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Consistent Observing of Fetal Pulse and Uterus Withdrawals

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Abstract
Fetal monitoring during pregnancy time is the most important to save the life of the mother as well as the child. In this paper, we present a device that is used to measure the fetal heart rate during the time of pregnancy. The major component used for this detection is Fetal Digital stethoscope sensor which is to be placed on the abdomen of the pregnant and the signals are processed by the micro-controller used and the accurate fetal heart rate is identified and sent as a text message to the respective mobile phone through the usage of GSM module and also by the usage of EMG sensor the uterus contraction also be simulated as the output on the desktop. This system is very flexible and low cost helps the patient to monitor the fetal heart rate in home.
Keywords: *FetalHeartRate,uterus contraction, GSM.*

I.INTRODUCTION

In this present scenario, there are different techniques used for fetal health monitoring at the time of pregnancy. There are methods like CTG, ACOG and many methods based on acoustic techniques.In this paper, a device is developed such that it consists of a fetal digital stethoscope sensor which is made up of three electrodes anode, cathode, and a reference electrode. In this model, these are placed on the abdomen. Thus the ECG signals are fetched from these electrodes and are pre-processed and then analyzed through different standards. To be informative a GSM module is used to transmit the fetal heart rate values to the required mobile. The message can also befollowed up the doctors. Thus by using these kinds of methodologies, one can reduce the stress felt by a pregnant woman due to the movements from here and there.

The heart of this process can be defined as the microcontroller used. The microcontroller controls the whole process from fetching the electrode signals and Preprocessing the signals and accurate fetal heart rate is sent to the consultants mobile by GSM. The usage of this microcontroller can also be extended to the other applications. In this paper, this can be extended by using a fetal EMG sensor with the same microcontroller to get the analog view of uterus contraction.

II.LITERATURE SURVEY

ChuqiLiuet.al[1],proposed a fetal heart signal processing algorithm by including the adaptive denoising method which was based on spectral subtraction and nonlinear self-excitation signal. Using this algorithm in a Doppler ultrasound fetal heart simulator and mother womb showed good de-noising effect and improvement in signal to noise of signals with the absence of self-excited howling was achieved.

Gupta et al [2],determined the progress of health and growth of the fetus in different stages with different techniques for heart measuring and other health monitoring issues. In this work, a new prototype was developed called a fetal kick detection device which is used to monitor the health of the fetus at regular intervals. This prototype is not implemented in the real-time scenario can be considered as the major drawback of this work.

Ronaltgainiet.al[3], proposed fundamental prototype algorithm for extracting FECG from abdominal ecg. ABDECG preprocessed by normalization and filtering based on thresholding and 1st order differentiation, maternal peak was identified. using this peaks GRS of MECG identified & same had been cancelled to obtain FECG. Fetal peaks was identified from culled out signal which was provided

QRS complex,heart rate for diagnosis .This algorthim gave 100.N accessing when channel was near to fetus heart.

Muhammad I.Ibrahimyet.al[4],proposed an algorthim for simultaneous measurement of fetal and maternal heart rates from maternal abdominal electro cardiogram and labour for ambulatory monitoring.Doppler ultrasound used for statistical comparison on five volunteers results showed average root mean square difference of 5.32% & linear correlation co-efficient from 0.84-0.93 fetal heart rate remained +5 beats per minute limit to reference ultrasound method for 84% of time.

Firoz Ahmed et.al[5], developed an ambulatory system which is capable of monitoring the FHR as well as MHR for 24 hours. Micro- controus beard to sense AECG & process it and record maternal and fetal ECG. Also developed an algorithm for extracting FHR from ATCG by substracting of MECG & developed an ambulatory system for recording RR & FHR.

MasoudRohamet.al[6], proposed end to end wearable wireless fetal heart monitoring system consisting of Doppler ultrasound and pressure sensing front end equipped with short range radio mobile cellular gateway for wide area communication through internet browser for remote monitoring and diagnostics. Heart rate & contraction was similar to fetal monitoring device yielgel concordance correlation coefficient of 88% & 94% respectively.

