Utilizing Arduino and Sensors to Secure and Screen Human Prosperity

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Abstract
Devices that are linked to the internet and used to support basic necessities, health, and the environment are part of the Internet of Things (IoT). The capabilities and storage capacity of cloud computing and the Internet of Things are both at their greatest potential thanks to these technologies. Healthcare technology is quickly evolving, allowing individuals to live better lives via the use of linked gadgets such as smartphones, computers, and wearable devices. The electrocardiogram, or ECG, is a critical tool for keeping tabs on a patient's pulse and activity in the heart. This study presents a concept for a low-cost ECG patient monitoring system that may be used at home by patients or family members without the assistance of a physician. Because Arduino is used as an interface card rather than expensive NI DAQ cards, the price is lower.

Introduction
There are still some businesses that use paper medical records and handwritten notes to make choices in the early stages. Using smart gadgets to make their jobs simpler and safer is a natural next step for the medical industry as we enter the next age of medical care. Combining cloud computing with Internet of Things (IoT) is critical in the medical profession. Billions of smart gadgets such as smartphones, tablets, laptops, desktops and wearables are linked together through the Internet of Things (IoT). Cloud and Internet of Things (IoT) technology in healthcare may cut expenses and improve patient outcomes by monitoring, diagnosing, and treating their health. Everybody nowadays uses the internet to exchange material, obtain information, and utilize social media for talking and playing online games. The IoT devices' data is very important to cloud computing. Patients' health status may be monitored and stored in the cloud using IoT healthcare apps.According to a research by the World Health Organization (WHO), chronic illnesses, lung diseases, cancer, high blood pressure, heart failure and high glucose account for 63% of all worldwide fatalities.

[2]. The number of businesses that provide these devices and services to detect falls has expanded dramatically in recent years. Sensors worn around the waist or neck have accelerometers that can discern the difference between normal activity and a true fall. These buildings have already begun to enhance the quality of life for many persons who are physically disabled or elderly and live on their own.

Humanity faces several global concerns, one of which is health [1]. Human beings have a basic right to the greatest possible degree of health that may be achieved [2]. Having a healthy population leads to a rise in GDP

and tax revenues since healthy people are more likely to be financially secure throughout their lives. Additionally, a healthy population reduces strain on already overworked health care facilities.This reduces the burden on these institutions. Individuals must have access to a contemporary healthcare system in order to maintain their health As the world's population ages, so do the healthcare issues that accompany it. Around 761 million people will be 65 or older by 2025, which is twice as many as predicted in 1990. [3] The leading cause of mortality in the world is coronary heart disease, which kills 7.2 million people each year. Aiming to improve the quality of life for those with debilitating conditions like Alzheimer's and heart disease, healthcare practitioners are developing smart, low-cost pervasive systems.

[5-6] A modernized health care system should deliver improved healthcare services to consumers. Traditional methods are being replaced by more contemporary, patient-centered ones in the healthcare industry. The conventional strategy relies heavily on healthcare personnel [7]. They must go to the patients to perform the diagnostic procedures and provide the required guidance. Using this method has two major drawbacks: Two things are necessary: first, the patient must always have access to healthcare specialists on site, and second, the patient must be admitted to a hospital and hooked up to biological devices at their bedside for an extended length of time[8-10].

Design Objective

Healthcare monitoring systems have attracted significant attention from both academics and corporations. Even after patients were out of the hospital, physicians were able to monitor their progress thanks to this method. ECG waveforms of patients who are being monitored should be shown on a monitor or PC in real time, if possible. LabVIEW virtual instruments will show the correct ECG waveform on computer or laptop screens to monitor a patient's heartbeat. An ECG instrumentation system will be used. As a result, you may design an accurate data gathering system using an Arduino microcontroller and LabVIEW.

I. Related work

An intelligent and personalized healthcare platform for patients has been developed by [1]. This technology aims to provide remote patient monitoring and treatment. The semantic web and cloud storage of SM-flexible IoT make it feasible to collect data from a variety of sources, consolidate them, and present them in a way that is both user-friendly and sensitive to privacy concerns. Their presentation included a survey and a proposal for health care services [2]. The Internet of Things (IoT) was examined as a possible source of value and innovation. Sensors linked to Raspberry Pis and the Internet of Things (IoT) may be used to monitor patients' pulse rates and body temperatures [3]. Doctors may use a wearable device that provides remote health monitoring to access data stored in the Bluemix cloud for diagnostic reasons. The Bluemix cloud uses the MQTT protocol (Message Queuing Telemetry Transport) to send and receive messages. Patients' temperature and heart rate are measured using sensors DS18B20 and KG011.

IoT in healthcare is a hot topic, and a new study released by [4] outlines the benefits and challenges of integrating IoT in the healthcare system and proposes a low-power monitoring system that can read and store patient information. [5] A Wi-Fi module was used to input important health data into a software. At any point in time, anybody can get to and make use of data. There is a bell that rings when anything out of the ordinary happens, alerting the staff to the need for immediate attention. To ensure the safety of patient information in the database, cloud computing and password-protected Wi-Fi are essential.

