

## Design of ECG Acquisition System and Noise Removal Using MSP 430 Controller

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### Abstract

*In today's world, electrocardiography (ECG) is very important to detect heart related problems. Many technologies have been developed for medical monitoring. In this study, we are developing monitoring system using 3 leads. This system takes input as an analog signal processes and conditions it and converts it into digital signal. After converting, it processes the digital signal with MSP430 controller.*

**Keywords:** *Electrodes, energia, EMG, GSR, electrocardiogram, LM35, MSP430 controller, MATLAB*

### INTRODUCTION

Electrocardiography (ECG) is the acquisition of electrical activity of the heart captured over time by an external electrode attached to the skin. Each of the cell membranes that form the outer covering of the heart cell have an associated charge which is depolarized during every heartbeat. These appear as tiny electrical signals on the skin which can be detected and amplified by the ECG [1]. In addition to this, we are measuring other parameters like body temperature, GSR Response and EMG[2]. Electromyography (EMG) is an electro diagnostic medicine technique used for diagnosing and recording the electrical activity produced by skeletal muscles. EMG results are often necessary to help diagnose or find a solution to number of conditions such as: Muscle disorders, such as muscular dystrophy or polymyositis. The galvanic skin response (GSR) refers to changes in sweat gland activity. These activities are reflective of the intensity of our emotional state. It is also known as emotional arousal [3]

### LITERATURE SURVEY

Initially at the beginning of the work, the drawback in the current system is studied.

To overcome the drawbacks, similar kind of implementations is studied via different papers published by different authors [4]. Based on the exhaustive study made of the current implementations, a solution to overcome the problem is found.

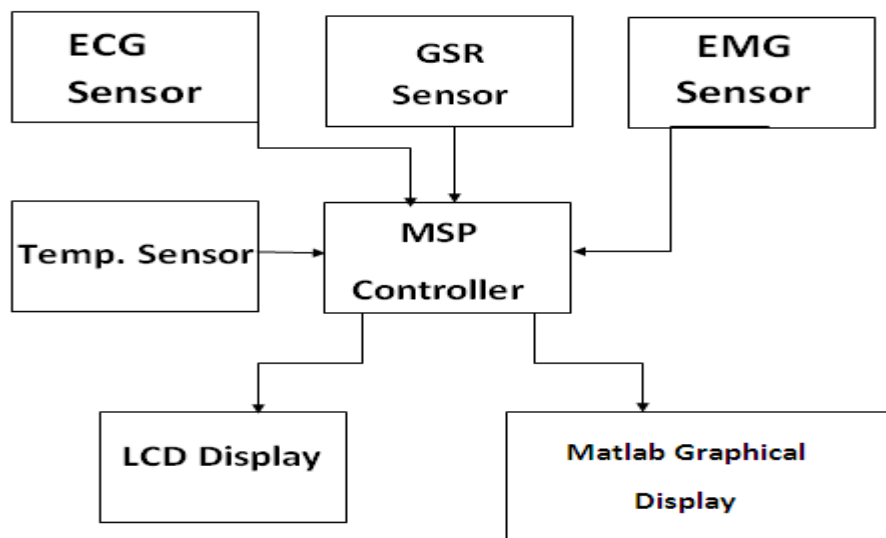
Ira Mahajan has designed an ECG data acquisition system using integrated analog front end. The ECG data acquisition system developed by choosing appropriate components such as electrodes, analog front end unit (ADS1292), P89V51RD2 microcontroller and display unit. ADS1292 AFE Chip has 24 bit 8-channel ADC for Patient monitoring. It has very less size reduce the components in the system by 95% and reduce the power (1 to 5 mv) by 95% also. ECG waveform displayed on the oscilloscope [5].

### BLOCK DIAGRAM

In this system, the ECG signals are obtained from the three electrodes such as red, green and yellow attached at the specific locations on the patient's chest. The red electrode is placed under right clavicle near the right shoulder within the ribcage frame [6]. The yellow electrode is placed under left clavicle near the left

shoulder within the ribcage frame. And the green electrode is placed on the left side below pectoral muscles lower edge or left ribcage. These signals are given to the MSP430 controller and the heart bit rate is displayed on the LCD and ECG signal is displayed on the MATLAB graphical display [7]. To obtain the GSR response, the GSR sensor is attached at the any finger and

the response is displayed on the MATLAB graphical display. The EMG wave is extracted by putting the EMG sensor on biceps or on legs and it is shown on the MATLAB graphical display. The temperature sensor LM35 is used to measure the temperature of the patient's body and the temperature is displayed on the LCD.