Wendi yang et al[7],proposed FHR monitoring system based on phonocardio graphic method. Customized stethoscope used for sensitivity. Also adopted noise cancellation methods to extract FHR. Results are compared with Doppler moniter given a variation of 10% by this method.

Chen linet.al[8], proposed R-peak enhancement technique to improve detection of fetal heart rate. Two simulation sets were designed for noise countranation and R-peak internal changing rate resulted in weighing statistically generated weighing mask improved accuracy of R-peak detection rate by 25%& decrease false alarm raise of 20% with white noise contamination and ensured high R-peak detection rate (>80%) with mild noise contamination.

Nair et.al [9],proposed variable pulse width – finite rate of innovation(VPW-FRI) Model which deals with pulse parameter like location, amplitude and width and allowed to automatically segment to identify fetal QRS complexes and R peak locations from compressed sample to yield fetal HR.

III. METHODOLOGY

In this methodology, we get input from the pregnant lady by placing the two sensors namely Fetal digital stethoscope sensor and EMG sensor near the abdomen of the lady. Thus the electrodes that are present with the sensors fetch the fetal heart rate of the child and the signals are amplified by the amplifier and transmit the corresponding electrical signal to the microcontroller. As per the below diagram, we can obtain the readings from the lady.

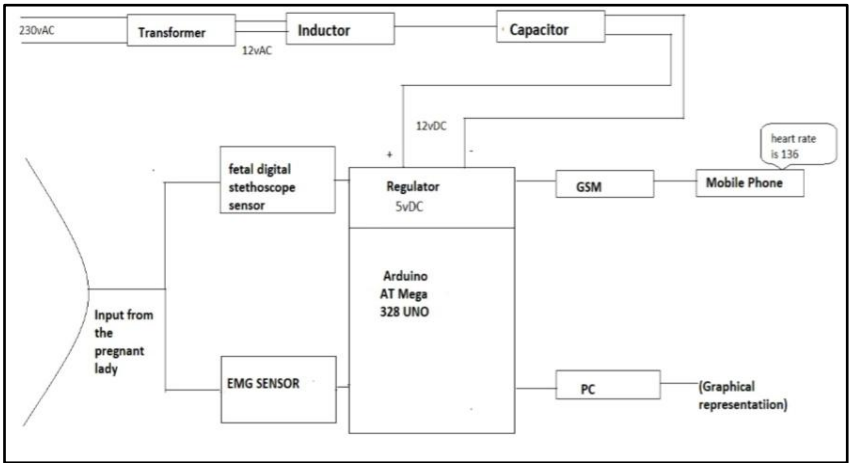

Fig.1: Block Diagram

In this method, the microcontroller is programmed such that to get low noise data.

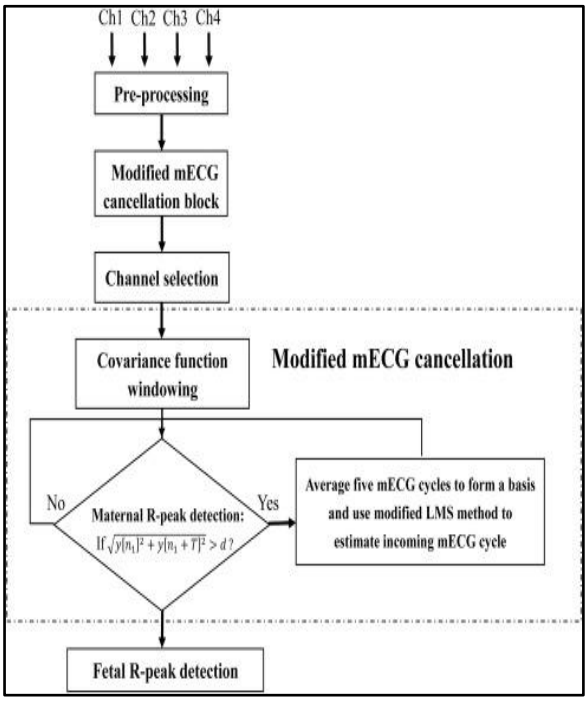

Fig.2

After the successful fetching of the signals, they are pre-processed as per the written guidelines in the program through the microcontroller. Later the information from the microcontroller is transmitted through the GSM module to send the text message for the required mobile phone and we can obtain the graphical representation of the fetal heart rate
And also from the EMG sensor graphical representation of the uterus contraction is obtained.
Software used:
1)Proteus IDE for simulating fetal heart rate and uterus contractions.
2)Arduino IDE.

