PENINSULA PUBLISHING LLC

ESTIDAMAA
Vol. **(2025)**, 2025, **pp**. 39-45
ISSN: 3078-428X

Research Article

A Cloud based Smart Wireless Sensors using Secure Android Multi-Agent System

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ARTICLE INFO

Article History
Received 12 Mar 2025
Revised: 1 May 2025
Accepted 1 Jun 2025
Published 15 Jun 2025

Keywords
Smart WSN,
Sensors,
Multi-agent,
Health Care,
Smartphone.

ABSTRACT

This paper aims to present a comprehensive proposal for the implementation of smart wireless sensor networks (WSNs) to monitor patients using smartphone devices. Smartphones offer three key capabilities that can be effectively leveraged in healthcare settings: first, the array of sensors integrated within smartphones; second, the wide range of communication technologies (i.e. WiFi, Bluetooth, IrDA, RF, etc.) which enable multiple pathways for transmitting data; and third, location services that can assist healthcare providers in tracking and locating patients.
A major contribution of this paper is the conceptualization of a global healthcare information repository in the cloud, accessible via the internet. This repository would impose intelligent constraints on the WSN environment and serve as a valuable source of information for future research undertaken in the healthcare domain. I have formatted it as an academic paper introduction, tightened the writing in places, used more formal/technical language, and highlighted the key ideas and contributions. Please let me know if you would like me to modify or expand on any part of the rewrite.

1. INTRODUCTION

It costs a lot to stay in the hospital, and most people would rather be at home, where they can sleep well and eat meals that were made by someone else. With the help of new tools, it is now possible to heal at home.
A growing practice is for people to self-monitor at home and share the results electronically. Patients are taught how to take their own vital signs. After that, the information is sent online or over the phone. It is checked by nurses and then added to the patient's digital personal health record (PHR). Anyone on the patient's care team can access that PHR, so everyone always has the most up-to-date information on the patient. New communication platforms and technologies are emerged in this area and Wireless Sensor Network is the advanced platform introduced in this manner, where patient can be mobile or traveling abroad and stayed connected to health care centers; this platform has served in two dimensions: The first one is the spatial and temporal scope of distributed sensing [1-5]. The spatial scope can include health observations made when a person is stuck in a building (like a home or hospital) or a clearly defined area (like a disaster site), as well as health observations made as a person moves around in their daily life. Time-based notes can be made during an illness or event, or they can be made over a long period of time to help manage a long-term disease or for public health reasons. [6].
The second dimension is that of the group size, which can range from an individual patient at home, to groups of patients at a hospital and victims at disaster sites, and all the way to large dispersed population of subjects in a medical study or an epidemic [7-10].
The last critical dimension is the type of wireless networking and sensing technologies that are used: on-body sensors with long-range radios, body-area gateway sensors implanted in-body with wireless communication and power delivery, wireless

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DOI: https://doi.org/10.70470/ESTIDAMAA/2025/005

