

Chapter 45

Virtual Telemedicine and Virtual Telehealth: A Natural Language Based Implementation to Address Time Constraint Problem

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ABSTRACT

Telemedicine is modern technology that is employed to provide low cost, high standard medical facilities to the people of remote areas. Store-and-Forward method of telemedicine suits more to the progressive countries like Pakistan as not only is it easy to set up but it also has a very cheap operating cost. However, the high response time taken by store & forward telemedicine becomes a critical factor in emergency cases, where each minute has a price. The response time factor can be overcome by using virtual telemedicine approach. In virtual telemedicine, a Clinical Decision Support System (CDSS) is deployed at rural station. The CDSS is intelligent enough to diagnose a patient's disease and prescribe proper medication. In case the CDSS cannot answer a query, the CDSS immediately sends an e-mail to a medical expert (doctor), and when the response is received, the CDSS knowledge-base is updated for future queries. In this chapter, the authors not only report a NL-based CDSS that can answer NL queries, but also present a complete architecture of a virtual telemedicine setup.

INTRODUCTION

In last few decades, the concept of e-Health has made easy to provide health facilities such as curative care and preventive care to the patients of remote areas such as rural areas (Kensaku,

2005). Two most common types of e-Health are telemedicine and telehealth. The telemedicine (Khalid, et al., 2008) has been emerged into one of the most pertinent applications of telecommunication and information technologies (Ackerman & Carft, 2002). Telemedicine has been proved to be an effective and efficient solution to provide curative care to patients in the remote areas, where

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medical experts are not available in physical. Similarly, telehealth has been come into sight as an expansion of telemedicine as telehealth also provides the preventive care besides the curative care (Berner, 2007). In telehealth, patient's data is sent to the physicians or medical experts for diagnosis and medical prescription. Following are the details of both the technologies.

Telemedicine

In current times, one of the most developing applications in the field of clinical medicine is telemedicine (Puskin, et al., 2006). In the telemedicine, the modern technologies such as telecommunication & information technology are employed (Puskin, 1995) to deliver clinical care at remote areas where advanced health facilities like hospitals are not available (Perednia, 1995). With the help of telemedicine, the improved medical facilities are made available to the people of remote areas at low cost (Kensaku, 2005). The key attribute of the telemedicine based healthcare is easier and cost-effective solution for medical consultation as patient's medical information is transmitted through telephone, internet or satellite and a medical specialist can examine the patient's report, diagnose the diseases and prescribe medication (Ackerman & Carft, 2002).

Telehealth

In contrast with telemedicine, telehealth provides both curative and preventive care facilities. The real concept involved in telehealth is the providence of health care facilities to the people of remote areas (Puskin, et al., 2006). The successful application of telehealth in developed countries such as USA, UK, China, etc the telehealth technology has been proved to be an easier and cost-effective solution for medical consultation. Using telehealth technology, a physician communicates with the patient using modern technologies such as e-mail and voice-chat, and video conferencing (Berner, 2007).

As telehealth has been used successfully in developed countries, telehealth can be a possible solution in Pakistan to provide better medical facilities in remote areas. Real-time telehealth is not feasible in Pakistan due to its high cost. However, the store and forward method based telehealth can be a cost-effect solution. In (Ackerman & Carft, 2002) a major problem with store-and-forward method is highlighted that time-factor can be very high in certain cases. To address this issue a concept of virtual telemedicine is proposed in (Bajwa, 2010) and an improved framework is presented in (Kensaku, 2005). Typically, telemedicine and telehealth basically work in two different ways:

Store-and-Forward Method

This is simple and cheapest way of using telehealth technology (Khalid, et al., 2008). In store-and-forward method of telehealth, a physician communicates with a patient using e-mail or fax facilities (Houston, 1999). A patient's medical report containing various bio-signals such as blood pressure, body temperature, weight, pulse rate, blood sugar level, etc are sent to the physician for diagnosis (Rashid, 2003). The physician may also ask for additional reports such as blood test, urine test, X-Rays, etc. All the patient reports are sent to the physician in the form of medical images (see Figure 1).

However, a problem with store-and-forward clinical method is the time factor involved that is typically from 1 minute to 48 hours (Perednia, 1995), depending upon the availability of the physician. The situation may become more verse if patient is in serious condition and requires immediate medication.

Real Time Method

In this method of telemedicine and telehealth, doctors monitor patient remotely using various modern technologies such as video conferencing (Ackerman & Carft, 2002). In the real time

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