An Advanced Patient Health Monitoring System

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Abstract- Health and wellness worry all of us as it has an essential role in our lives and dramatically impacts our society. Distribution of health care is a vast, complicated issue, especially for those living in small countries and specialists' lack of healthcare. This work aims to produce a home monitoring system that focuses on a patient and satisfies customers' specific demands, which relocate medical care out of the healthcare facility right into the house. It develops a reliable administration of care, decreasing cost as well as conserving lives. Our model used several biomedical sensing units to obtain vital patient indications as blood pressure, heart rate, ECG, glucometer, airflow, and body temperature level. These observed data is the key to utilizing the patient's information and understanding to improve health care using the supported user interfaces in the introduced mobile application. We designed a cost-effective, secure, low-cost, and safe module throughout the design procedure (expense, timelines, sources).

Keywords- Biomedical Systems, Arduino, E-health Shield, Android Applications.

1. INTRODUCTION

Medical care is among the most integral parts of life with individuals. For a society, health care significantly influences social productivity and economic competitiveness. A healthcare system is essential to the future success of our country. Technology has influenced nearly every business in some impactful way, from altering how people connect and take a trip to forming how populations obtain healthcare treatment. Technological breakthroughs have paved the way for a more productive and reliable world. In the healthcare field, innovation regularly makes its method into healthcare facilities, physicians' offices, and clinical research studies. On the outside, the industry is transforming to be extra personalized for patients; clinical centers have counted on electronic. This task is to add to the custom remote patient tracking system to reduce expense while providing outstanding medical care services [1-4]. The main functions are carrying out the noticing part, which is generally reviewing the essential body criteria using sensing units, then the interaction part, the interface, and sending out the information to a much more streamlined database and website using the main interface employing different communication technologies offered. Thus, an ideal device with a reduced price will be introduced.

Generally, our main problems are [5]:
1) The high price of medical care.
2) Rising demand for performance as well as cost-effectiveness of E-Health applications and also modern technologies.
3) Lack of medical professionals in backwoods
4) Lack of healthcare in the rural area.
5) Poor wellness proficiency
6) Individuals in rural areas are much more have to travel far away to access healthcare services.

Hence, the main objectives of the proposed system are:
1) Assist in saving lives with remote appointments, whether immediate or diagnostic.
2) Enable much more enlightened decision making.
3) Develop more efficient, convenient, and also low-cost shipment of care.
4) Help with previously as well as a lot more precise medical diagnosis.
5) Provide higher and quicker access to a person's case history, lowering the risk of negative medicine interactions or inadequate action to a training course of therapy.
6) Allow country citizens to obtain professional diagnosis and treatment from remote clinical facilities.
7) Improve the timeliness of treatment and also lowers transfer prices.

2. AN OVERVIEW OF THE PROPOSED SYSTEM

Interest in mobile monitoring technologies and electronic medical records is blowing up as medical facilities. Moreover, clinics make every effort to offer physicians and caretakers advanced accessibility to clinical info. Diagnosis, as well as treatment, are increasingly dependent on keeping an eye on the information. The proposed system is based on sensors, such as shown in Figure 1. In extra, the E-
Health platform sensors set that transfer information to keep an eye on tools of the healthcare facility IT framework. High blood pressure, Electrocardiograph (ECG), heart-rate as well as body temperature are becoming long-term surveillance sensors for medical diagnosis and treatment, and a cord attaches sensors to a trip that connects sensing units as well as displays by cordless links. Wireless technologies will give a lot more freedom and also a movement to the people. The advantage to the patient's convenience is evident, especially for long-term surveillance.

![Diagram](image1)

**Figure 1: The introduced sensor network**

As medical care vacates the medical facility and into the home, trusted innovation for keeping an eye on a person's wellness is required. Vital signs of screens offer essential fundamental information concerning a person's health. Regrettably, most of the strong characters keeping track of the systems provided today are very costly as well as inaccessible [6-8]. The majority are designed for medical facility use and have complicated user interfaces that do not blend well with the house setting. A lot more gadgets are needed that are developed especially for house use by individuals, their households, and caretakers. The introduced home indicators checking system (U-Care) should fulfill the need for an accessible, comfortable, and easy to use for every age and ability. Several existing modern technologies should be united and incorporated into a single operating device, as in Figure 2. A quick prototyping module is a group of methods to rapidly fabricate a range model of a physical part or assembly using three-dimensional CAD information. Construction of the component or assembly is usually done using a CNC router, Laser Cutter, or 3D printing. The properties of the material will undoubtedly determine its suitability for a design. For our work, we have selected to work with acrylic. Nevertheless, there are various sorts of materials that can be used. Polymer construction is the technique of developing a piece of resilient plastic into a thing. There are many advantages of Polymer fabrication: lightweight, heavyweight in performance, affordable, a laser cutter can be used with it, and with a little heat, it is easy to shape and mold.

