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PHYSIOLOGICAL ACTIVITIES AND HEALTH CARE SOLUTIONS USING ANDROID MOBILE DEVICE

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ABSTRACT: The time we spend in hospitals, emergency admissions, etc., are extremely costlier. It also increases the workload of doctors and medical professionals. Managing the cost, quality of treatment and caring for seniors are important issues in healthcare. These issues have a demand for in-home patient monitoring. A low-power embedded wearable sensor measures the health parameters dynamically, and is connected, according to the concept of IPv6 over low-power wireless personal area network, to the M2M node for wireless transmission through the internet or external IP enabled networks via the M2M gateway. A visualization module of the server program graphically displays the recorded biomedical signals on Android mobile devices used by patients and doctors at the end of the networks in real-time. Our approach for a global M2M healthcare solution is managed to process the large amount of biomedical signals through the extended network combining IPv6 technique and mobile technology for daily lifestyle to users appropriately.

Keywords: Android mobile device, global network, health condition, healthcare application, IPv6 over low-power wireless personal area network, machine-to-machine.

I INTRODUCTION

HEALTHCARE spending indeed accounts for a significant fraction of the welfare budget of any country. In the years to come, the demographic compression, along with the increased number of senior members in the society will undermine economic sustainability of available healthcare systems. However, to compensate effects and implications of demographic changes in the society, it is also necessary to identify suitable technology solutions capable of reducing healthcare costs, and at the same time, of improving healthcare services quality for citizens. Impaired individuals, patients affected by chronic diseases or engaged in rehabilitation therapies may take full advantage from pervasive healthcare systems deployed close to where they live and move, with the main goals of increased independence, safety, and quality of life on the one hand, and of care cost-saving on the other hand. Various research proposals have recently appeared in the literature that suggest the development of solutions, which are able to record and analyze patients' behavioral patterns, to monitor users' mobility, to assist individuals with special needs in their daily activities, such as self-care, etc.

Moreover, such continuous monitoring would increase early detection of abnormal health conditions and diseases, and therefore provide a great potential to improve the quality of life of patients. Recent technological advances in M2M systems together with the rise of M2M communications over wired and wireless links allow the design of lightweight, low-power sensors at low cost for wearable sensor networks, integrated circuits, and wireless communication. At its inception, the future of M2M communication was uncertain at that time, engineers were just beginning to learn how to directly connect cellular technology to other computer systems. However, with the dramatic penetration of embedded devices, M2M communications became a dominant communication paradigm in many applications that concentrate on data exchange among machines to make these machines intelligent in a narrow sense and among currently networked applications and services, whose core is the intelligent interaction of machines in a general sense.

With advances in mobile communication, new opportunities have opened up for the development of healthcare systems that remotely monitor biomedical signals from patients. The availability of a new generation of mobile phones has had an important impact on the development of such healthcare systems, as they seamlessly integrate with a wide variety of networks (such as 3G, Bluetooth, wireless LAN, WCDMA and GSM), and thus enable the transmission of recorded biomedical signals to doctors or patients from a central server located in a hospital, home, or office. A Smartphone presents a programmable monitoring platform for healthcare as people go about their daily lives . It is now possible to infer a range of behaviors on a phone in real-time, allowing users to receive feedback in response to everyday lifestyle choices that enables them to better manage their health.

II RELATED WORK

PATIENT MONITORING SYSTEMS TO ENSURE SECURITY

There are different schemes are available for ensuring security in patient monitoring systems. Confidentiality is one of the issues when storing patient related data. In Cipher text Policy Attribute Based Encryption (CP-ABE) was proposed. The patient data is encrypted and decrypted based on access policy. After encrypting data, it can be stored in a server. So everyone can download the copy of the data, but the access policy which was satisfied by the user can decrypt it. Here different algorithms were used to generate keys, encrypt the data and decrypt the data. Dynamic integrity checking can be found and multiple secret sharing was used to ensure confidentiality and dependability. The main goals are confidentiality, dynamic integrity assurance and dependability. Two security issues were considered. Secure and dependable distributed data storage and fine-grained data access control. Confidentiality, integrity and dependability are the major requirements of data storage. Confidentiality is achieved by public key encryption, integrity is achieved by MAC (Message Authentication Code) schemes and dependability is achieved by error correcting codes. To achieve access control, SKC (Symmetric Key Cryptography) and PKC (Public Key Cryptography) were used. In SKC, each patient has to know all the authorized users and encrypt his own data with each user by pair wise key and it has several drawbacks. In PKC, attribute based encryption is used. CP-ABE is the variation of ABE. The data integrity schemes were based on the principle of algebraic signatures. Here the verification of data can be done without the need for original data. These schemes were secure and efficient against different types of attacks

