IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

COVID-SAFE: AN IOT-BASED SYSTEM FOR AUTOMATED HEALTH MONITORING AND SURVEILLANCE IN POST-PANDEMIC LIFE

[1]Prof. Anjanabhargavi Kulkarni, [2]Spoorthi Kamble, [3]Anuja Patil, [4]Bibifatima Inamdar, [5]Shreya Naik

[1] *Assistant Professor* [2,3,4,5] *Students of Final year BE, Dept. of Computer Science and Engineering*
Dept. of Computer Science and Engineering,
Angadi Institute of Technology and Management Belagavi, Karnataka, India.

Abstract: In the early months of the COVID-19 pandemic with no designated cure or vaccine, the only way to break the infection chain is self-isolation and maintaining the physical distancing. In this article, we present a potential application of the Internet of Things (IoT) in healthcare and physical distance monitoring for pandemic situations. The proposed framework consists of three parts: a lightweight and low cost IoT node, a smartphone application (app), and fog-based Machine Learning (ML) tools for data analysis and diagnosis. The IoT node tracks health parameters, including body temperature, cough rate, respiratory rate, and blood oxygen saturation, and then updates the smartphone app to display the user health conditions. The environmental risk conveys from the virtual zone concept and provides updated information for different places. Two scenarios are considered for the communication between the IoT node and fog server, 4G/5G/Wi-Fi, or LoRa, which can be selected based on environmental constraints. The required energy usage and bandwidth (BW) are compared for various event scenarios. The COVID-SAFE framework can assist in minimizing the coronavirus exposure risk.

***Index Terms* - IoT, health monitoring, smart healthcare, pandemic, COVID-19**

I. INTRODUCTION

This project is fully computerized application which maintains the information about patients. This patient's information will be helpful for doctors to keep a track of patient's disease, their previous treatments. It also provides the remainder facility for patient. It is powerful, flexible, and easy to use and is designed and developed to deliver real conceivable benefits to hospitals. This System is designed for multi-Specialty hospitals, to cover a wide range of hospital administration and management processes.

Existing System: Hospitals currently use a manual system for the management and maintenance of critical information. The current system requires numerous paper forms, with data stores spread throughout the hospital management infrastructure. Often information is incomplete or does not follow management standards.

Proposed System: This project is designed for any hospital to replace their existing manual, paper-based system. The services for the patients are provided in an efficient, cost-effective manner, with the goal of reducing the time and resources currently required for such tasks.

Preliminary Investigation: The initial investigation HMS has the objective of 'determining the validity of the user request for a computerized System and whether it is feasible, studies should be conducted. It handles a user request to change, improve or enhance an existing System. First stage is the preliminary investigation. The main aim of preliminary investigation is to identify the problem. In this phase of System Development, we study the existing System, collects various information about the record maintenance and how data are fed up in the files. Basically, we need to know exactly what our System actually wants and what we should do our best to provide with a System that can be implemented.

TABLE 1. **Characteristics of the participants in the COVID-19 and non-COVID-19 groups.**

	Non COVID	COVID	*p*-value
Gender	13 (female)	15 (female)	0.873
Age (years)	59.9 19.8	59.5 14.4	0.919
Body temperature	37 1	39 9	0.328
Oxygen saturation (%)	86 8	84 10	0.426
Shortness of breath	9 (no)	9 (no)	0.804
Cough severity	2 (low) 4 (high)	7 (low) 16 (high)	< 0.001
Chronic respiratory disease	18 (no)	27 (no)	0.079
N	30	30	

TABLE 2. **Accuracy and F1-score indices for test set according to different methods.**

Method	Accuracy (%)	F1-score (%)
Proposed Method	74.7 ± 4.2	75.3 ± 3.7
Decision tree	72.9 ± 4.0	73.5 ± 3.8
SVM	72.6 ± 4.2	74.1 ± 4.0

TABLE 3. **Scenario specific activities and power requirement**

Scenario	No Network	S1	S2	Power consumption (mW)
Data acquisition	Yes	Yes	Yes	678
Data post-processing	Yes	No	Yes	770
LoRa Transfer	No	No	Yes	1040
Cellular network	No	Yes	No	970
BW requirement (bps)		147 K	80	
Data Burst time (sec)		1	0.02	

