mentions the use of Particle Swarm Optimization (PSO) algorithm for power optimization in the simulation. Are there any specific considerations or constraints to be aware of when applying PSO for spreading factor allocation in a real-world IoT network?

11. While the proposed model demonstrates improved power efficiency, how does it affect other performance aspects of the network, such as latency, throughput, and reliability? Are there any potential trade-offs between power optimization and other network performance parameters?

12. In terms of scalability, the manuscript discusses the exponential increase in IoT devices and the need for reliable energy conservation technology. Considering the projected rise in the number of end devices to billions, how well does the proposed model accommodate and scale to such a massive number of devices within an IoT network?

13. The simulation results indicate a reduction in LoRa energy consumption. Can you provide insights into how this reduction translates to an extension in battery life for end devices? Are there any projections or estimations of the potential increase in battery life achieved through the proposed optimizations?

14. Beyond LoRaWAN and LPWAN, what are the broader implications of the research findings? How can the research

outcomes and optimization techniques be applied to other wireless communication protocols within the IoT domain to improve energy efficiency?

These thought-provoking questions aim to stimulate further analysis and exploration of the core concepts in the manuscript, encouraging deeper reflection on the practical implications, scalability, and broader applications of the proposed model for optimized low-powered wide area networks within the Internet of Things.