HEALTH MONITORING USING WSN

Wireless Sensor Network (WSN) is also used for in-home patient monitoring. A distributed tele-monitoring system was proposed. It uses Services layers over Light Physical devices (SYLPH) model. It is a service oriented architecture model. The objective of this model was that resources to be distributed among multiple WSN and to execute over different wireless devices independently. Various networks from different wireless technologies can also be connected using this model. In Infrared (IR) sensor based system was used. IR based monitoring system was installed in house to collect motion values of the patient and different feature values like activity level, mobility level and non-response level. To differentiate normal and abnormal behaviors, Support Vector Data Description (SVDD) method was used. To classify the behavior patterns, behavior pattern classification algorithm was used here. The need for a PC was eliminated. The WSN was installed home. These nodes are then connected to the hospital sever through internet. Here number of sensors was used to collect only ECG signals. The ECG signals were first sampled and transmitted to the access point placed in patient's home. Then these signals were transmitted to the hospital through internet and analyzed to detect heart related diseases.

PATIENT MONITORING WITH THE HELP OF MOBILE PHONES

Mobile phone takes important role in patient monitoring to receive process and transmit patient details. Health Net mobile monitoring was proposed . BSN (Body Sensor Network) embedded in clothes, collect body parameters and communicates with patient's mobile phone. Sensors and central hub were embedded in patient's shirt. The vital signals were collected by the sensors and transmit them to the central hub. Central node then communicates with mobile phone through Bluetooth link. Here confidentiality was achieved by AES128 and authentication was achieved by SHA. A novel Wearable Mobility Monitoring System (WMMS) was introduced. This model was established based on smart phone approach. This system is easily wearable on patient's belt and it monitors patient's mobility and takes photograph during any change of state.

III PROPOSED SYSTEM

This proposed system describes a wireless M2M healthcare solution that uses Android mobile devices in a global network. The use of a global M2M network in healthcare applications promises to replace the use of traditional healthcare systems based on wireless sensor networks, providing ease of measurement, extension of network, accessibility, and reliability. The proposed system also promises to help improve the expansion of healthcare service coverage by providing efficient support for IPv6 over low-power wireless personal area network (6LoWPAN) and mobile technology in wide areas.

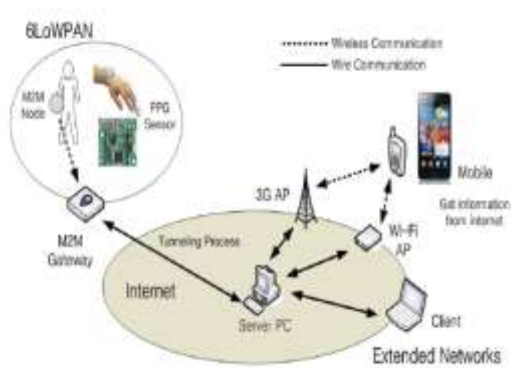

Figure 1 System architecture of a wireless M2M healthcare system

SYSTEM DESIGN

The System Design has person section, care section, and appliance section. The person section has the sensors for sensing the activity of the various parts of the person. The sensors which are used here are temperature sensor for picking the temperature details of the patient. The heart beat sensor for picking the heart beat rate of the patient.