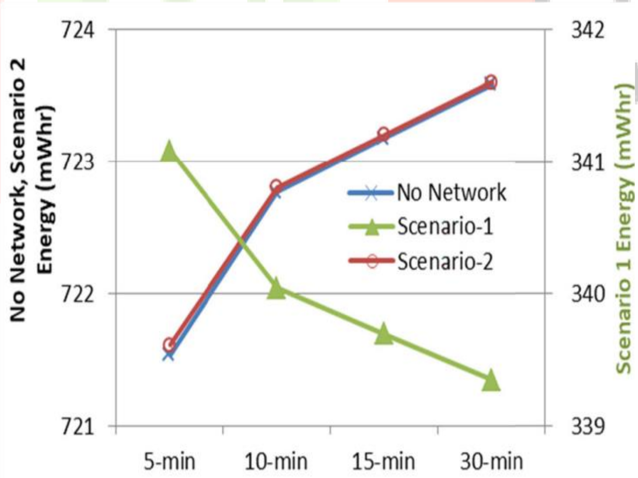

FIGURE 1. **Scenario-specific hourly energy requirement for different transmission intervals.**

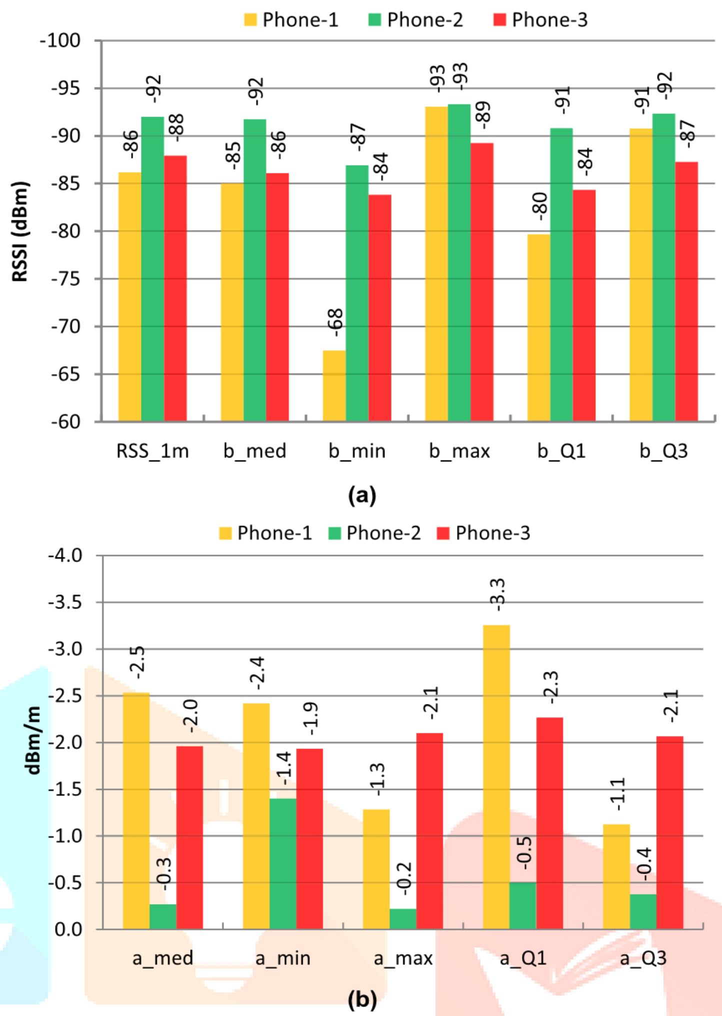

Figure 2. **(a) Phone specific RSSI values for the 1 m reference and the RSSI threshold of *b* for different levels of RSSI data (maximum, minimum, median, Q1 of 75%, and Q3 of 75% RSSI values), (b) phone specific values of a for different levels of RSSI data (maximum, minimum, median, Q1 of 75%, and Q3 of 75%.**