sensors embedded in assistive devices carried by individuals, wireless sensors embedded in the environment, and sensors embedded in the ubiquitous mobile Smartphones [1][11-14].
Smartphone is an emerging technology that revolutionize researches within the domain of healthcare and medical studies; this is due to the widespread of this technology (i.e., as mobile phone devices). New Smartphones are equipped with more than 14 different sensors, the most important sensors for this work are: Light sensor, Accelerometer, Gyroscope, Magnetometer, Barometer, Proximity, and Near Field (NFC) [15].
Smartphones significance came from the operating system (e.g., android from Google and windows mobile from Microsoft); the operating system provides enough resources to lunch applications that can collect knowledge for the user of the Smartphone; this imposes the availability to connect information resources such as the internet or information repositories Smartphones are running the latest versions of web explorers such as Chrome, Firefox, Internet Explorer and others. As we move toward home-based healthcare and remote patient tracking, made possible by new technologies, there are a few things we need to think about when it comes to security[16-18]. Concerns about data privacy and confidentiality arise when sensitive medical information is sent online or over the phone. To keep patient information safe from people who shouldn't be able to see it or intercept it while it's being sent, it's very important to use secure transmission methods and encryption protocols.
Using Wireless Sensor Networks (WSNs) also brings up security issues linked to keeping data safe and keeping networks safe. To protect WSNs from being hacked, tampered with, or accessed by people who aren't supposed to, steps like authentication systems, data encryption, and breach detection systems must be put in place. Another thing that makes security more difficult is the use of smartphones for healthcare tracking. Since smartphones have many sensors and are connected to the internet, personal health information stored on them could be accessed by people who shouldn't be able to. To reduce these risks and protect patient privacy, it is important to use strong security measures like encrypting devices, biometric authentication, and safe data storing[19].
Also, using smartphone operating systems and web sites to access information resources makes people more open to malware, phishing attacks, and data breaches. To make smartphones used in healthcare settings safer, they need to have regular software changes, antivirus software, and users who know how to use cybersecurity best practices. Incorporating new technologies into healthcare has many benefits, but it's important to put security measures at the top of the list to protect patient data, keep information private, and lower the risks of cyber threats and privacy breaches[20].

1.1 Challenges In Wsn

Sensors' battery is a key issue in designing WSN where sensors' functionalities are optimized by the lifetime of the battery Routing, network discovery, and transmission are battery consumable actions taken by sensors; this consumption is increased tremendously in mobile environment.
Sensors are distributed over local areas and can't be accessed globally; this prevent health care centers from gaining access to global information as it regards their patients.
Low computation power introduced by sensors can't be promoted due to sustain their small size and their.

2. PROBLEM STATEMENT

First of all Healthcare centers need to, continually, collect data from a large number of distributed targets as they practicing normal live; this is hardening the working conditions for sensors in term on battery consumption. In addition, Patients with critical situations need to be monitored, all the time, by smart sensors that can develop knowledge from regional and global resources; this is to respond promptly and act in superior to more escalations. However, Researchers conducted by health care research centers, especially for the Drugs' effect need continuous monitoring and analyzing data collected from wide distributed resources while Sensors need to be smarter in reacting to situations occurred with the patient; this is imposing wider duty cycle and unacceptable battery consumption. As well as Sensors have to be developed to have the ability to talk to other sensors in the neighbor; this is to have the ability to server in the condition where bases station is unreachable. Lastly The low computation power, possessed by the sensors, prevent developers from embedding more intellectual behaviors the WSN.

2.1 Hypothesis Investigated by This Paper

1. H1: people (i.e., patients) tend to carry their mobiles more than carrying other devices and in the same category, people tend to re-charge their mobiles
2. H2: patients are subjected to common symptoms and need to be guided by other patients who experienced such symptoms and got reply from specialist (i.e.,)
3. H3: social patients are more knowledgeable than the patients that do not have social activities, thus social sensors promote patient experience in reacting to situations.
4. This hypothesis is going to be investigated by capturing knowledge gained from social resources (i.e., social sites like Facebook, Twitter, and others)

5. H4: ontological approach to control sensor reactions to the events occurred within the environment helps gaining autonomous decision making and safe the patient.
6. H5: Integration between Smartphone sensing system is introducing a critical solution to medical, psychological, and behavioral research
7. H6: sensor integration to Smartphone increases battery lifetime due to using the Smartphone connection as alternative pathways to route events.

2.2 Data Safety and Confidentiality

Healthcare centers need to constantly collect data from a huge number of spread-out targets. This puts a lot of stress on sensor operation, especially when it comes to battery life. This requirement makes it even more important to deal with security issues to protect the integrity and privacy of the data being gathered. To keep data safe during transmission and storage, security procedures must be put in place These keep you safe from risks like being spied on and getting in without permission. It's also important to make sure that hackers can't get into sensor networks so that data collection doesn't stop and private healthcare data stays safe[21].

