Unified Ubiquitous Healthcare System Architecture with Collaborative Model

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Abstract

Ubiquitous Healthcare is very promising technology now a days. With the advent of many medical technologies, the desire to meet the high expectations of customers is becoming the concern in medical world. Ubiquity is the answer to provide medical services anytime, anywhere. Thus, this paper discuss about the ubiquitous healthcare system. To design a successful ubiquitous healthcare system, we have to consider many aspects. This paper introduces unified ubiquitous healthcare system architecture with collaborative model. Here, we present the 3 components of the system and briefly explained each functions.

1. Introduction

Ubiquitous healthcare is an emerging technology that increases an efficiency, accuracy and availability of medical treatment. The purpose of ubiquitous healthcare is to provide convenient healthcare service to both caregivers and patients, and to make it easy to diagnose patient's health condition. People can monitor their health without visiting the hospital or clinic. Hospitals can provide patients with efficient medical services through computerized medical information and resources.

Ubiquitous Healthcare system means the environment that users can receive the medical treatment regardless of the location and time. As the quality of the life has been improved, we are more focusing on our health and people want to be treated with the arising trend of the Ubiquitous. With the advent of the new technology, the interest of the remote treatment has been increasing. So, Systems are developing that can check their health status and treat them in a distance in a real time. Now, we are asking more services that can detect patient's location and utilize this information. This system is the service which can help to detect the location of people or things through the portable-equipment based on wireless communication network. With this system we can process and manage data at the hospital or Emergency room in a distance by transferring bio-data such as ECG data and pulse data as well as the user's location information.

Ubiquitous healthcare systems will monitor patients as they maintain their normal everyday activities, in order to warn the patients or healthcare workers of problems as well as collecting data for trend analysis and medical research. The continuous monitoring of the health record would give a better diagnosis. The integration of wireless body sensor network is very important for timely monitoring.

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Ubiquitous Healthcare system is composed of interconnected systems that cater medical services anytime and anywhere. The system is composed of three which are called Mobile Medical System, Homecare Medical System and the Hospital based- Medical System. In this paper we introduced unified ubiquitous healthcare system architecture with collaborative model. This paper aims to simplify the implementation of the system.

2. Background

This section discusses the background of the study. The Medical Healthcare as Location Based Service and Wireless Healthcare System Support.

2.1. Medical Healthcare as Location Based Service

Location Based Service (LBS) is an information or service, accessible with mobile devices through the mobile network which make use of the ability of the mobile device to be track for getting the location information.

Location-based service is a service for seeking people or things location through mobile devices based on wireless communication network and uses the information. In this service environment, patients can freely move from insides such as home and office to outsides like roads.

In Ubiquitous Healthcare, Location based Service means a lot, considering the importance of mobile devices in many ways in u-healthcare implementation. LBS include services to identify a location of a person or object, such as discovering the nearest hospital, detecting the location of patient. LBS include parcel tracking and vehicle tracking services. LBS can include mobile sensor devices that transmit the result to the host hospital for record tracking and saving for future diagnosis. They all require that the provider of the Location-Based services have access to the location information of the subscriber and this information is fundamental to delivery of the Location-Based services. This requires the existence in the wireless network of a location-determining capability. In sum up, LBS is defined as application services and systems for providing and using additional information combined users' location information in moving and much different information in real-time with consideration of two important sides which are location movement and accessibility to information in the movement. LBS can be divided into Location Determination Technology, LBS server technology for management of location data and LBS application technology for providing service. Among these, the Location Determination Technology ensuring location accuracy and reliability must be prepared for LBS activation.

2.2 Wireless Healthcare System Support

There have been many propose wireless networks to carry out u-healthcare system. Among these are WMAN, 3G, 4G and WLAN. Wireless Networks is the main backbone of delivering ubiquitous services. It serves as the line of communication of the devices.

The gathered data is transmitted to the hospital and can be viewed by the physician. The physician can monitor the patient's condition and that allow her/him to give distance medication advice prior to the current condition of the patient. In emergency cases, the patient can be transfer to the nearest hospital for immediate treatment. While on their way to the hospital, the medics can give a proper treatment for the patient because the patient's healthcare data was timely transmitted to the hospital, and being monitored.

3. Medical Expert System

Expert systems are designed to solve complex problems by reasoning about knowledge, like an expert, and not by following the procedure. An Expert System is a computer system that emulates the decision-making ability of a human expert. Medical expert systems will begin to appear, however, as researchers in medical artificial intelligence continue to make progress in key areas such as knowledge acquisition, model-based reasoning and system integration for clinical environments. In medical application expert system is very important for decision making. Like for example in classifying who will be treated first, the treatment must be correct and expertly consulted and other considerations that need an expert analysis. Medical expert systems have evolved to provide physicians with both structured questions and structured responses within medical domains of specialized knowledge or experience. The structure is embodied in the program on the advice of one or more medical experts, who also suggest the optimal questions to consider, and provide the most accurate conclusions to be drawn from the answers the physician chooses.