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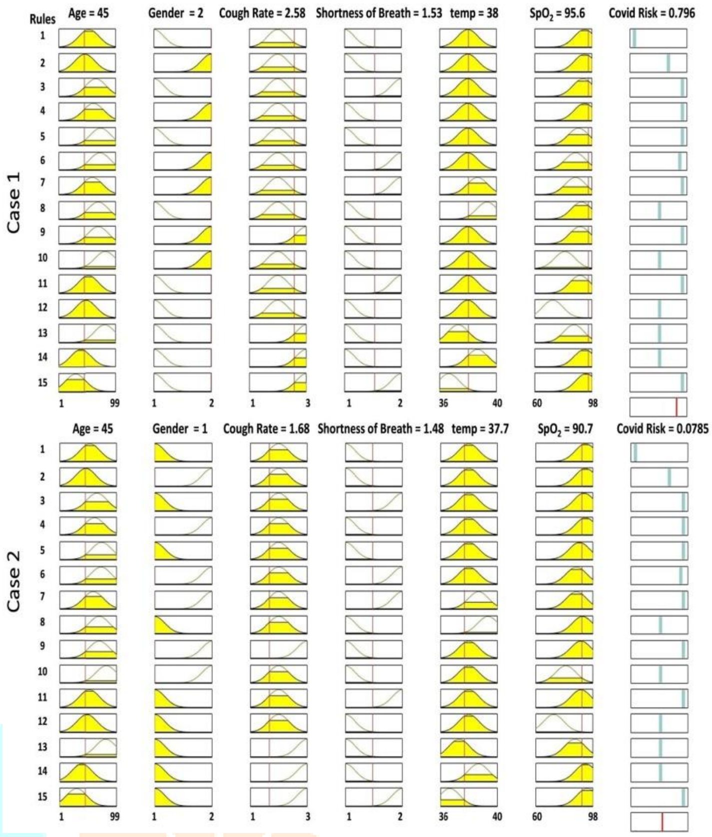

FIGURE 3. **The designed fuzzy inference system**

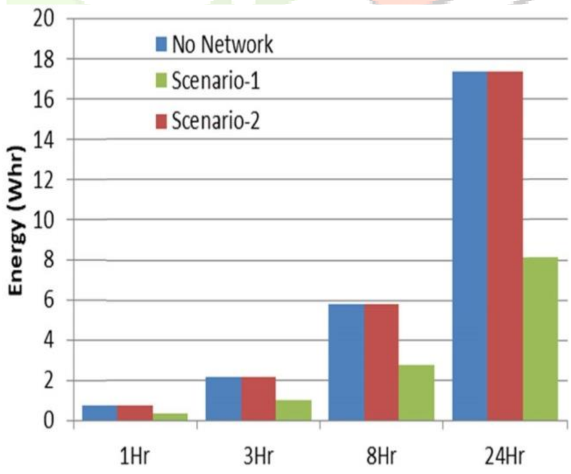

FIGURE 4. **Scenario-specific hourly energy requirement.**

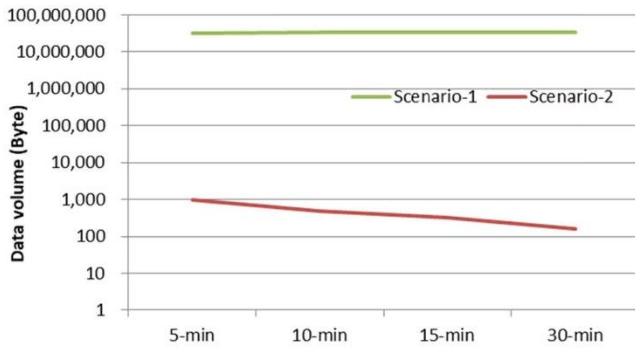

FIGURE 5. Scenario-specific hourly data volume for different transmission intervals

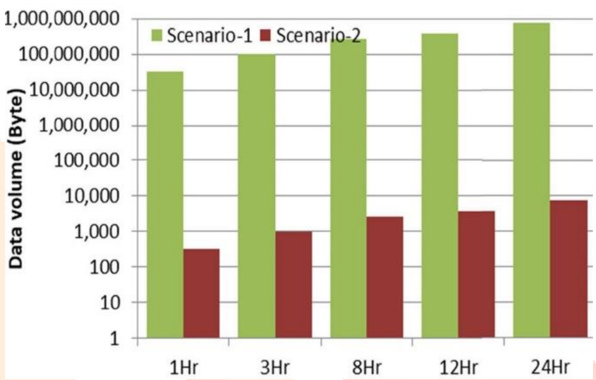

Figure 6. Scenario-specific data volume for different operation durations at 15-minute transmission intervals.