In very serious medical situations, patients need to be constantly watched by smart sensors that can use resources from around the world to move quickly if things get worse. Adding such high-tech monitors, on the other hand, makes it harder to keep data safe and private. Strong encryption and access rules must be put in place to make sure that private patient data doesn't get changed or lost, or falls into the wrong hands. Also, strong authentication steps should be taken to make sure that only people who are allowed to see patient information can do so and that requests to see data are real.

Also, healthcare research centers that study how drugs work and other medical events happen need to constantly gather and analyze data from many different sources. When you gather and look at data in this way, there are security risks, and private study results could be made public. To keep study data private and accurate, it needs to be handled in a safe way. For example, the data needs to be made secret and only certain people can see it. Researchers must also follow government and social rules to make sure they are responsible with data and protect patients' privacy[5][22-25].

Being able to talk to nearby devices through better sensors opens up both opportunities and risks when it comes to security. Many people can sense and act together when connections are better, but this also leaves holes that bad people could use. To find and stop possible threats to sensor networks, secure communication methods and intrusion detection systems should be put in place. Also, security checks and changes must be done on a regular basis to fix new threats and holes in sensor technology[26].

Lastly, sensors don't have a lot of computing power, which makes it hard to add more complex intelligence to wireless sensor networks (WSNs). From a security point of view, this limitation means that usefulness and resource limits need to be carefully balanced to make sure that security measures don't make it too hard for sensors to work. To keep sensor resources as low as possible while still protecting against security threats, it's important to focus on efficient cryptographic algorithms and light security procedures. Also, ongoing research and development is needed to find new ways to make low-power sensors in WSNs safer[26-30].

3. METHODOLOGY

The proposed system is composed of multiple agents spread all over the network and acts as smart sensors that collect data and information, and pass it to health care repository through special web services designed for this purpose, as figure (1) illustrates:

