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Wireless Sensor on Patient Health Care Monitoring

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Abstract—As the technology development and advances in wireless communication and we are using the wireless sensor network to monitor the patient and storing the information about the patient Health conditions and alert to the physician or health care. The wearable sensor is placed on the human body and they collect the physiological Vital signs of the patient and report to the health care.Advances in wireless sensor networking have opened up new opportunities in healthcare systems. Sensor-based technology has invaded medical devices to replace thousands of wires connected to these devices found in hospitals.This paper discuss about the various issues in WSN (wireless sensor network)monitoring system the main issue can be the security and privacy when the vital signs which noted from the patient body is transfer to the appropriate health care centre at the time the data can be lost or altered by any one on the way of transmission.

Keywords—*wireless sensor network, wireless body network, wireless application, wireless medical sensor, ZigBee.*

1. Introduction

In today world people facing multiple physical and psychological problems in some emergency cases the patient want to be treated at the spot so at the time we canuse the patient details about the medical information can be taken from the sensor and it will be very useful to start the right treatment on time.WBAN(wireless body area network) can monitor vital sign of the patient body and chronic condition or progress of recovery from an illness.A typical WBAN is composed of number of miniature, light weight, low power sensing devices, management electronics and wireless transistor**.** Wireless medical sensors are inserted on a patient's body and can be used to closely monitor the physiological condition of patients. These medical sensors monitor the patient's vital body signs of patients like patient body temperatures, heart rating, bp and oxygen level, etc. and transmit the data in a timely fashion to some remote location without human intervention.
WBAN with an extremely low power consuming sensor are used to track the patient's vital signs in critical situation and transfer the information to the local physician or healthcare centre through internet in real time. WSN uses ZigBee and other standards.

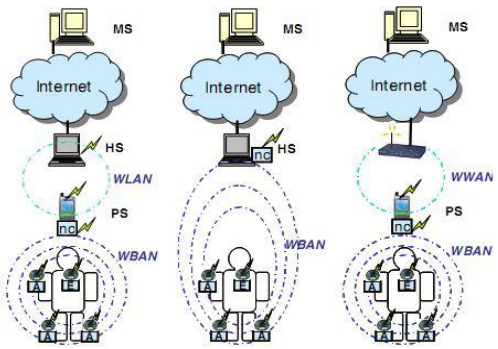

Fig.1:WWBAN working

The application of the WSN in healthcare system can be divided into three categories:

1.1. Tracking of patients in clinical setup
1.2. Home care and elderly care monitoring
1.3. Storing of patients long-term data's

1.1 Tracking of patients in clinical setup

Advancing technologies in Wireless medical sensor networks are becoming more important for tracking patients in the clinical atmosphere. The WBAN architecture have the ability to handle multiple sensor in patient body for monitoring different signals with different requirements.

The deployment of wireless medical sensor may reduce the hospitalized cost with a advanced mobility. The patient are no need to visit hospital often for their problems and data will be stored for long time and the digitized signals which are used to making decision and observations for the patient treatment and it will be useful to treat the patient at the right time with previous diagnosis.

1.2 Home care and elderly care monitoring:

It is of more important to provide low cost, high-quality healthcare services to the elderly people for enabling them to live independently. At homecare can help address the social and financial problems of an aging population. Using WMSN, we can achieve the home healthcare services.

1.3 Storing patients long-term data's:

Sensor links the physical with digital world by capturing the data real world data and converts it into the

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processed and stored format. The data which are captured from the patient body are used in two ways:

- The applications of wireless sensor network analysis the data gathered by sensor and make the decision depend on the continuous monitoring
- The continuous tracking of patient can be used to find the solution for the unsolved problem in the healthcare.

2. Wireless Sensor Platforms

Recent years have witnessed the emergence of various embedded computing platforms that integrate processing, storage, wireless networking, and sensors. These embedded computing platforms offer the ability to sense physical phenomena at temporal and spatial fidelities that were previously impractical. Embedded computing platforms used for healthcare applications range from smart phones to specialized wireless sensing platforms, known as motes, that have much more stringent resource constraints in term of available computing power, memory, network bandwidth, and available energy.
Existing motes typically use 8-b or 16-b microcontrollers with tens of kilobytes of RAM, hundreds of kilobytes of ROM for program storage, and external storage in the form of Flash memory. These devices operate at a few milli watts while running at about 10 MHz

2.1 Healthcare Application

Wirelessly networked sensors enable dense spatiotemporal sampling of physical, physiological, psychological, cognitive, and behavioral processes in spaces ranging from personal to buildings to even larger scale ones. Such dense sampling across spaces of different scales is resulting in sensory information based healthcare application s which, unlike those are describes fuse and aggregate information collected from multiple distributed sensors. Moreover, the sophistication of sensing has increased tremendously with the advances in cheap and miniature, but high-quality sensors for home and personal use,the development of sophisticated machine learning algorithms that enable complex conditions such as stress, depression, and addiction to be inferred from sensory information, and finally the emergence of pervasive Internet connectivity facilitating timely dissemination of sensor information to caregivers.