*Figure 1: Block Diagram of ECG Acquisition System Using MSP430 Controller*

## COMPONENTS

### MSP430F5529 Controller

- USB debugging and programming interface featuring a driverless Installation and application UART serial communication with up to 9600 baud.
- Supports msp430g2xx2, msp430g2xx3, and msp430f20xx devices.
- Two general-purpose digital i/o pins.
- Two push button for user feedback and device reset.
- Easily accessible device pins for debugging purposes

### Electrodes

The potentials generated from the heart of the human body are picked through electrodes. The electrodes helps in

reducing the possibilities of artifacts, drift and base line wandering etc.

### GSR Sensor

GSR it is nothing but Galvanic Skin Response, which is used to measure the electrical conductance of the skin. Our level of emotional arousal changes in response to the environment occur then the subsequent change in emotional response that we experience also increases eccrine sweat gland activity. Strong emotions can be captured by simply connecting two electrodes to two fingers on one hand.

### LM35 Temperature Sensor

LM35 is a temperature sensor which is designed to measure objects hotness or coldness. Then it provides proportional resistance, current or voltage output which is measured as per specific application. LM35 gives output in the form of temperature which is in °C. Compare with

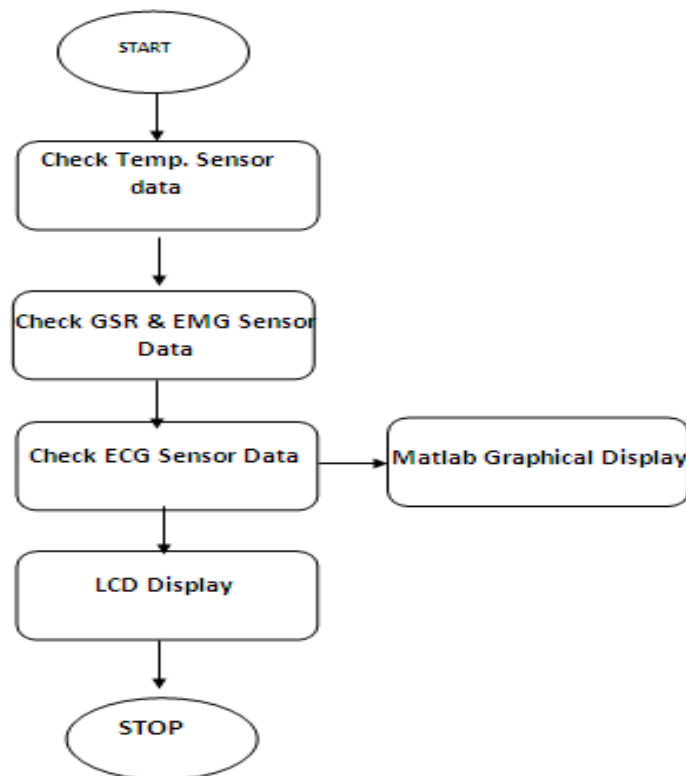
thermistor, LM35 measures the temperature more accurately.

### EMG Sensor

Electromyography (EMG) enables the translation of these electrical signals into

numerical values and that enables them to be used in a wide area of applications. Our sensor is especially designed for surface EMG, and works both with pre-gelled and most types of dry electrodes.

### FLOWCHART



**Figure 2:** Flowchart of the Proposed System

### CONCLUSION

In today's world, many technologies are developing so humans are intended to use these technologies. So in this project we are going to design an ECG acquisition system; which gives pure and noiseless ECG signal in minimum cost.

### REFERENCES

1. AD620-Low Cost Low Power Instrumentation Amplifier. Analog Device Inc.1999.
2. An Analogue Front-End System with a Low-Power On-Chip Filter and ADC for Portable ECG Detection Devices
3. Sharankumar, D.Jayadevappa, Mamata V Shetty(2018), "A Novel approach for Segmentation and Classification of brain MR Images using Cluster Deformable Based Fusion Approach", *Periodicals of Engineering and Natural Sciences*, Volume 6, Issue 2, pp, 237–242.
4. Bahoura, M., Hassani,M. (1997), "DSP implementation of Wavelet transform for real time ECG wave form detection and heart rate analysis", *Compute Methods Programs Biomed*, Volume 52, Issue 1, pp. 35–44.
5. Sharankumar, D.Jayadevappa, Mamata V Shetty (2018), "Fuzzy Deformable Based Fusion Approach for Tumor Segmentation and Classification in

- Brain MRI Images”, *International Journal of Engineering & Technology(UAE)*, Science Publishing Corporation Inc, Volume 7, Issue 4.7, pp. 171–179.
6. Huasong Cao, Haoming Li, Leo Stocco, Victor C. M. Leung, “Design and Evaluation of a Novel Wireless Three-pad ECG System for Generating Conventional 12-lead Signals”,
  7. J. W. Zheng', T. H. Wu', Y. Fan', Z. B. Zhang, Y. Zhang (2007), “Handheld devices make real-time telemedicine possible and affordable”, *International*

*Conference On Complex Medical Engineering*, China, pp. 265–269.

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