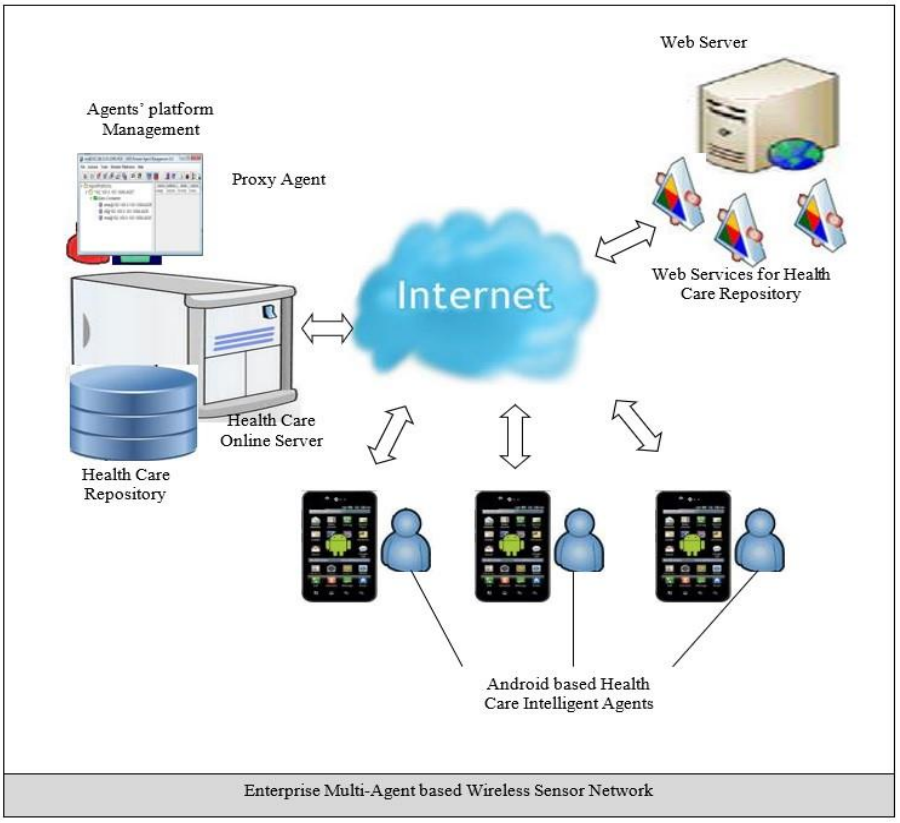

Fig. 1. The Proposed System

This paper Build cloud based integration infrastructure to collect, organize and brokering information from globally distributed resources; this is to enrich health care researches and provide global information resource for decision making in health care domain . Data collection is implemented through special android Agents (i.e., these agents will be designed along the implementation of the proposed system).

$\forall_{sensor}\, \nexists_{agent}\ Bind\ (sensor, agent)\ \forall_{event}\ Receive(event, agent)\ \wedge\ \ Conceptualize(event)$ --eq.1

$\forall_{agent\ \in\ SensoryNet}\ \nexists_{platform}\ \ Joind(platform, agent)$ --eq.2

While the Provides alternative pathways to the base station, where Android agents are playing the role of relaying and routing data passed from sensors to the base station; this will decrease battery consumption and provides alternative pathways

$\exists_{baseStation} \nexists_{url}\ Access(baseStation, url) \rightarrow Reachable(baseStation)$ --eq.3

$\exists_{baseStation}\ \nexists_{proxyAgent}\ Reachable(baseStation)\ \forall_{agnet\ \in platform}$

$Recognize(proxyAgent, agent) \rightarrow Gateway(proxyAgent)$ --eq.4

$\forall_{sensor\ \in\ WSN}\ \nexists_{baseStation} \forall_{event}\ Trigger(sensor, event)\ \wedge\ Reachable(baseStation)\ \ \rightarrow$

$Informed(baseStation)$ --eq.5

$\forall_{\boldsymbol{sensor}\ \in \boldsymbol{WSN}} \nexists_{\boldsymbol{agent}}\ \forall_{\boldsymbol{event}}\ Trigger(sensor, event) \rightarrow Trigger(agent, event)$ --eq.6

$\forall_{agent\ \in\ platform}\ \nexists_{baseStation} \forall_{event}\ Trigger(agent, event)\ \wedge\ Reachable(baseStation)\ \ \rightarrow$

$Informed(baseStation)$ --eq.7

In addition, the Provides regional smart decision making helper, where Android agents are social agents and can develop knowledge required regionally, thus even if the base station is not reachable; knowledge available within the neighbor can assist in certain vital cases.

$\exists_{WSN}\ \exists_{agentPlatform}\ Integrated(WSN, platform) \rightarrow\ \ Smarter(WSN)$ --eq.8

The global health care information center utilizes a YL-69 body moisture sensor inserted directly into the body to measure volumetric blood content. Readings from this sensor are fed into a NodeMCU microcontroller along with ambient temperature and humidity measurements from a DHT11 sensor module. The NodeMCU processes this sensor data and controls a blood movement system via an L298N sensor, blood movement system as needed to maintain desired body moisture levels.

The NodeMCU also facilitates connectivity to cloud services, enabling remote storage and monitoring of body conditions. An app displays real-time sensor measurements and sensor activation status through a dashboard interface. This allows users to monitor moisture, temperature, and humidity data as well as control sensor operation and modify moisture set points remotely.

By continuously measuring body moisture and automatically global health care information center to maintain ideal checking conditions, this system provides a comprehensive solution for precision blood movement system applications or automated systems. The modular design and cloud connectivity also grant flexibility in terms of integrating additional sensors or expanding monitoring and control capabilities in the future. The complete System setup of health care information center are shown in Figure (2) respectively.

