Telemedicine Enlightenment: A Smart Health Care System for Rural Areas

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ABSTRACT

Telemedicine is a widely used technology and by taking its advantage, we designed a system for those patients who are unable to reach hospitals due to improper resources. The aimed paper is using wireless sensor networks to achieve the task. This intelligent server can use any topology such as star, ring etc in we preferred start topology considering the ease it provides.

Keywords: Telemedicine, Wireless switch, Server, Wireless sensor Network and a Mobile Doctor.

1. INTRODUCTION

Telemedicine is combination of two word “tele” and “medicine.” It’s a rapidly developing field where medical information can be discussed via phones or internet. Rural areas can’t afford faraway treatment therefore remote medical procedures or examinations can be achieved by telemedicine. A simple two way communication between professionals via telephone or using satellite technology or using video-conferencing to interact with patients and expert doctors are all under the umbrella of telemedicine. The designed system deals with the analysis of a telemedicine system and has many advantages especially in developing countries where sufficient facilities are not given in rural areas and usually city hospitals can’t accommodate a large number of patients from these areas [1].

2. WHY TELEMEDICINE

Usually specialists do not prefer to visit rural areas of Pakistan because they are not up to the mark due to incapability’s or lack of equipment. People in rural areas have no other choice but to reach city hospital even for minor care; they do not the facilities to go for the specialist and even die before reaching at city hospital. Developments in information and communication field help these people to get solutions more at that their door step. By using healthcare via different communication technologies like audio, visual and data, patients can get health care delivery, consultation, diagnosis, and treatment of their cause, and can also get awareness in particular field and medical data transfer. At this moment, there are many projects being developed by using switching systems with a high speed computer networks including optical fiber, and cell phones using satellites to facilitate such people.

3. BENEFITS OF TELEMEDICINE IN PAKISTAN

A healthcare system is not only useful for patients in remote site but also helpful for doctors or specialist to interact with people in all over world for their practice more efficiently. People in remote sites may get help quickly to diagnose their disease independently and can also save their money and time with data security due to secure communication network.

4. PROBLEMS FACED BY PEOPLE IN RURAL AREAS

Pakistan Perspective: In all bad environment and situations, Pakistan is doing its efforts for the war on terror and people of the country faced many challenges and even died in this war in bomb blasts. Health care system is a necessity for developing countries like for Pakistan. Currently, in Pakistan seventy five percent of population lives in rural areas where road and transport facilities are limited, shortage of doctors in rural areas, specialists are not interested to go in remote areas due to poor infrastructure, patients being carried on their own way to reach the city hospital for an immediate health care or diagnoses which could have easily been cured at their place provided medical consultations are available. Most cities of Pakistan facilitate telecommunications links, more than 1800 cities of Pakistan have access to 531,787 broadband connections and 400 cities are on Fiber Optic, giving possibility to access universal health information. Implementation of the system initially is not up to the mark but it will also provide solutions usually in emergency situations. This research is intended towards the people living in the rural areas of Pakistan [1].

5. TELECOMMUNICATIONS LINK

Another tool of healthcare is the link of communications like an electronic connection that links new technologies, telecommunications link which contains POTS (the plain old telephone system), digital telephone connections like ISDN (Integrated Service Digital Networks) and devoted digital networks such as ATM (Asynchronous Transfer Mode) and Frame Relay, optical fiber and coaxial cable, radar system using microwaves, LEO (Low Earth Orbit) and...
Geosynchronous satellites, the VPN (virtual private networks) and Internet, each of the telecommunication link have their own task and helping to develop a secure connection between patients and consultations all over the country, depending upon the infrastructure and by using a given bandwidth, because all links are not available of that particular area. As an example; at sea, ships will access through radio waves not a landline connection. The best communication link is the one which will provide the consultations quickly supported by the best communication links.

6. SYSTEM STRUCTURE

System structure of a general tele-healthcare system is shown in the figure 1 given as under:

![Figure 1: General block diagram](image)

7. A TELEMEDICINE SYSTEM

Proposed tele-healthcare system is made of five components:

7.1 Patient Monitoring

Input unit monitors the patient with the help of different electrodes connected to the patient via infrared sensors. Various medical devices like otoscopes and stethoscopes thermometer are used in this regard. ECG and EMG machines are used for continuously monitoring through a digital camera that can be attached to high speed network computers, aiding with an interactive intensive care patient’s examination through store and forward technology. Digital camera store information of all about the patient and forwarded it through the computer from one location to another.

