

Wireless Sensor Networks for Health care: Current Status and proposing a model in the perspective of emergency situations

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Abstract:

Every human being wishes healthy living and avoid hospital visits but there are limitations due to various circumstances (age, accidents, health status, communicable and communicable diseases etc), Hence in this global world continuous health monitoring is important. Wireless technologies play vital role to treat patients suffering from communicable diseases like Covid-19, Hepatitis A, B, C, measles, influenza, salmonella etc. The increasing population of senior citizens and pre-existing disease patients (who are already suffering from any disease) require more wireless health monitoring devices because these groups having higher risk of severe covid-19. While treating these diseases shielding is mandatory not only for doctors, nurses but also for other frontline medical associative. Wireless sensors (wearable or non-wearable) performed vital role in current pandemic Covid-19 positive patients while monitoring them, treating them in isolated as well as non- isolated place or in case of limited self- protection kits. Rapid advancements in wireless sensors improving and enhancing the quality of care in critical conditions without physical contact with patients. Wireless body area network and wireless medical sensor area network is a new invention as a part of wireless sensor networks but Still various issues or challenges remain to be addressed. This Paper is aims to review of wireless sensor devices use in current covid-19 pandemic to reduce the threat of covid-19 while treating

patients as well as future challenges or issues like security, reliability and privacy of medical data.

Keywords: Wireless, medical, health, covid-19, patients, pandemic.

Introduction:

Wireless sensor network (WSN) has introduced in 1950's for army purpose in united states. WSN is used to monitor and record the temperature, sound, pollution levels, wind, pressure, oxygen level etc and transfer collected managed data in various devices. According to current covid-19 pandemic situation unlike other fields medical or health care field is most important addressing field. In medical science these sensors are using from last few decades for health care purposes thus new term wireless medical sensor network (WMSN) is introduced. For real time and non-obstructive delivery of crucial or sensitive data and for long term supervision of critical patients, bio medical sensors are using. However, we cannot say these sensors fully saving the patient life but definitely these devices created a standard like smart nursing, fast accessible data, full monitoring from outside the isolated room in communicable disease situation like Covid-19. wireless medical sensor network reducing mishappening as well as medical errors, and reducing the chances of get infected from patients to hospital staff which increasing the recovery ratio of crucial patients. Wireless sensor networks provide a proper observation of patients is done through sound, image object location, controlled medical equipment, lookup data etc. ^[1] Provides an efficient and secure treatment way in which sensors arranged in covid-19 infected body which tracks the accurate state of the person for diagnosis. In this paper we exploring current state of wireless sensors for health applications and also expanding challenges of wireless medical sensor network in health care field. Proposing a sensor model to reduce some challenges.

Current status of wireless medical sensors:

Sensors are used with electronic based medical devices to collect crucial data and convert it in electrical signals for analysis [2]. Sensors are used inside or outside the body according to requirement. Hospitals, doctors, nurse etc want real time accurate data or results by these devices for proper treatment.

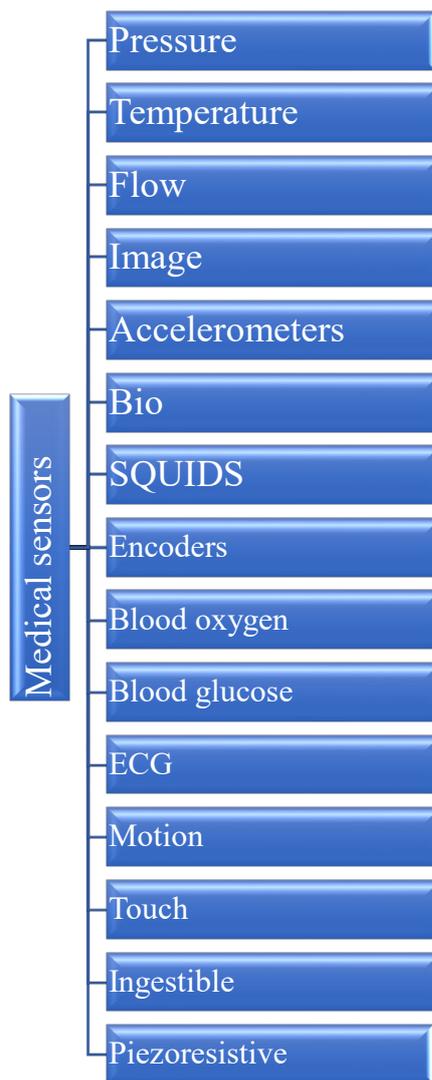


Figure 1: Various wireless medical sensors

Required significant sensors for Covid-19:

- a) Temperature Sensors- Body temperature is major parameter for covid-19 positive patients. Temperature sensors alerts when body temperature variation seen during observation of Covid-19 positive patient.
- b) Piezoresistive Sensors- Respiratory problem is another major parameter for covid-19 patients. Changes in breathing rate seen then these sensor alerts for immediate treatment. This sensor is used for counting or monitor breathe of covid-19 positive patients.
- c) SPO2 Sensors- Oxygen saturation is also another major parameter. Decreasing oxygen saturation level in blood increases high heartbeat and pulse rate, if immediate treatment not given then heart failure is also possible.
- d) ECG Sensors- ECG best for observing cardiac issues. Unmonitored and untreated cardiac patients can die due to covid-19.
- e) Position sensors- For blood pressure calculation, accurate position of patient is also required.
- f) Real Time sensors- If patient misses the right time dosage, it will be risky. Triggering on time is mandatory.
- g) Environmental sensors- Atmosphere condition must be taken to collect accurate data. Winter season, heater in room etc affects the temperature.