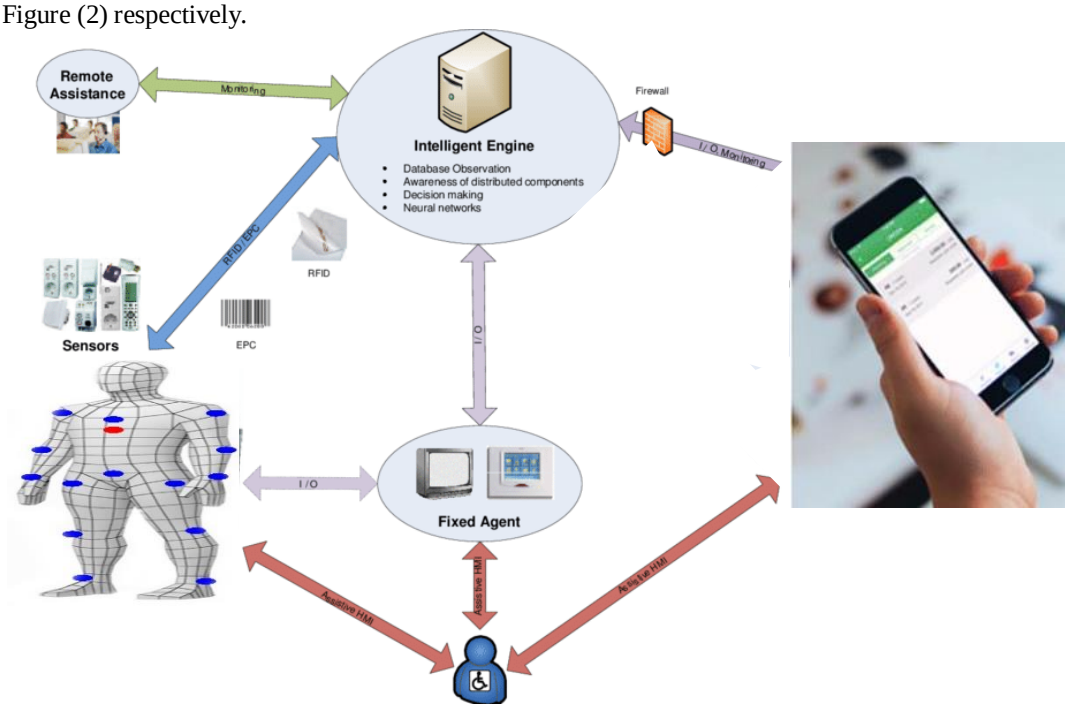

Fig. 2. The complete System setup of health care information center

4. RESULT

The global health care information center by smart systems also promotes improved health. Optimized blood and nutrient delivery minimizes stress and bolsters disease resistance, facilitating healthier growth. The end result is higher quality check up and follow up, increased productivity, The automated functionality of these systems additionally saves time and labor by removing the need for manual oversight of check schedules.

Broader environmental gains are realized as well, as curtailed blood waste aids blood conservation efforts and contributes to environmental sustainability. The data insights provided by smart systems further enable informed decision making regarding resource management and farming practices. This facilitates precision blood movement system with optimized produces and efficiency.

In summary, properly implemented smart the global health care information center systems can drive blood conservation, cost savings, body health improvements, time efficiency, sustainability, and data-driven health. The technologies provide an effective solution for automated, precision blood that simultaneously addresses environmental, productivity, and resource management needs. When designed and deployed conscientiously, they represent a promising step toward more sustainable blood usage across The global health care information sector.

We put in place the Optimal Server Activation and smart global health care information center systems to see how well Enterprise Multi-Agent will work compared to other algorithms that are already in use. It's just a simplified version of the real-world apps that are used. A lot of data centers have thousands of computers that serve millions of people at once. Each year.

The scenario in this thesis is very simple. The input data were made at random, and the user resource requests ranged from 0 to 50. Each number in the input file represents a different user's request. We think it takes one second to handle one request in the tests, and the cost is measured in seconds. The program then figures out how many users there are, adds up all the resources they've asked for, and then quickly sends each user's request to the geo-distributed data centers to cut down on energy use. Here are some of the test results from comparing smart global health care information center systems on both small and big sets of data.

