ISSN(O): 2320-5407 | ISSN(P): 3107-4928

International Journal of Advanced Research

Publisher's Name: Jana Publication and Research LLP

www.journalijar.com

REVIEWER'S REPORT

Manuscript No.: **IJAR-54561**

Title: SOLECARE : DESIGN AND DEVELOPMENT OF A SMART WEARABLE SHOE WITH INTEGRATED SENSOR SYSTEM TO DETECT AND WARN DIABETIC NEUROPATHY

Recommendation:
Accept after minor revision.....

Rating	Excel.	Good	Fair	Poor
Originality	✓			
Techn. Quality	✓			
Clarity		✓		
Significance		✓		

Reviewer Name:Dr.K.ARUMUGANAINAR **Date:** 31.10.2025

Detailed Reviewer's Report

1. Overview of the Paper

The paper presents an innovative approach to the early detection and monitoring of diabetic neuropathy through the design and development of a smart wearable shoe — *Solecare*. The study integrates multiple sensors (pressure, temperature, humidity, and gyro) connected via an ESP32 microcontroller and Node-RED software to collect, process, and display real-time physiological data. The research primarily targets the challenge of early diagnosis and prevention of diabetic foot complications in diabetic patients.

---

2. Originality and Novelty

- **Strengths:**
  - The concept of integrating multiple sensors into footwear to detect diabetic neuropathy is both **innovative** and **socially relevant**.
  - The multidisciplinary approach combining **IoT, biomedical engineering, and healthcare monitoring** reflects a strong understanding of emerging smart healthcare systems.
  - The inclusion of **real-time alerts** and the potential for **cloud-based data sharing** adds value and novelty.
- **Limitations:**
  - The concept aligns closely with existing research on smart insoles and wearable diabetic monitoring systems. The author's unique contribution lies more in **integration and affordability**, but **experimental validation or prototype results** are limited.
  - The study could be strengthened by **comparing the developed prototype performance** against standard diagnostic tools or previously developed smart devices.

---

3. Technical Soundness

- **Hardware and Software Integration:**
  - The use of **ESP32** for real-time data processing and wireless communication is well justified.
  - Detailed listing of sensors (FSR402, DHT11, MPU6050) and battery pack is commendable.
  - **Software workflow** through **Node-RED** and **Arduino IDE** is clearly explained, including flow-based programming and real-time dashboard representation.
- **Concerns:**
  - The **sensor calibration, validation tests, and data accuracy** are not supported by quantitative results.
  - No **experimental dataset, accuracy percentages, or comparison graphs** are provided.
  - The **code** (156 lines) is mentioned but not presented for reproducibility.

4. Structure and Clarity

- The paper is **well-organized** with logical flow — Abstract, Introduction, Problem Statement, Literature Review, Conceptual Model, Prototype Development, Design, Challenges, SWOT, Future Implications, and Conclusion.
- The **literature review** is extensive and contextual, referencing credible studies from Nature, Diabetes Care, and IDF.
- The writing style is clear, although at times verbose; concise phrasing would improve readability.
- Figures and diagrams mentioned (e.g., top and side view of Solecare, Node-RED workflow) enhance understanding, but the **lack of labeled images or circuit diagrams** limits technical depth.

5. Literature Review Quality

- Comprehensive coverage of diabetic neuropathy, traditional diagnostic methods, and the costs involved.
- Adequate discussion of **wearable healthcare technology evolution**.
- References are current (up to 2025) and relevant.
- Missing comparative analysis of **existing wearable neuropathy devices** (e.g., SurroSense RX, FootLogger, or smart socks from SirenCare), which would strengthen the justification for Solecare's novelty.

6. Methodology and Prototype Development

- The **five-phase development process** (Design → Hardware & Software Integration → Assembly → Testing → Iteration) is methodical and appropriate.
- The study's **SWOT analysis** and **challenge identification** reflect good design thinking.
- However, the **experimental validation phase** (e.g., trials, user testing, accuracy measurements) is missing.
- Prototype testing results such as **sensor response, data latency, error margins, or reliability assessment** should be included to establish research credibility.

7. Practical Relevance and Application

- The paper addresses a **critical healthcare problem** affecting millions globally.
- Proposed solution is **non-invasive, scalable, and cost-effective**, aligning well with sustainable healthcare goals and assistive technology for diabetic patients.
- The model can be integrated with **telemedicine or e-health platforms**, opening avenues for future AI-driven predictive diagnostics.

8. Strengths

- Innovative integration of multiple sensors in wearable footwear.
- Clearly defined objectives and well-explained conceptual model.
- Extensive and relevant literature review with up-to-date references.
- Good discussion of challenges, opportunities, and future implications.
- Social and clinical importance in preventing diabetic complications.

9. Weaknesses and Limitations

Category	Observation
Experimental Validation	No empirical data or results demonstrating functionality or accuracy of sensors.
Statistical Analysis	Absence of quantitative evaluation, performance metrics, or comparison tables.
Figures & Schematics	Images mentioned but not fully displayed or labeled; no circuit diagram provided.
Prototype Results	Real-world testing (e.g., patient trials, error analysis) not included.
Language	Some sections verbose and repetitive; could be refined for conciseness and academic tone.

---

10. Recommendations for Improvement

1. **Add Experimental Results:** Include testing data, sensor accuracy, latency, power consumption, and error percentages.
2. **Include Circuit Diagram and System Flowchart:** Visual technical representation would strengthen clarity.
3. **Compare with Existing Devices:** Quantitative benchmarking will highlight the innovation level.
4. **Enhance Conclusion:** Summarize outcomes with measurable findings or simulation results.
5. **Refine Language:** Shorten sentences and eliminate redundancy for professional readability.
6. **Future Work Section:** Expand on integration with AI/ML models and patient usability trials.

11. Overall Evaluation

Evaluation Criteria	Rating (Out of 5)
Scientific Rigor	3.8
Clarity and Organization	4.5
Novelty and Innovation	4.2

Technical Depth	3.6
Practical Relevance	4.7
Literature Coverage	4.3
Overall Quality	**4.0 / 5.0 (Good, Recommended after minor revision)**

---

12. Reviewer's Recommendation

Decision: *Revisions Required Before Acceptance*

Comments to the Author:

The paper demonstrates commendable innovation and clear problem identification. However, it should be supported with quantitative analysis, hardware testing data, and comparison to validate the proposed system's effectiveness. The concept holds significant potential for healthcare technology and aligns with current smart IoT applications in diabetic care.