Existing Wireless sensor model for Covid-19:

For monitoring multiple patients simultaneously Figure 2 shows the existing model. This model consists ^[3]--

Object: Patient who is going to be monitor.

Sensor Nodes: Sensors are used for reding data.

Data Storage: Received or collected data storage and analyse.

Monitoring: Manual Observation

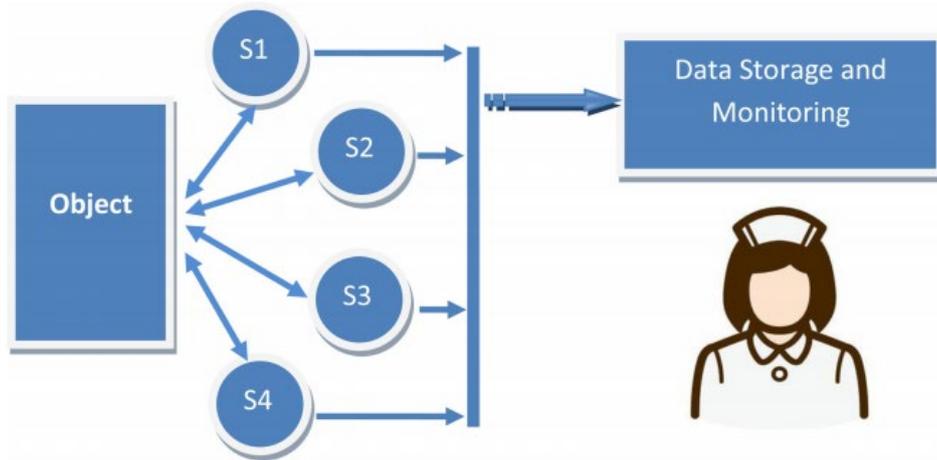


Figure 2: Existing wireless sensor model network ^[3]

Proposed wireless network model:

The proposed wireless network model consist microcontroller to read received information. In this model temperature, real time, ECG, SPO2, environment and piezoresistive sensors are attached. According to situation analysed data broadcast to next level and send alert message to associative. In all steps privacy is also ensured through password protection.

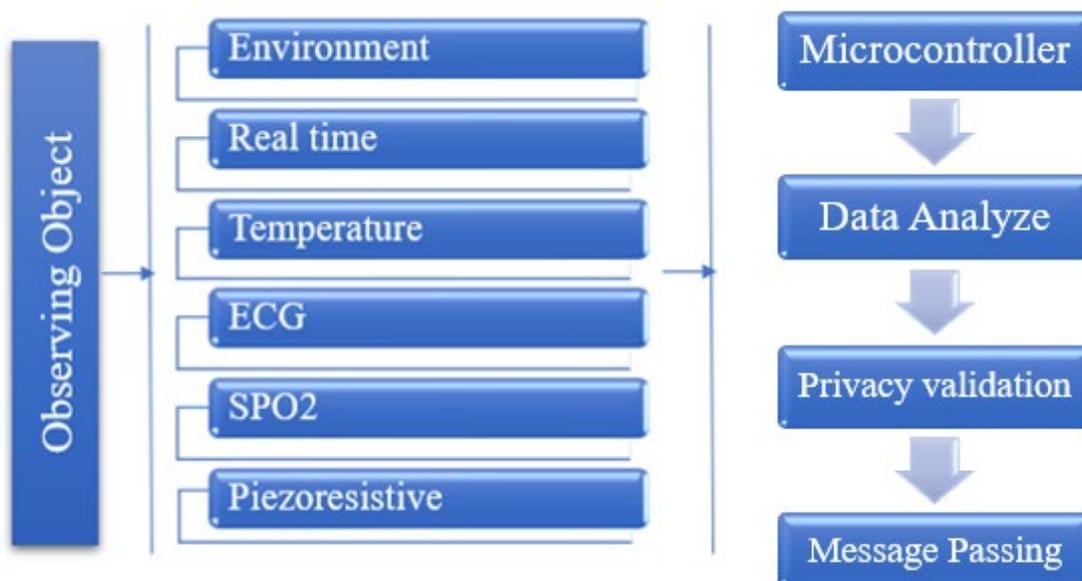


Figure 3: Proposed wireless sensor network model**Challenges and suggestions:**

- 1) Medical Emergency Traffic—Must provide highest access channel for emergency traffic. Priority of emergency data should be considered.
- 2) Energy Consumption—Reduce energy consumption, load balancing routing protocols, avoid congestion and data compression techniques must be used.

- 3) Packet missing—During transmission of data ensure that data must not be missed.

Cross layer solution is best.

- 4) Stack storage—Self and auto replace algorithms must be used.

Conclusion:

In this paper explored the current status of wireless medical sensors in health care field. Also defined required sensors for monitoring covid-19 positive patients. Shown arising challenges and suggestion. Proposed a wireless network model which reduces human error as well as data collection of every stage. The treatment and patient satisfaction are major parameters in the time of ongoing Covid-19 pandemic. These strategies definitely improve the existing system for future not only for Covid-19 as well as other communicable diseases. Hospital Staff can treat patients without any threats of being infected.

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