The first experiment is a test to see how well smart global health care information center systems works compared to other systems. In the first trial, examples from [6] were used to compare the two algorithms. The examples showed how many servers Enterprise Multi-Agent has in three of its data centers. The results are shown in Figure (3) shows how Optimized blood and nutrient delivery minimizes stress and bolsters disease resistance, facilitating healthier growth. . The technologies

provide an effective solution for automated, precision blood that simultaneously addresses environmental, productivity, and resource management needs.

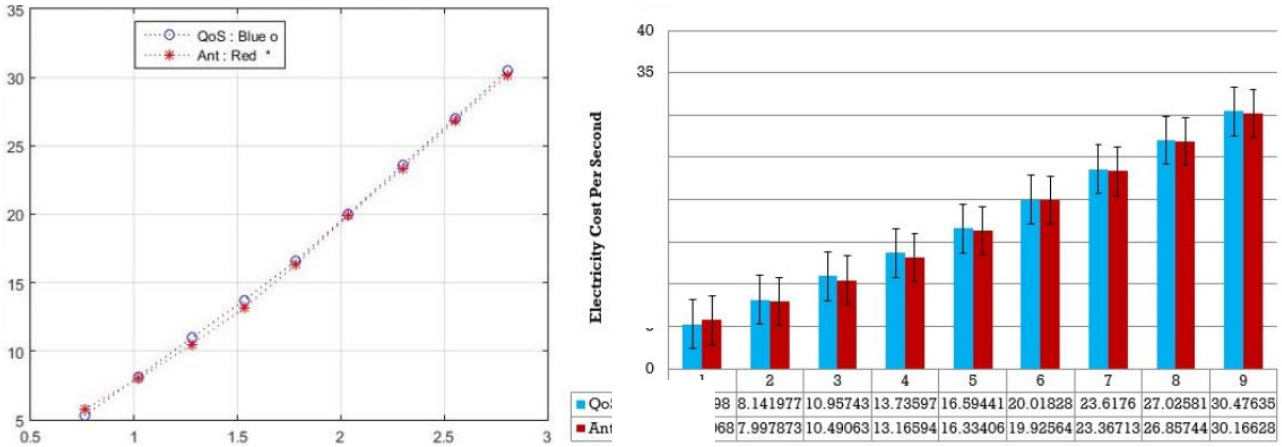

Fig. 3. The health care information center improving body health

5. CONCLUSION

In Conclusion , implementations of Internet of Things (IoT)-enabled smart The global health care information center systems offer immense potential to transform blood management across global health, commercial, and residential landscapes. The intelligent global health system of real-time data, control automation, and remote monitoring unlocks impactful capabilities in optimizing global health.

At the core, these technologies leverage insights from IoT sensors and meteorological data to determine highly precise body moisture levels, climatic conditions, and plant blood demands. This enables the delivery of exact blood quantities at the ideal times. The outcomes stretch well beyond sheer blood conservation. Users can handle their systems remotely through mobile and web interfaces, which gives them a lot of freedom and convenience. Integrated automation features also fix inefficient work practices by getting rid of the need for human check-up tasks. Cut down on blood use to save money Save enough on utility costs to prove that the method is economically viable.

Smart health systems also create large datasets that help people make better decisions about medical tactics and how to use resources. When looked at as a whole, the answers that these new technologies offer are very broad and have a big effect. IoT-based smart global health systems hold a lot of promise as a way to solve important problems related to health shortages. Because they can cut down on trash, improve body health, and encourage environmentally friendly habits, they are very useful for improving resource management in all body health follow up.

Funding:

The authors confirm that no funding was acquired from any organization, grant agency, or institution. This research was undertaken without any external financial contributions.

Conflicts of Interest:

The authors declare no competing financial interests in this study.

Acknowledgment:

The authors would like to thank their institutions for providing the necessary facilities and guidance, which proved vital in achieving the study’s objectives.

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