4. Wearable Sensor Devices

There are types of wearable sensor devices; this can be in form of wrist watch type, shoulder type, chest type and necklace type. The wearable sensor device is used to get heartbeat rate, blood pressure and other kind of health status related monitoring signs.

There are several wearable sensor devices that can be used in ubiquitous healthcare especially in monitoring the health status of the patient while they are away from the hospital and even in the hospital. Body area networks, wireless body area network or body sensor network are terms used to describe the application of wearable computing devices. This will enable wireless communication between several miniaturized body sensor units and a single body central unit worn at the human body.

5. Unified and Collaborative U-Health System Model

Unified and Collaborative U-Health System Model is composed of interconnected systems that cater medical services anytime and anywhere. The system is composed of three which are called Mobile Medical System, Homecare Medical System and the Hospital based- Medical System. In order to implement the Ubiquitous Healthcare System we need to use a wireless networks and cloud server support.

5.1. Mobile Medical System

Mobile Medical System is the component of Ubiquitous healthcare System which operates on emergency cases. This is consisting of team who works for immediate and fast transfer of the patient. It supports location based service.

The Mobile medical System is the system that gives emergency or immediate medical services. The system is composed of Ambulance, patient monitoring and sensor networks, medical equipment, medical staff and the remote hospital. In this way the patient can be treated while on the way to the nearest hospital and by then can be transferred to Hospital for proper medication.

Figure 1. Mobile Medical System

5.2. Homecare Medical Systems

Homecare Medical system is the System for home based medical services. This team is assigned for medical treatment in house.

Homecare Medical System is medical system that is supports home patient or out patients. This is to give medical treatment and monitor their health status while they are home or outdoor.

Homecare Medical System is composed of Wireless body sensors, light medical equipment and Ubiquitous Medical Applications to transfer medical analysis to the Hospital based-Medical System for better diagnosis. In case of emergency and the patient need an immediate treatment, mobile medical unit can move the patient from home to the hospital. While in the ambulance, immediate treatment can be administered.

Figure 2. Homecare Medical System

5.3. Hospital based- Medical System

Hospital based- Medical System is the component which functions as the overall main system. It is composed of team works within the hospital building. This is where the database is located, and plays as a host System.

Hospital based- Medical System is the system used in hospitals. This is the main medical system where the Mobile Medical System and Homecare Medical System are connected for central medical diagnosis.
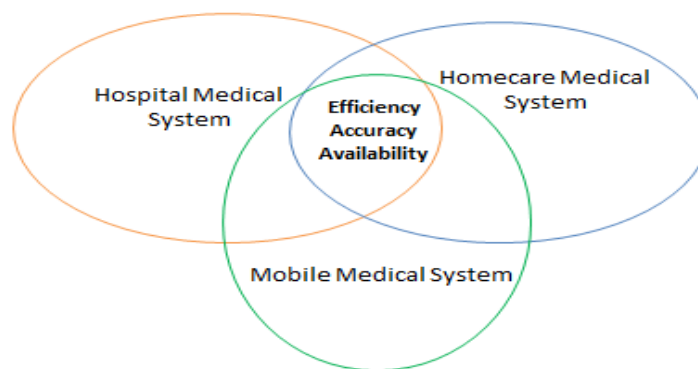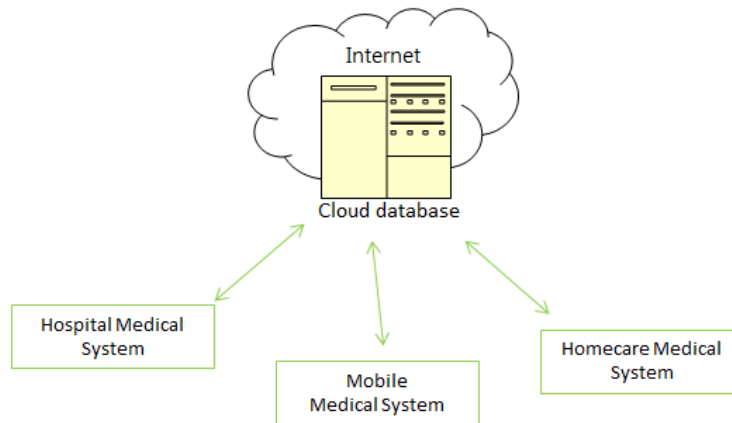

Figure 3. Hospital Medical System

Figure 4. Unified and Collaborative U-Health System Model

The three components must work collaboratively to ensure Availability, Flexibility and Easy information sharing.

Figure 5. Cloud database support

Database in the cloud will give advantage to provide fast data transmission wherever the location of the patients maybe. Each entity has shared data in the cloud with the support of wireless networks.

5. Conclusion

Ubiquitous Healthcare system is composed of interconnected systems that cater medical services anytime and anywhere. Ubiquitous healthcare aims to provide fast and efficient medical treatment anytime and anywhere. With the help of emerging technologies that support ubiquity, ubiquitous healthcare is possible. The system is composed of three which are called Mobile Medical System, Homecare Medical System and the Hospital based-Medical System. In this paper we introduced the unified ubiquitous healthcare system architecture with collaborative model. This paper aims to simplify the implementation of the system.

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