A BIO-SENSING SYSTEM ON CHIP AND SOFTWARE FOR SMART CLOTHES

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ABSTRACT: *One of the new technologies in the field of health is wearable bio-sensor, which provides vital signs monitoring of patients, athletes, premature infants, children, psychiatric patients, people who need long-term care, elderly, and people in impassable regions far from health and medical services. The aim of this project was to explain features and applications of wearable bio-sensors in medical services. Although the use of wearable in health care is still in an infant stage, it could have a magic effect on health care. Wearable bio-sensors capable of continuous vital signs monitoring and feedback to the user will be significantly effective in timely prevention, diagnosis, treatment, and control of diseases. The main concept of this project was to use a bionic sensing system that monitor vibration, heartbeat, temperature and respiratory sensors for patient. So the output can obtained by with the help of IOT module and verify the output in LCD display. The development of sensor system is done in this system and it can be used for measuring the vital values of the human body.*

Keywords: *Medical smart shirt, monitoring, wearable bio-sensors, vital signs, Internet of Things, Bionic Senor.*

1. INTRODUCTION

Today, the industry of medical care and control has undergone significant changes owing to a wide range of facilities and services; these changes include more emphasis on prevention, recognition of primary risks, proper education of users, new ways of healthcare, and people's authority in control of their personal health. These changes have evolved following the emergence of factors such as increases in the population of the elderly, various chronic diseases, and the field of their treatment. The requirement for self-health monitoring and preventive medicine is increasing due to the projected dramatic increase in the number of elderly people until 2020. Developed technologies are truly able to reduce the overall costs for prevention and monitoring. This is possible by constantly monitoring health indicators in various areas, and in particular, wearable devices are considered to carry this task out. These wearable devices and mobile apps now have been integrated with telemedicine and telehealth efficiently, to structure the medical Internet of Things. As the life expectancy of individuals increases with recent advancements in medicine and quality of living, it is important to monitor the health of patients and healthy individuals on a daily basis. This is not possible with the current health care system in North America, and thus there is a need for wireless devices that can be used from home. These devices are called biomedical wearable, and they have become popular in the last decade.

There are several reasons for that, but the main ones are: expensive healthcare, longer wait times, and an increase in public awareness about improving quality of life. With this, it is vital for anyone working on wearable to have an overall understanding of how they function, how they were designed, their significance, and what factors were considered when the hardware was designed. Therefore, this project attempts to investigate the hardware components that are required to design wearable devices that are used in the emerging context of the Internet of Medical Things (IoMT).

2. LITERATURE REVIEW

[1] "Microcontroller implementation of low-power compression for wearable biosignal transmitter", VLSI Design Automation and Test (VLSI-DAT) 2016 International Symposium on, pp. 1-4, 2016 :

AUTHOR: C.T.Chang, C.M. Nien and R. Rieger.

YEAR: 2016

This paper presents a low-power algorithm for the compression of biosignals (ECG, EMG, gait pattern). Sample decimation is guided by the second derivative of the signal as a metric for signal activity. Here, we describe the implementation of the algorithm on a general purpose microcontroller of the transmitter node of a body-area network. The algorithm is optimized for low computational complexity and consists of 180 controller instructions. It incorporates feedback to achieve a targeted compression factor (CF). Simulated and measured results with different biosignals confirm that the code achieves a typical CF around 10, needs 137 controller cycles per input sample and consumes 507 nJ per sample on the prototype hardware.

[2] "Programmable ExG biopotential front-end IC for wearable applications", IEEE Trans. Biomed. Circuits and Systems, vol. 8, no. 4, pp. 543-551, 2014 :

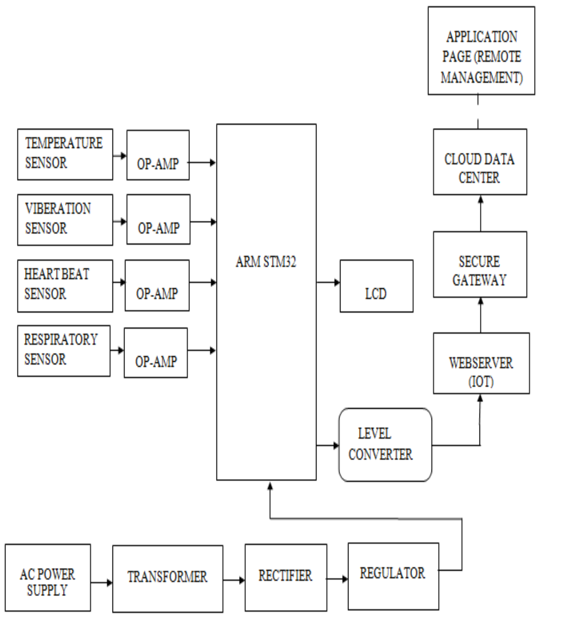
AUTHOR : S .L. Teng, R. Rieger and Y.B. Lin.

YEAR : 2014

This paper presents a configurable CMOS integrated circuit front-end for the recording of a wide range of biopotentials (ExG). The system offers a choice between a single-differential or double-differential recording channel topology, wide continuously adjustable gain range (37-66 dB), selectable CMOS or BJT input stages, offset compensation, differential and buffered single-ended voltage output. Measured results from a prototype manufactured in 0.35 μm CMOS technology are presented. Practical recording examples of the electrocardiogram (ECG) and electromyogram (EMG) confirm its operation. The chip consumes between 110 and 324 μW depending on configuration, occupies a core area of 0.16 mm 2 , achieves a CMRR > 97 dB, and 21 nV/√Hz input-referred noise. The chip is suited for combination with a microcontroller in long-term wearable physiological sensing applications.

3. HARDWARE AND SOFTWARE USED

ARM STM32, Temperature Sensor, Vibration Sensor, Heartbeat Sensor, Respiratory Sensor, Transformer, Rectifier, Regulator, IOT Module, Operational Amplifier, Level Converter, LCD.



Keil C embedded software tools are used in this project.

4. WORKING PRINCIPLE

Input power supply unit like transformer, rectifier and regulator are used. Thus, a 5 V regulated power supply starts with a 12V Alternative Current(AC), transformer that delivers 12 V to the bridge rectifier, which converts the AC to DC and drops the voltage down to about 9 V and then delivers the voltage to the filter circuit, which smoothes out the ripples and passes the voltage on to the 7805 voltage regulator, which holds the output voltage at 5 V. The another main input components are sensors, they are used to collect the real time data and give the digital form of output which are understandable to user. The output was displayed in uses of LCD display and the data can be collected by anytime, anywhere with the help of most advance technology of this decade Internet of Things (IOT) module.

5. RESULT

The temperature, the heart rate, muscle movement and the proper respiration rate of the patient details was monitor in real time processing by using the input sensor unit and convert the analog output signal of sensor into digital signal by using STM32 microcontroller and verify the output of LCD display with the output of the IOT module.

6. CONCLUSION

A real time datum of the sensors are monitored with the IOT web link and verified the result once again by using LCD display with the help of 32-bit microcontroller STM32. The detection was based on the classifications of the sensor used as a input unit, the output of the sensors are mostly analog, to collect analog output signal and converted it into the digital output signal to help of program dumped into the microcontroller. So the output can be seen as digital form. In further more the input power supply are low and output is more accuracy.

7. ADVANTAGES

1. This project is most helpful to elder care, athletes and hospital patients, simply the doctor need to go and check ever patient daily with the help of this project the doctor can check many patient details at the same time in the provide IOT link in mobile devices. Briefly doctor gets information about patients.

2. Easy operate.

3. Real time monitoring.

8. REFERENCES

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