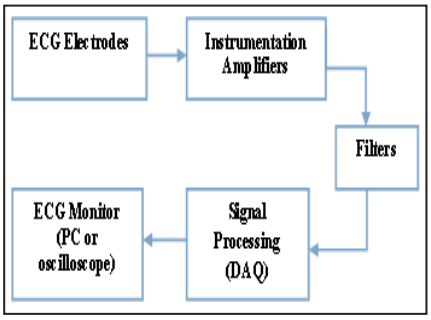
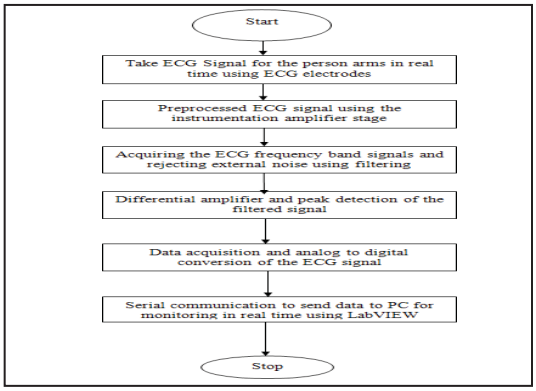


Fig. 1: ECG Based Personal Healthcare Monitoring System Design Algorithm

ECG electrodes are used to begin the preprocessing of the desired healthcare monitoring system, as seen in the schematic in Figure 1.1. For further signal processing, amplifiers and filters are needed. On a virtual instrument made in LabVIEW that resembles the actual thing, the ECG signal is delivered to the computer.

ECG Instrumentation

A transducer is required to convert the body's ionic potentials into electrical potentials detectable by standard electronic equipment in order to record the ECG. Fig. 2 displays a block diagram of the basic ECG measurement apparatus.



There are two types of electrodes: those that can be polarized (capacitors) and those that can't be polarized (insulators). One of the most popular types of electrolytes is silver-silver chloride, which is more closely related to a non-polarizable electrode than any of the other alternatives.

Fig. 3: ECG Electrodes

B. Data Acquisition System

To obtain the filtered and amplified ECG signal from the ECG monitoring system, the analog to digital signal conversion and subsequent processing are essential. It is then transferred to a computer or other display device for further analysis. Acquiring data from an electrical or physical phenomenon is known as computer data acquisition (DAQ) Figure 6

shows a block schematic of a typical data gathering device.

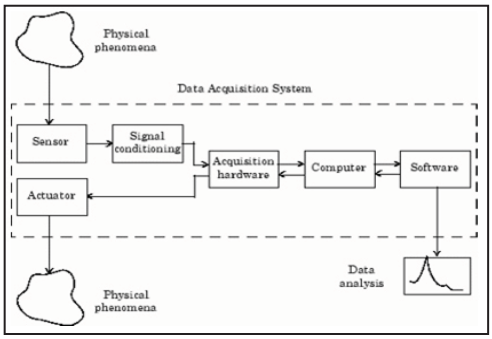
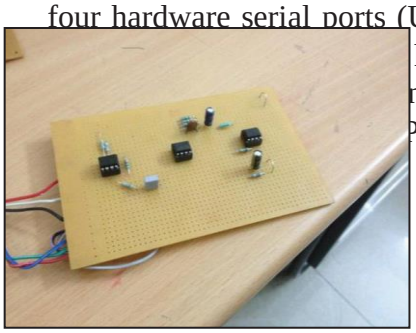


Fig. 6: Block Diagram of a Data Acquisition System

Fig. 1: Arduino Mega 2560

based on the ATmega2560-based microprocessor, Arduino Mega 2560 (datasheet). In addition to 54 digital input/output pins, this Arduino board has four hardware serial ports (UART) and 16 header and a ncluded (14 of WM outputs). and an AC to



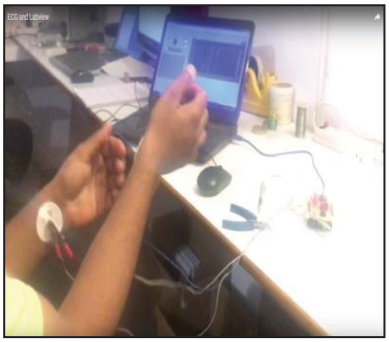
DC converter or battery power supply included in the package, so you can get started right away with the microcontroller. Additional power may be supplied via a battery or an AC-DC converter.

Finger Print Sensor

Updated fingerprint sensor module R305 is compatible with this version. In the R307 Fingerprint Module, optical fingerprint sensors, high-speed DSP processors, high-performance fingerprint alignment algorithms, and big capacity flash chips integrate fingerprint entry, image processing, and matching.

LEDs are flashed in real time when the ECG waveforms of the individual are at their highest, and the peak detector circuit is used to detect this. Fig. 10 depicts the ECG signal processing circuit that was constructed by the researcher.

Fig. 10: ECG Signal Processing Circuit Designed on PCB



Result and Discussion

This research gathered information on both software and hardware implementations. A circuit design tool, Proteus, was used to develop the circuit step by step, with each step resulting in a distinct waveform. Thus, the software's implementation was affected. LabVIEW was used on a PC to get hardware implementation data. To display and alter the results of the signal collection, LabVIEW software was used to construct a front panel and block diagram.. Standard ECG devices generated a waveform that was quite similar to this one. Because of Proteus Design Suite, the end result is what it is. To simulate a circuit, engineers utilize the Proteus 8 professional-schema capturing program.

Conclusion

Using IoT and cloud integration in healthcare, safe and secured data is sent to patients. Patients' ECGs and respiration rates may be reliably tracked using the recommended method, which provides reliable data in a low-cost setup. As a single Arduino MEGAboard and sensors are used, the system is both cost-effective and practical. IoT devices are equipped with fingerprint sensors to keep tabs on their owners' health and safety.

In this work, an ECG-based real-time health care monitoring system was developed and deployed. It was found that the hardware designed in LabVIEW performed well when tested in a virtual instrument. The hardware was developed using the necessary parts and gadgets. A final ECG monitor PCB design was also created. Before PCB design, testing was done on general-purpose PCBs. Finally, the PCB was fabricated and tested. Proteus confirmed an ECG monitoring system's design. Proteus. The ECG-based health monitoring device performed well without PC noise. This method provides low-cost ECG monitoring for personal and professional use.

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