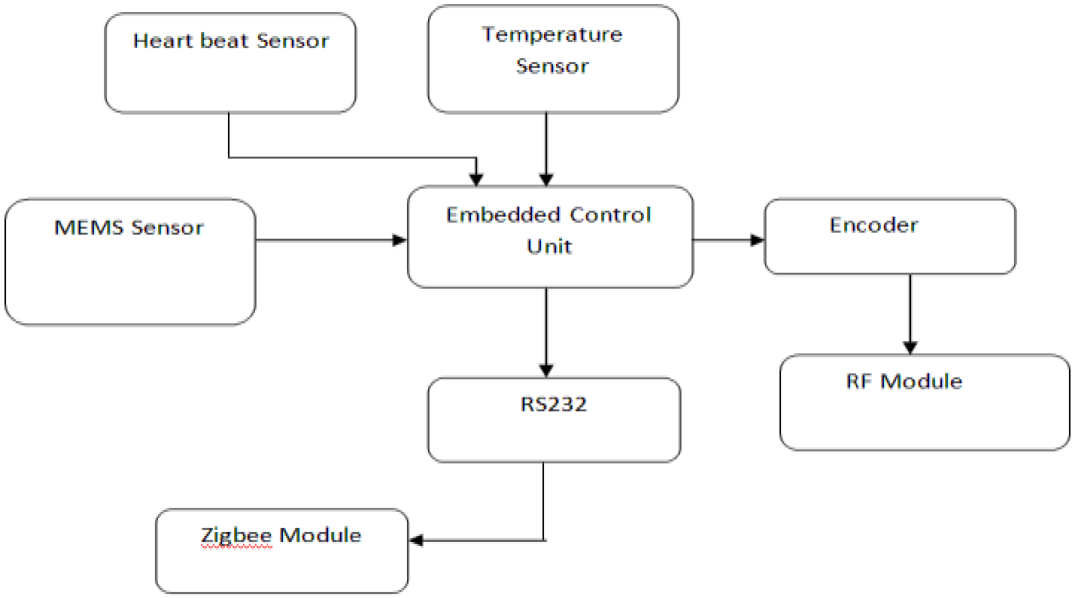

Figure 2 Proposed Architecture

M2M Devices

As the core hardware devices in the proposed system, the M2M devices are designed to measure and transmit the PPG signals in a wireless M2M healthcare system. The PPG sensor is designed to obtain the PPG waveforms and oxygen saturation data from a patient's finger by calculating the ratio of red and infrared light on the hardware surface, which depends on the absorption of both types of light. The PPG sensor contains an analog signal process, amplifiers, filters, and analog-to-digital converters (ADCs).

The filtered signals are gathered into the microcontroller of an M2M node through an UART port containing the sampled PPG signals at 75 Hz. The M2M nodes connected to the wearable sensors are placed on patient's body and are mainly responsible for collecting and transmitting the sampled signals at 75 Hz for the PPG signals to the M2M gateway. The M2M nodes connected to the wearable sensors are placed on the patient's body in order to collect health parameters such as ECG signals, PPG signals, and an oxygen saturation value and transmit the collected parameters to the server for monitoring and analysis. The M2M gateway is placed between an IPv6 over IEEE 802.15.4 network and an IP network.. A Tiny OS-based M2M node is allocated its own IP address by the M2M gateway over IPv6 packets. In particular, the 6LoWPAN protocol stack is implemented on top of the IEEE 802.15.4 layer in the M2M nodes for the transmission of packets according to a higher-level protocol, namely, the 6LoWPAN ad hoc on-demand distance vector routing protocol developed by the IETF group.

6LoWPAN

The 6LoWPAN is a new attempt at extending an IP based sensor network environment at different local coverage areas for healthcare applications with the IPv6 technique. Therefore, external hosts directly communicate with the M2M nodes because each M2M node is assigned a global IPv6 address, thereby supporting higher accessibility and epoch making network extension. The proposed system is made up of local gateways in different places with different IP addresses. First, the IPv6 address and the M2M gateway address must be defined at the M2M gateway and server for the IPv6 communication. As the IP network can be generally accessed by IPv4 addresses, the IPv6-to-IPv4 tunneling process, which changes the address format in the M2M gateway, is required for it to be possible to approach the server PC through the internet.

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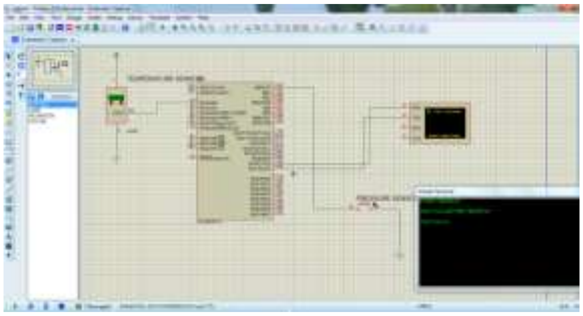
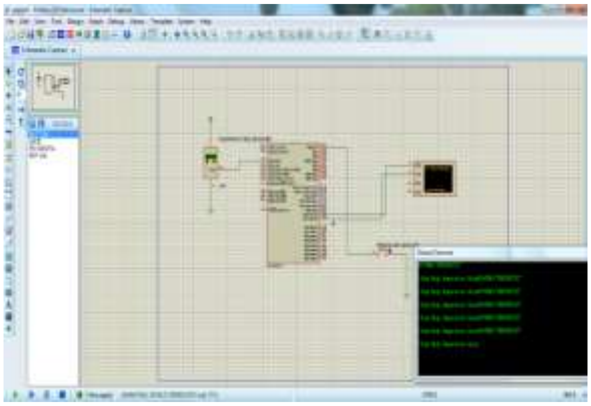
IV SIMULATION RESULTS





V CONCLUSION

A wireless M2M healthcare solution using the Android mobile devices is successfully implemented in a global network with the help of the IPv6 technique. The M2M devices are designed and used for the measurement of PPG signals and their transmission to a server PC through the IP-enabled internet, while the Android mobile device is used to provide a mobile healthcare service by means of an Android application running on a Samsung Galaxy S device with wireless internet access. By combining the 6LoWPAN and mobile communication

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