![Diagram](image2)

**Figure 2: The main hardware design of the proposed system**
In our system, the users (people, Medical professionals, healthcare providers) can communicate with the system utilizing two types of interface. The first is the mobile user interface; it is an android application that checks the customer’s essential indicators dimension from the biomedical sensing units. The second is an internet user interface where the measurements can be stored on a database as well as the medical professionals or health care service providers can check it and also assess the medical history of the individual; likewise, individual can by hand enter his measurements as well as watch his medical history. The android application is attached to the E-Health system utilizing Bluetooth device developed for transparent wireless serial connection which sends the measurements from the biomedical sensors to the user mobile where the user can monitor his dimensions using his android mobile. The application is very basic; the application shows the info the nodes are sending out, consisting of the sensing unit data collected, as shown in Figure 3.

![Figure 3: The main Interfaces of the proposed software application.](image-url)
3. THE HARDWARE SECTION THE PROPOSED SYSTEM

The primary steps of developing the hardware area are: (a) cutting and shaping the acrylic sheet making use of the laser cutter, (b) fabrication - the setting up of the parts utilizing screws, bolts, adhesives, solder, etc. and also (c) including the circuit cards and the connectors of the biomedical sensors. For more accuracy, the E-Health Sensing unit Platform was utilized close to the standard sensors. It includes different sensors allowing determining many of the body’s crucial signs: pulse, oxygenation level, temperature, high blood pressure, as shown in Figure 4. These sensing units can be attached to the Arduino UNO R3 board [9]; Figure 5. The e-Health Sensing unit [10] Guard permits Arduino to make biometric and medical applications where body monitoring is required by utilizing various sensors: pulse, oxygen in the blood (SPO2), airflow, body temperature level, electrocardiogram (ECG); this info can be used to monitor in real-time the state of an individual or to collect delicate data to be ultimately examined for medical diagnosis. Biometric information collected can be wirelessly sent out using any of the connection options available.

Figure 4: The E-Health shield.

Figure 4: The Arduino UNO R3 board.

4. THE GRAPHICAL USER INTERFACE OF THE SUPPORTED APPLICATION

As we stated, this system is designed for two kinds of users as well as they are the following: Users; They are the ones that the system will undoubtedly be checking and checking out vital specifications from after that occupies the analysis right into the primary data source. The android application is attached to the E-Health system making use of a Bluetooth tool developed for transparent cordless serial connection which transfers the dimensions from the biomedical sensing units to the customer mobile where the user can monitor his sizes using his android mobile [11-13]. Making use of the application is really basic; the App reveals the info the nodes are sending, including the sensing unit information collected. We are also aiming to execute a registering system along with a visit system so that clients reach visit and sight or query their documents with restricted access and opportunities[14-18]. Doctors: They are the ones that
will be suggesting as well as speaking with individuals based on their information saved on the database. Samples of screen shots are shown in Figures (6-8).

Figure 6: The layout of the patient readings and his medical history.
5. CONCLUSIONS AND FUTURE WORK

We have chosen biomedical sensors that determine important indicators that cover many common diseases, diagonals, and healthcare troubles for that objective. As accuracy plays a crucial element, we have included the E-Health platform sensors to accomplish that job. Moreover, for linking and regulating the biomedical sensors, the Arduino board was used because it simplified the quantity of hardware and software advancement. The Arduino system offers many collections that let us get our system running. To connect the Arduino to the interface, Bluetooth is utilized to transfer data from the Arduino to the android mobile application rather than Wi-Fi, Zigbee, GPRS, or 3G innovation transfers the data in an approved distance array as well as easy to use with any android mobile. The mobile transmits the day to a database utilized to store the day and monitor it on a website where physicians and doctors can watch it. Likewise, the customer could see his readings background and hand enter brand-new tasks, and obtain clinical recommendations. For the mechanical style, we have selected a simple model layout that suitable for everyone to utilize. It is easy to use, lightweight, can be used at any location with any smartphone, affordable, and also satisfy the system requirements. System interaction with the customer can be developed by adding image recognition and smart acknowledgment of the commands in Speech, which provides great benefits to different ages of people which match their special needs. The ability to assess the body’s essential indicators will make it able to immediately predict medically feasible dangers that may conserve lives.

REFERENCES