IV. EXPERIMENT RESULTS

All the connections are made as mentioned in the above methodology. The Fetal digital stethoscope sensor used is placed on the abdominal region. Since it is connected to the microcontroller, the results are fetched through the electrodes used in this sensor.
Thus the message is transmitted through the GSM module and also the obtained results are viewed in the graphical form due to usage of the sensor. In this results section, we can totally find two characteristics of the pregnant woman namely fetal heart rate, the graph of uterus contraction and fetal heart rate.

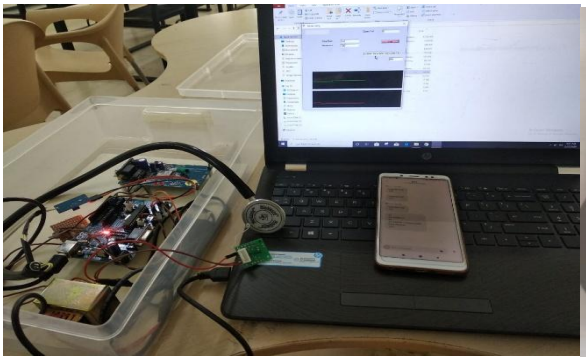

Fig.3. Experimental setup of fetalheartrate monitoring and uterus contraction.

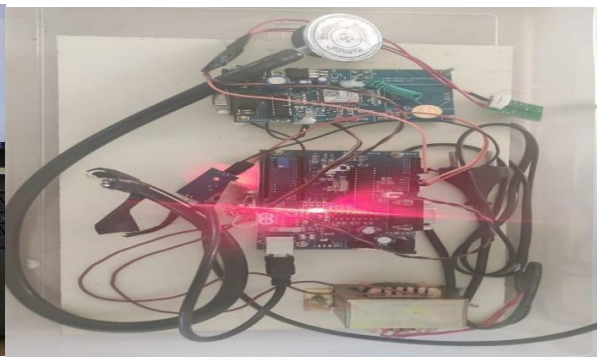

Fig.4.hardware components

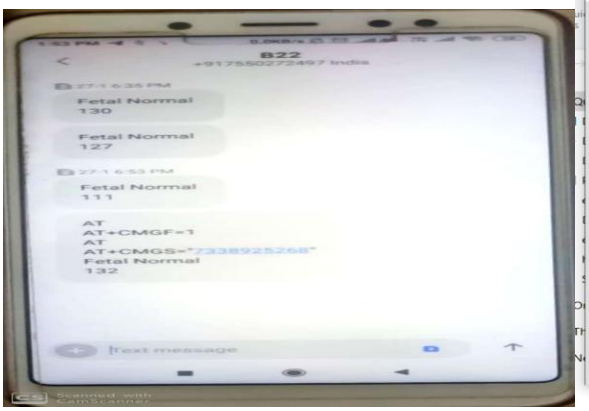

Fig.5.simulation of fetal heart rate And uterus contraction.

Fig.6. Digital value of fetal heart rate transmitted to the Mobile using GSM.

V.CONCLUSION

From the above method, the heart rate of the fetal is monitored and the output is accurate. By using the noise reduction method the clear data is carried out. The sensors are placed on the abdomen region to evaluate the fetal heart rate and to simulate the fetal heart rate and uterus conntractions. The clinical experiment is carried out by using the method on 10 pregnant women and the data obtained are stored in the database. The data are get analyzed with one another all the result shows the accurate value. The normal heart rate value is compared with the value obtained by this device it shows maximum efficiency.

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