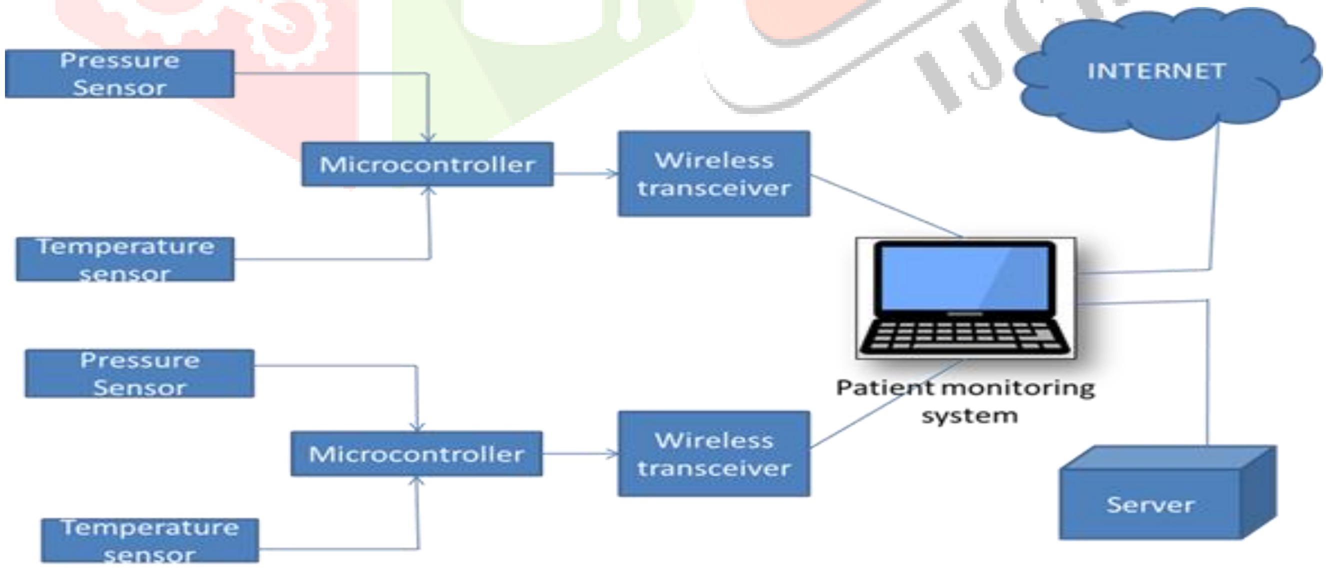

Figure 7. Architecture Diagram

In this paper, we concentrate on the temperature sensors & heart beat sensor for monitoring of multiple patients. Figure 1: Basic architecture of patient monitoring system Also in addition to the system, we have performance Evaluation of different sensors so that the monitored data should be more Accurate & precise. It's beneficial to the patient that effective & accurate delivery of the information to the monitoring system is achieved. So that doctor will come & see the patient. Thus, the necessary health aid can be provided and once the doctor arrives the results of concerned patients. This project proposes a system that provides a continuous health monitoring service for people. It can facilitate doctors in diagnosis and improve the efficiency and quality of medical administration