7.2 Wireless Switches

Wireless switches connect the link between patient’s monitoring units to the consulting unit. Wireless devices are the switches or integrated into a blade of an undertaken class switch, useful for control the management of Wireless large area network points of access. Their deployment is a comparatively new phenomenon seen and such control functions existed before in WLAN controller devices.

![Figure 3: WS2000 wireless Switch](image)

Wireless switches connect to WLAN APs (access points) through a switch port. Also connect to the other patient’s monitoring network through other ports of that switch. These switches are the gateway to the wired network, all information in form of frames from Wireless LAN clients have to pass through the Wireless LAN switches to the healthcare network. One of the high performance Wireless Switches like WS2000 switch small to medium business solution is available at the market now a day by using internet between the two units.

![Figure 2: Patient monitoring unit](image)
The threats found by using internet, WS2000 switch fix by SPI (Stateful Packet Inspection) and NAT (Network Address Translation) will hide the healthcare network with other networks. SPI will check precisely the packets coming from network thoroughly.

By default, SW2000 wireless switches support DHCP server to provide the IP address to the wired and wireless clients on the given network and manage or control anywhere in the world.

7.3 Server

It is simply a program that runs on a machine, providing specific and a particular service to other machines called clients request to do the specific tasks, connected to the machine found.

Recently for the years, functionality of server has become so rich and complex varied in nature that there are very powerful and high speed computers dedicated to exclusively servers.

7.4 Wireless Sensor Network

Wireless network connections are even more reliable network for patients monitoring equipment by asking questions in everyday morning by putting in contact with nurses if they detect any sign of emergency. Patient push the button on a key pad that will alert the controller to switch on the specialist for consultations. Several equipment’s are present for monitoring the patients 24 hours in a day. There is a continuous monitoring through digital camera if they will find any false alarm [2].

7.5 Priority center/Controller

Controller set the priority for the clients that are connected through wireless switch. The system require diagnostic-quality video, noise less audio, and medical image handling and encryption/compression to support applications interactively.

Server has a capability of storage and management of email messages, providing services to email users who can read, retrieve, and manage these emails messages.
connections more bits are required, to adjust or to match limited data rates both audio and video compression rates can be adjusted up and down. This can be achieved by the above mentioned standards. The acquisition, compression, processing, and the communication interface tightly integrated to provide the system efficiency [2].

7.6 Doctor

The important unit that can provide the facility of medical consultations is the “Doctor’s unit”. Controller get the priority through the priority center and data from the client or patient’s monitoring unit and connect that particular client to the specialist (depend upon the patient). This unit consists of high speed computer network equipped with a modem for displaying incoming bio signals from patient’s monitoring unit [3].

User has full control of the telehealth care session in doctors care unit. The doctor can monitor the connection with the client which is called patient’s monitoring unit and send commands to the client in form of various signals such as bio signals or images. Unit connected on the network can be ICU or distance mobile tele healthcare units connected through phone lines.

8. APPLICATIONS:

The proposed system can be used in any area which is away from city area. People who need emergency cure and can’t reach the hospitals in time can take benefit from this.

9. CONCLUSION

The proposed system is designed for rural areas where patients can’t reach. Patients can access the doctor any time independent of wherever they are. Using wireless technology online help from the doctor can be availed.
10. LITERATURE CITED

We had a research on some rural areas where we observed that most of the people were facing a lot of problems for reaching the doctors. Included areas are Mithi at tharparkar, Northern areas of Pakistan and many areas of the world away at countryside. Literature surveyed included:

i). Roots of violation of women/children’s rights in rural areas of Pakistan by Dr. Tahira S. Khan (Gender Studies Researcher/Consultant) published at International Conference on the Human Rights of Women and children in Pakistan Lahore, 17 November 2005 Alhamra Cultural Centre Rural development in Pakistan


iv). Pakistan: Now the Poverty Bomb goes off, M, Ziauddin, and Third World Network


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REFERENCES


