Sensor-Based Continuous Multiparameter Monitoring and Infusion Syringe Pump Control System in Real-Time with Internet of Things

Section A-Research paper

Sensor-Based Continuous Multiparameter Monitoring and Infusion Syringe Pump Control System in Real-Time with Internet of Things

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Abstract-Biosensing technologies are becoming more and more important in security, sports, and healthcare sensors. Vital signs of a person include breathing, temperature, pulse rate, and blood pressure. Hospitalized patients' vital signs should be tracked and reported to the doctors on a regular basis. According to the doctor's recommendations, the medication is automatically injected if there are any variations or disorders. A data transmission system with the fastest throughput and two-way communication is required for that. The common methods of transmission include Bluetooth, GSM, GPRS, and others. However, the main issue is time delay, as well as a restriction on continuous monitoring. A novel method is used to exchange data continuously and instantly in order to solve these issues.

Through this method, patient data are transmitted in just a few nanoseconds while the patient is continuously monitored. If there is a change in the parameters, an infusion syringe pump automatically administers the patient's medications in accordance with the doctor's instructions. Flash programmer and the Keil C compiler are the programmes used.

Keywords- Biosensing technologies;Internet of Things; Keil C; Flash programmer; Infusion Syringe pump.

I. INTRODUCTION

Real-time data checking is a commonly used technique for monitoring and review, evaluating, and adjusting information stored in software, databases, or systems. Through graphical or visual representation, it aids in reviewing and tracking the cumulative functions and processes performed with the data at a glance [1] [2]. Real-time observation of any medical signals is significantly assisted by the advancement of biosensors-based systems [3] [4].

Physiological parameters of an individual encompass breathing, temperature, pulse rate, and blood pressure [5]. These data points are consistently tracked and communicated to the doctors [7]. The majority of individuals are now observed directly by doctors or nurses [6]. This method is quite simple, but it's also challenging, so we need better and more accurate monitoring [8].

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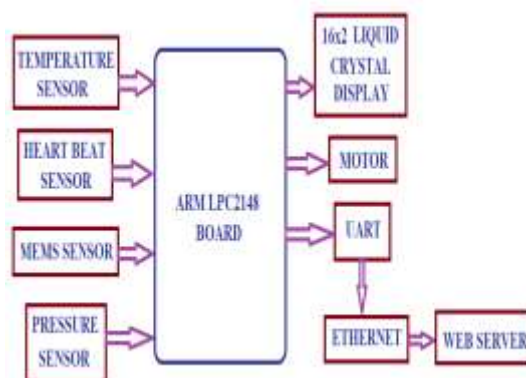*Section A-Research paper*

II. METHODS OF THE SYSTEM

Fig 1 Infusion Syringe Pump Control System

Patient monitoring is an important aspect of patient care given at hospitals. Vital parameters that are to be analysed for patient monitoring are temperature, BP, heart rate, oxygen saturation, ECG and change in position of the patient (for bedridden patients) [9] [10]. Basically four parameters are being measured here, they are temperature, BP, heart rate and change in position [11] [12]. The above mentioned parameters are measured using temperature sensor (LM35), BP apparatus, heart beat sensor (LM358) and MEMs respectively [13] [14]. The sensor used for measuring heart rate consists of an pre amplifier, where the received signals are converted to voltage signals from current signals and these signals are being amplified [15] [16]. The signals obtained from the temperature sensor, BP sensor and MEMS are converted to voltage signals and is transmitted to an ARM controller via ADC channel. For the machine understanding the acquired signals are converted to digital form using analog digital converter. After the conversion to digital form the signal are processed in the ARM controller and send to UART. Before this the basic configuration are done in the corresponding gadgets to receive data through internet. A specific IP address is obtained while configuring so as to increase its secure transmission. UART helps in the transmission of the processed signals to the WiFi module, later from the WiFi module datas are displayed in the web server according to the IP address obtained. The data that are being transmitted can be viewed through both the web server and also the hyperterminal application. Before transmitting it to the web server the results are initially displayed on the LCD display. As the results are being viewed by physician, if there occurs any variations in the parameters of the patients the interrupts are given by the doctor accordingly. This results in the incubation of medicine to the syringe and the medicine is injected to the patient. For incubating the medicine,' W ' is the interrupt given which helps in the rotation of the motor in the anticlockwise direction and the output is displayed as stage 1. For injecting the medicine to the patient 'Z' is the interrupt given which results in the clockwise rotation of the syringe and the output is displayed as stage 2.

III. RESULTS AND DISCUSSIONS

The four vital parameters sensed by the sensors are temperature, blood pressure, heart rate and the change in position of the patient, these are measured by LM35 - temperature sensor, LM358- heart beat sensor, bp apparatus and MEMS respectively. The received signals are converted to voltage signals and transmitted to the ARM microcontroller via ADC channels. In case of the heart rate sensor the signals received are converted to voltage

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signals from current signals and then amplified using an amplifier.

For the machine understanding format the signals are converted into digital form during the passage through analog-digital converter. The signals are processed in the ARM controller, then send to the UART. Basic configurations are done in the corresponding gadgets to receive the data through internet. A specific IP address is obtained while configuring so as to increase its secure transfer. The results are displayed in LCD at first.

Fig. 2 Results Displayed In The Sensor

The data are displayed in a web server according to the IP address given. These results can be viewed in hyperterminal application.
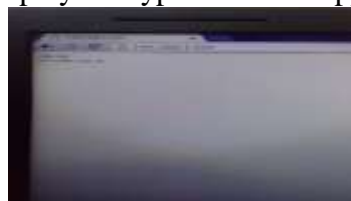

Fig.3 Display In Hyperterminal Application

Fig. 4 Results Display In Web Server

The interrupts are given by the physician according to the variations, results in the incubation of medicine to the syringe and injection to the patient. For incubating the medicine 'w' is the interrupt given, rotates in anticlockwise direction. Then the output is displayed as stage1.

Fig. 5. LCD Display During First Interruption

For injecting medicine to the patient 'z' is the interrupt given resulting in clockwise rotation. The output is displayed as 'stage2'. A wi-fi module is connected to provide internet connection to the system.

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Fig.*6.*LCD Display After Second Interruption

4. SUMMARY

Bio-sensing technologies are of increasing importance in healthcare, sport, and security sensors. The respiration, temperature, pulse rate and blood pressure are important vital signs of persons. These parameters of hospitalized patients should be continuously monitored and reported to the physicians. If there is any variation or disorders the medicine is injected automatically according to the doctor's advice. For that, a fastest and two way communication data transmission system are needed. The usual ways of transmission are bluetooth, GSM, GPRS, etc . But the main problem facing is time delay and also limitation of continuous monitoring. To overcome these problems a new technique is implemented which can exchange data continuously without any time delay. The advanced system used here is Internet of Things (IoT). The data of the patients are transmitted through this technique within a fraction of seconds and the patient is monitored continuously. If any variation occurs in the parameters, medicines are injected automatically to the patient according to the doctor's advice using an infusion syringe pump .The software used are Keil C compiler and flash programmer. Hyperterminal application is used to display the result.

IVCONCLUSION AND FUTURE WORK

The IoT based monitoring is quiet useful as compared to manual monitoring and also it is more reliable and efficient. After receiving any variations, the medicines are automatically incubated and injected according to the doctor's command. An alarm system can be set up. alarm system helps in reducing the work load of doctors, by avoiding the continuous monitoring of the patient parameters, delay due to IoT interface can be improved using effective sensors and thereby this technique can be implemented in hospitals and industries.

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