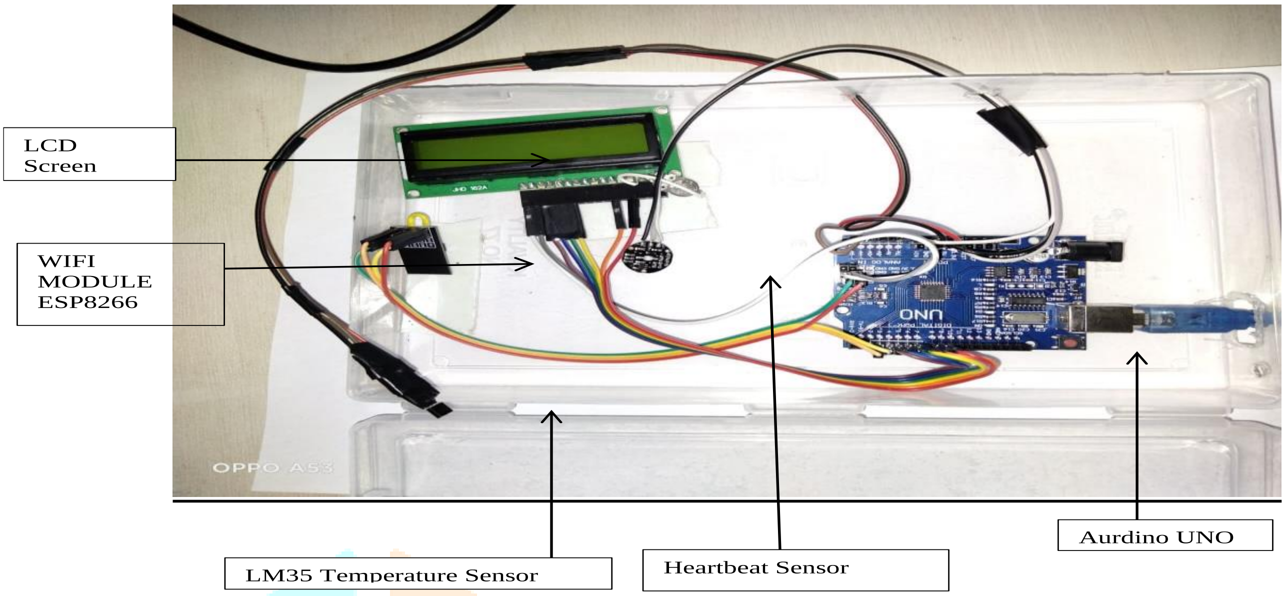

Figure 8. Circuit Diagram

CONCLUSIONS:

Critical Evaluation of System

- Can't finds the old history
- Can take the second suggestion
- Patient could not get the report detail
- Increase in Illegal doctors
- Tablets corruption in pharmacy which causes the death of patient
- Could not complain of doctor
- Donate of parts and blood are not possible

Suggestions for future work (Enhancements)

- Automation of the entire system improves the efficiency.
- Gives appropriate access to the authorized users.
- Effectively overcomes with the delay in communication.
- Updating of information becomes easier.
- Helps people find blood donors in times of need.

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ACKNOWLEDGEMENT

It is our proud privilege and duty to acknowledge the kind of help and guidance received from several people in preparation of this report. It would not have been possible to prepare this report in this form without their valuable help, cooperation and guidance.

First and foremost, we wish to record our sincere gratitude to **Management of our college** and to our beloved Principal **Dr. Anand Deshpande,** Angadi Institute of Technology and Management, Belagavi for his constant support and encouragement in preparation of this report and for making available library and laboratory facilities needed to prepare this report.

Our sincere thanks to our HOD **Prof. Sagar Birje,** Department of Computer Science and Engineering, AITM, for his valuable suggestions and guidance throughout the period of this report.

We express our sincere gratitude to our guide Department of Computer Science and Engineering, AITM, Belagavi and **Prof. Anjana Kulkarni** for guiding us in investigations for this seminar and in carrying out experimental work. Our numerous discussions with her were extremely helpful. I hold her in esteem for guidance, encouragement and inspiration received from her. The project on **"COVID SAFE: AN IOT-BASED SYSTEM FOR AUTOMATED HEALTH MONITORING AND SURVEILLANCE IN POST-PANDEMIC LIFE"** was very helpful to us in giving the necessary background information and inspiration in choosing this topic for the project. Our sincere thanks to **Prof. Gautam Dematti,** Project Coordinator for having supported the work related to this project. His contributions and technical support in preparing this report are greatly acknowledged.

Last but not the least, we wish to thank our **Parents** for financing our studies in this college as well as for constantly encouraging us to learn engineering. Their personal sacrifice in providing this opportunity to learn engineering is gratefully acknowledged.