2.1.1 *Vital sign monitoring in hospitals:*

Wireless sensing technology helps address various drawbacks associated with wired sensors that are commonly used in hospitals and emergency rooms to monitor patients. The all too familiar jumble of wires attached to a patient is not only uncomfortable for patients leading to restricted mobility and more anxiety, but is also hard to manage for the staff. Quite common are deliberate disconnections of sensors by tired patients and failures to reattach sensors properly as patients are moved around in a hospital and handed off across different units. Wireless sensing hardware is less noticeable and has persistent network connectivity to backend medical record systems help reduce the tangles of wires and patient anxiety, while also reducing the occurrence of errors.

2.1.2 At-home and mobile aging:

As people age, they experience a variety of cognitive, physical, and social changes that challenge their health, independence, and quality of life Diseases such as diabetes, asthma, chronic obstructive pulmonary disease, congestive heart failure, and memory decline are challenging to monitor and treat.

These diseases can benefit from patients taking an active role in the monitoring process. Wirelessly networked sensors embedded in people's living spaces or carried on the person can collect information about personal physical, physiological, and behavioral states and patterns in real-time and everywhere. Such data can also be correlated with social and environmental context.

From such Bliving records useful inferences about health and well being can be drawn. This can be used for self awareness and individual analysis to assist in making behavior changes, and to share with care givers for early detection and intervention. At the same time such procedures are effective and economic ways of monitoring age-related illnesses.

3. Challenges in WBAN

There are various challenges in WBAN, there are 3 common challenges are

3.1 Communication Challenges

The prime factor in medical application is to provide a mechanism for secure and reliable communication among the various groups of sensors, handheld devices & mobile. Each device follows different standards depending on their company's standards.

3.2 Computational Challenge

Sensor networks are self organizing and operate with low power and very little computational capacity. There is a limit on the type and complexity of application data that these devices can operate on. The system must allow physicians, nurses, and others to assign access rights to patient data quickly and determine their data dynamically when a patient is transferred to another unit or hospital. Existing authentication systems are extremely rigid in this regard.

3.3 Programming Challenge

Also one should accept that Wireless devices are slower than wired because of traffic congestion and hence

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increases the challenge to create the devices that could reach to better performance. Wireless network based medical devices can be very limited in terms of power availability and processing strength. Thus ensuring privacy without using the very complex encryption algorithms can be a big issue for developers of medical devices.

4. Existing System

Issues and challenges on wireless sensor network are:

- The way the multiple sensors are handled and joined with each other, the sensor nodes have the reliable and secured way of communication between them.
- The capacity of sensor are low capacity
- In some case the sensor nodes can be in the inactive state so on that time it will not able to produce the signals suppose on that time the patient may be in emergency situation so they will not be able to monitor the patient it will not able to report to the physician or local healthcare centre.

The other issues can be the comfort level of a patient when they using this technology and the main issue is the security and privacy of the patient data that the vital signals which are gathered from their body.

5. Proposed System

The issue in existing system is the packet lost or hacking of Packet at time of transmitting the signals which is collected from the Patient body. The main challenge is to transfer the data from patient to the health care centre the security way of transmission. The packet can securely transmitted by Implementing some encryption algorithms and then using some Security measures. In this paper the RSA algorithm and the TBDS algorithms are used to encrypted and decrypt the message from the patient to the health care centre.

5.1 Concepts of cryptography

Data encryption emerged before the invention of computer. Diplomats, enthusiasts and mainly militaries contributed to the evolution of this art that consists in distort the information that is being transported, so that only the authorized recipient can decipher it.

In this regard, a cryptographic algorithm can be set as a function that converts encrypted message in clear messages and vice versa, making use of a cryptographic key. Currently, in addition to confidentiality, encryption also operates in the fields of integrity of authentication and is described below:

- Confidentiality: It ensuring that only the source and destination will understand the message.
- Integrity: It is used to notice that the message has been altered by any at the time of transmission
- Authentication: It is an medium to identify the authenticated valid user of the communication.

