RESEARCH ARTICLE   OPEN ACCESS

SMART HEALTHCARE MONITORING SYSTEM

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Rationale and Gap Analysis – In order to be used for long-term monitoring purposes, health monitoring systems need to satisfy certain medical and ergonomic requirements. For example, the system needs to be comfortable; the components should be flexible, small in dimensions and must be nontoxic, hypo-allergenic to the human body. Smart and cost effective health-care has been in increasing demand to meet the needs of growing human population and medical expenses. It is a known fact that country like India has become heart disease capital of the world. There is an urgent need to develop an effective health monitoring system that can detect abnormalities of health conditions in time and make diagnoses according to the gleaned data. A pulse oximeter is a tiny device that usually slides over your fingertip and uses infrared light refraction to measure how well oxygen is binding to your red blood cells. Oximeters report blood oxygen levels via an oxygen saturation measurement called peripheral capillary oxygen saturation, or SpO2. The easiest method of measuring temperature is directly on the skin. The MLX90614 temperature sensor can be used to measure the external temperature. This data will send to cloud system. ECG monitoring is a widely studied and applied approach to diagnose heart diseases. However, existing portable wireless ECG monitoring systems cannot work without a mobile application, which is responsible for data collection and passing on the messages to doctors. Recent advances in mobile technology and cloud computing have inspired numerous designs of cloud-based health care services and devices. Within the cloud system, medical data can be collected and transmitted automatically to medical professionals from anywhere and feedback can be returned to patients through the network. In this paper, we propose a new method for ECG monitoring based on (Ubidots) Internet of Things (IoT) platform. ECG data are gathered using a wearable monitoring node and are transmitted Vision-based approaches are based on visual sensors, such as video cameras for movement and gesture recognition, while sensor-based approaches use a wide range of emerging sensors

directly to the IoT cloud using Wi-Fi. Internet of Things utilizes open source protocols like MQTT, TLS/TCP for data communication and device management.

Objectives:

1. Build a consumer-focused integrated primary health care system
2. Improve access and reduce inequity
3. Increase the focus on health promotion and prevention, screening and early intervention
4. Improve quality, safety, performance and accountability

Hypothesis:

1. The data of all the parameter is analyzed.
2. Specialist based on the system will collect prescriptions and send the message to the patient via cloud communication platform.

Preliminary Work / Survey

Sensors connected to Node MCU will collect the real time ECG Signals, temperature, values of oxygen saturation from human being Store the data in cloud server Specialist based on the System will collect prescription along with the real time ECG Signals, Temperature, values of oxygen saturation from the cloud and sends the message to the patient via cloud communication platform. Sensor data can have di erent formats, such as numerical, categorical, graphics, video, etc. Based on these formats and sensor types, health monitoring can be classified into two approaches: vision-based and sensor-based approaches. The

and technologies for health and biomedical monitoring. The collection of data can be categorised into two categories depending on how the system gathers data, either directly or

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indirectly. Direct methods acquire data from hardware and sensors attached locally without intermediaries. These sensors capture information constantly and, in most instances, relay data wirelessly using numerous communication protocols to a home server or a coordinator. Indirect methods refer to data acquisition using a middleware-based infrastructure where the system collects sensor data from additional software or hardware sources. In order to achieve a pervasive healthcare system for independent living, a context-aware monitoring system should be able to observe, interpret and reason regarding the subject's conditions including behavioral, physiological, and environmental information. In a smart home environment, the system should be able to perform actions and provide feedback to the subject according to the results of its reasoning process. **Ubidots** is an IoT Platform empowering innovators and industries to prototype and scale IoT projects to production. **Use** the **Ubidots** platform to send data to the cloud from any Internet-enabled device Work thoroughly observed during this project is mention below

1) **Proper selection of sensors**
2) **No connection issue faced and proper calibration**
3) **Data of all the parameters is analyze by node MCU**
4) **Wireless transmission of data**

Expected Outcome

These rules for diagnosis can be summarized by considering all the combinations of membership functions of the body temperature and the pulse rate as given below
If the pulse rate and body temperature are (Low & Low) OR (Low & High) OR (High & Low) OR (High & High) Then the patient has to immediately go for a detailed Health Checkup.
• If the pulse rate and body temperature are (Low & normal) OR (High & Normal), then the patient is considered to be unwell.
• If the pulse rate and body temperature are (Normal & Low) then the patient is considered to be in a hypothermia state.
• If the pulse rate and body temperature are (Normal & High) then the patient is considered to behaving fever.
• If the pulse rate and body temperature are (Normal & Normal) then the patient is considered to be healthy
The **electrodes** are connected to an **ECG** machine by lead wires. The electrical activity of the heart is then measured, interpreted, and printed out. No electricity is sent into the body. Natural electrical impulses coordinate contractions of the different parts of the heart to keep blood flowing the way it should.