A. TBDS algorithm:

Step 1) When Cc Send Req: = Cs, Then New Account Created & Client Registered

Step 2) If Mem: = Confirmed Then Unique Token_Id Is Generated On That T For Specific Service.

Steps 3) Then Cc Send Req: = String Then Check For The Marked/Verified Token_Id With Ds.

Step 4) If (T_Id:= Correct) {Authenticated Client. } Else { Intruder (Fake Client). }

Step 5) IF Token_ID does not MATCH with the database entry for specific service that indicated presence of intruder and repeat STEP 1 to 4. Otherwise Data transferred through Secure Channel and RECEIVE ACK.

B. RSA algorithm

RSA algorithm involves three steps:

1. Key Generation
2. Encryption
3. Decryption

Key Generation: Before the data is encrypted, Key generation should be done. This process is done between the service provider and the user.

Steps:

1. Choose two distinct prime numbers a and b. For security purposes, the integers a and b should be chosen at random and should be of similar bit length.
2. Compute n = a * b.
3. Compute Euler's totient function, Ø(n) = (a-1) * (b-1).
4. Chose an integer e, such that 1 < e <Ø(n) and greatest common divisor of e , Ø(n) is 1. Now e is released as Public-Key exponent.
3. Data is encrypted and the resultant cipher text(data) C is C = me (mod n).
4. This cipher text or encrypted data is now stored with the service provider.

Decryption: Decryption is the process of converting the cipher text(data) to the original plain text(data).

Steps:

1. The user requests the service provider for the data.
2.Service provider verify's the authenticity of the user and gives the encrypted data i.e, C.
3. The user then decrypts the data by computing,
m = Cd (mod n).
4. Once m is obtained, the user can get back the original data by reversing the padding scheme.

RSA algorithm are use the private key to encrypt and uses the public key to decrypt the message .there are two keys in all encryption techniques the public and private key , the public is known by all the user on the same network but the private key is only know by the source and destination of the network.

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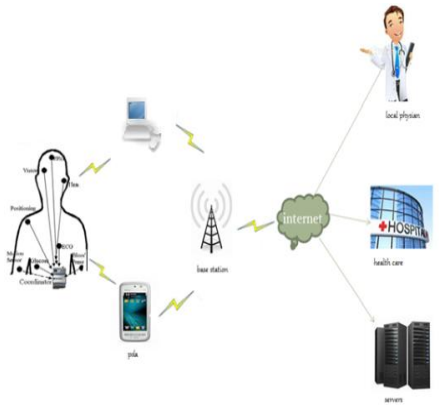

Fig.3: Architecture of wireless patient healthcare monitoring

The vital signal from the patient body are sensed by the sensor and the critical data are send to the personal device assistants and it send to the base stations from there the data are send to the local health care centre or the data are stored in the servers and analysed later.

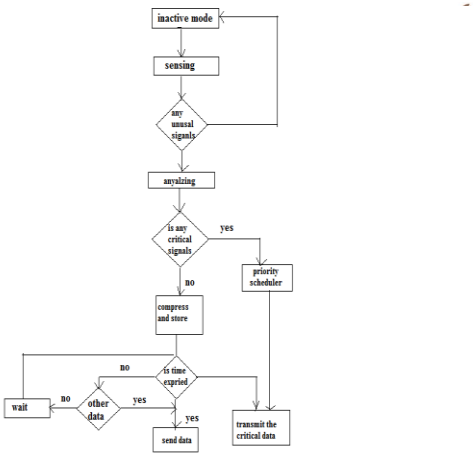

Figure-4 working flow of WBA

First the sensor will be in inactive mode and the it will detect the signals if there is any unusual signal it will analyse the signal it is critical signals are taken and compressed and stored in the database and using the priority it is scheduled and transmitted and the data which are stored in database are transmitted to the local physician if its time expired.

6. Conclusion

The wireless sensor network for human health care Monitoring are used to help the patient who are out of hospital to monitor and sends the vital signals to the hospital .the problem in existing system is the data packet can lose or hacked and modified by anyone . The issue in existing system is the packet lost or hacking of Packet at time of transmitting the signals which is collected from the Patient body.

The main challenge is to transfer the data from patient to the health care centre the security way of transmission. The security of data transmissions from these devices should be improved in a preventative manner to avoid possible attacks. Regarding WSNs, RSA public key algorithm is the most commonly used is standardized, and achieves efficiency relatively good.

so to secure the sensitive information about the patient health condition , we can some encryption algorithm s to secure the packet In this paper the RSA and TBDS algorithms are used to encrypt the ssage So it can't be readable by any authorized third person.

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