Benefits to the society
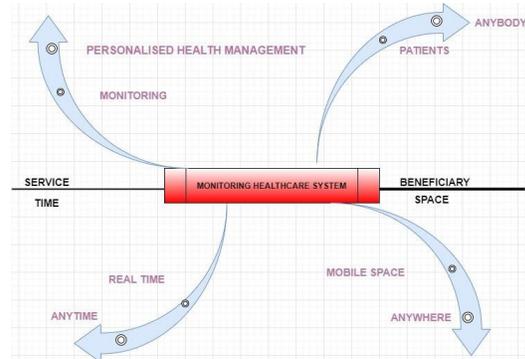
Primary care is the first point of contact with health services and provides a point of entry for the entire health system. Research has shown that access to primary health services is linked to better health outcomes, including improvements in self-rated health and a reduction in all-cause mortality. Primary care helps to increase access to health services, which is particularly important for isolated or deprived population groups that may not have the means to access these services otherwise. As the main port of entry into the healthcare system, primary care providers are available to help individuals to understand and discuss their health and any particular problems that they may be experiencing. In case of need, a referral can be made for more specialized care. There has been significant research comparing the quality of specialty and general practices. Primary health care implemented in a timely and helpful manner can also reduce the need for specialist care, which may be unnecessary and have the potential to harm patients. When primary health practitioners are able to encourage preventative measures or make early interventions, referral to a specialist for disease-specific care can often be avoided, thus reducing the risks associated with treatment. Pulse oximeters are useful for people who have conditions that affect oxygen saturation. For example, a sleep specialist might recommend a pulse oximeter to monitor the nighttime oxygen saturation level of someone with suspected sleep apnea or severe snoring.
ECG can help to detect
1) Arrhythmias – where the heart beats too slowly, too quickly, or irregularly.
2) Coronary heart disease – where the heart's blood supply is blocked or interrupted by a build-up of fatty substances.
3) Heart attacks – where the supply of blood to the heart is suddenly blocked.

Deploying sensors and sensing technology has multiple benefits, including predictive and preventive maintenance. They not only ensure that measurement data is transmitted faster, but also increase accuracy, thereby improving process control, and enhancing asset health. A new breed of sensors are capable of wired and wireless transmission, providing a real-time, continuous data feed from assets and processes. This empowers executives with a more holistic view of a process plant. Businesses that leverage sensors are more connected, secure, and agile than ever before. This will also help to overcome the shortage of doctor, improve medical advance, execute patient treatment in low fees and enhance medical care
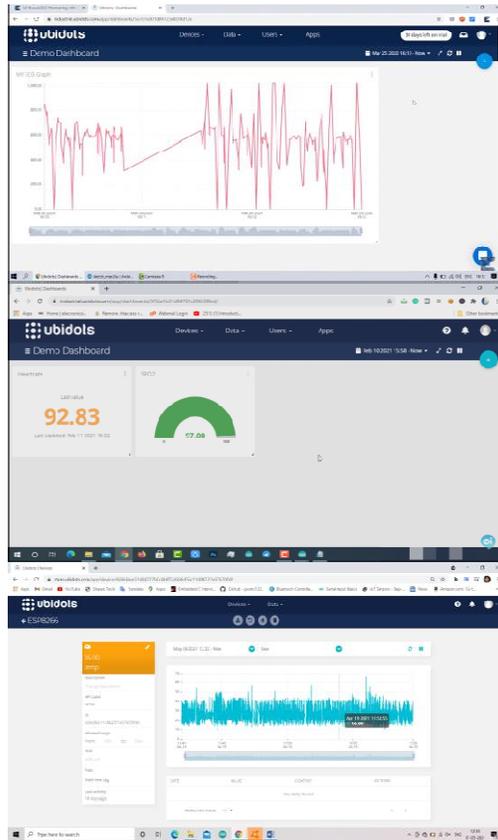
Cost Benefit Analysis

Cost benefit analysis compares cost and benefits of an intervention. The purpose of cost analysis is to determine if the project is worthwhile financially. The total costing which we are sparing for this project is 6-7k

Future Scope

As we know the things are changing with speed of technology. Advanced healthcare facilities, healthcare mobile application and all the new concepts of IoT are tuning the whole face of healthcare domain. It will help the doctor to monitor the patient health easily. The effective diagnosis and almost accurate care can be given. There have been number of exciting advance in recent years, which point to a fruitful future.

Analysis and Limitation

Intensive research was devoted to improve the efficiency of processing and analysis of ECG signals to achieve high diagnostic accuracy. During the processing phase, advanced information technologies are carried out through the development of diverse algorithms and intelligent techniques, such as analysis, modification, and synthesis applied to ECG signals to recognize and identify its significant components, with the purpose of discovering diagnostic information. These include, but are not limited to signal quality assessment, ECG signal classification, heartbeat detection and delay correction, peak detection, and training. Processing ECG signals is challenging due to their special characteristics, such as dynamicity, noise vulnerability, and inconsistency among individuals. Therefore, the optimization and development of ECG signal processing techniques has attracted research interest. A multitude of devices are being used nowadays for ECG monitoring systems. They are classified into mobile-based, wearable-based, and sensor-based devices. Mobile-based devices for ECG monitoring involve a wide range of devices, including, for instance, smartphones, smart watches, and pocket ECG monitors. Evaluated the effectiveness of using a smartphone-based ECG monitoring device on the frequency of clinic visits of patients who experienced ablation of AF. This study proved that the use of smartphone-based ECG monitoring led to a significant reduction in patient visits to the clinic after the surgical intervention. Likewise, a mobile device was integrated with an Arduino microcontroller and various sensors, including an ECG sensor, to retrieve sensory data and display vital sign measurements and send notification messages and the user's location to the healthcare provider if any abnormality was discovered. Another piece of work reported in [32] combined an Arduino microcontroller with an Android-based smartphone to develop an intelligent healthcare system and provide elderly patients with medical services at home. The system integrates an artificial bee colony (ABC) algorithm for ECG R-peak detection. It is able to detect various abnormalities, such as high blood pressure, low blood pressure, fever, tachycardia and bradycardia; it also sends notifications in case of unexpected events

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