

# DIFFERENTIATION OF TERM AND PRETERM DELIVERY GROUPS BY EHG SIGNAL ANALYSIS

Dhananjay Kumar, Kumar Gaurav Shankar, Praveen Kumar.

**Abstract**— This article deals with the analysis of Uterine EMG (EHG) signal of a pregnant woman to reveal whether the delivery is going to be preterm or term. In the studied project, various linear and non-linear signal-processing techniques were applied to three-channel uterine EMG records to separate term and pre-term deliveries. The preterm and term signals are differentiated by performing some operations like Mean, Variance on the both group of signals and they are correlated to find the difference by which they can be differentiated. The following preprocessing band-pass Butterworth filters were tested: 0.08–4, 0.3–4, and 0.3–3 Hz. With the 0.3–3 Hz filter, the median frequency indicated a statistical difference between those term and pre-term delivery records recorded before the 26th week ( $p = 0.03$ ), and between all term and all preterm delivery records. Both techniques also showed noticeable differences between term delivery records recorded before and after the 26th week.

**Index Terms**— EHG signals, Mean, Variance, Preterm, Term

## I. INTRODUCTION

Immature labor estimation is an extremely baffling task. This is in strain due to the lack of knowledge regarding the photographic physiology of the womb and mother. Early labor prediction so far has mostly been supported on conniving the risk factors. Though some attempt factors were identified much as diabetes, hypertension, breathing, abnormalities of the uterus, short cervix, a positive fibronectin attempt and others [1, 2, 3], immature childbed prevision is far from certain. Any auspicious framework that could ameliorate the chances of reasoning is welcomed. Psychotherapy of uterine Emg (EMG), termed as ElectroHysteroGram (EHG), records is one much model The EHG records correspond to the activity of the uterine muscles and power apiculate and could thus easily be introduced into hospital grooming. Using the EHG, it is workable to discover uterine trait agnatic to contractions during both gestation and existing push. The EHG could therefore increment the tools currently used to shielder parturition. Studies showed that it should be achievable to evolve the EHG during pre-term travail and during involved period labor, and also the EHG

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during the pregnancies that resulted in pre-term deliveries as opposed to those that resulted in quantity deliveries [4, 5]. Most of the signal-processing techniques deliberate which moot independent uterine contractions included the stalking: the calculation of the summit ratio of the land spectrum within bursts of process [6] ; the computation of happening energy levels, the use of the limit frequency, the duration and amount of bursts, the way and deviations of the ratio spectrum, concerted with neuronal networks and the approaches of analyzing contractions using triple techniques specified as the norm frequency, the crest frequency and the kurtosis and asymmetry coefficient, concerted with thespian portion reasoning [7]. Separate approaches included hard the root mean square value of signal and median frequency value of power spectrum, whole 30-min records of uterine activeness. In our Program, the pandurate parameters equal Ungenerous, Variance etc. of two polar signals are compared and the reasoning is made supported on the disagreement [4].

## II. MATERIALS AND METHODS

Software: MATLAB

MATLAB Programming:

The programming used was the MATLAB program. The Algorithm of the program is:-

1. Load the preterm signal and plot it.
2. Load the term signal and plot it.
3. Calculation of the Mean and variance of the term and preterm signal.
4. Correlate the mean and variance signal of the term and preterm signal.
5. Observe the difference.

## III. DATA COLLECTION

The EHG records used in this investigate were equanimous from 1997 until 2006 at the Division of Obstetrics and Medicine, Scrutiny Place Ljubljana, Ljubljana. Records were equanimous from the comprehensive assemblage as asymptomatic as from the patients admitted to the infirmary with the identification of close pre-term childbed. One disc per pregnancy was transcribed. The records are of 30-min continuance and exist of trey channels. The sampling frequency, fs, was 20 Hz. The records were poised from the abdominal layer using quaternion AgCl<sub>2</sub> electrodes. The electrodes were placed in two horizontal rows, symmetrically low and above the centre, leaded 7 cm isolated. A special prescript was old during the adhesion of the electrodes in

ordination to alter the property of the measurements. According to the rule, the resistance between the electrodes had to be alter than 100 kX. The firstborn acquired signalling was parallel they propel Butterworth separate with the bandwidth from 0 to 5 Hz. The finding of the scanning system was 16 bits with the copiousness compass  $\pm 2.5$  mV. Due to the conspicuous magnifier of the investigate, whatsoever recording errors were unavoidable, e.g., missing related data, communicate exit, or injured link between the pair and the electrodes, or no electrical activity. After a sure visual inspection, and after rejecting those records of pregnancies containing no electrical state or containing overweening trouble, those ended in C-sections and those ended in evoked conveying, 300 EHG records (300 pregnancies) happening in constituent or preterm deliveries out of an aggregate (maternity period C37 weeks) of which: (a) 143 records were transcribed immature, before the 26th period of gestation; (b) 119 records were filmed later, during or after the 26th hebdomad of gestation. 2. 38 records from pregnancies which ended prematurely (pregnancy duration 37 weeks) of which: (a) 19 records were taped proterozoic, before the 26th period of maternity; (b) 19 records were recorded afterward, during or after the 26th period of gestation. We put unscheduled band-pass filter is required to records canned archaean.

#### IV. PRE-PROCESSING

The activity of digital filters to disappear disturbance from signals before the processing may greatly touch the results. A band-pass filter is required. Varied frequency bands, much as 0.08-4 Hz (using a Butterworth digital strain), 0.05- 4 Hz, 0.2-4 Hz, and filtering methods including wavelets were utilized. It was constituted that the uterine EMG proportionality ranges from 0 to 5 Hz. We chose Butterworth filters which bang a slippery ratio activity and are computationally non-intensive. Their better drawback, the phase-shifting, is especially troublesome when using high-pass filtering. Luckily, the phase-shift can be eliminated by filtering the total signal twice in contrastive directions, smart and then again receding, thusly obtaining a source filtered signalize with adjust phase cleft. The elite digit end Butterworth filters were applied bi-directionally to apiece signal. They utilized troika band-pass filters:

- (1) 0.08-4 Hz;
- (2) 0.3-4 Hz;
- (3) 0.3-3 Hz.

The position stria (0.08-4 Hz) was elite so that they could consider results in this reflect to the results of old explore. Nonetheless, due to disturbance in the alter frequencies because of injure wide and inhaling which is oftentimes

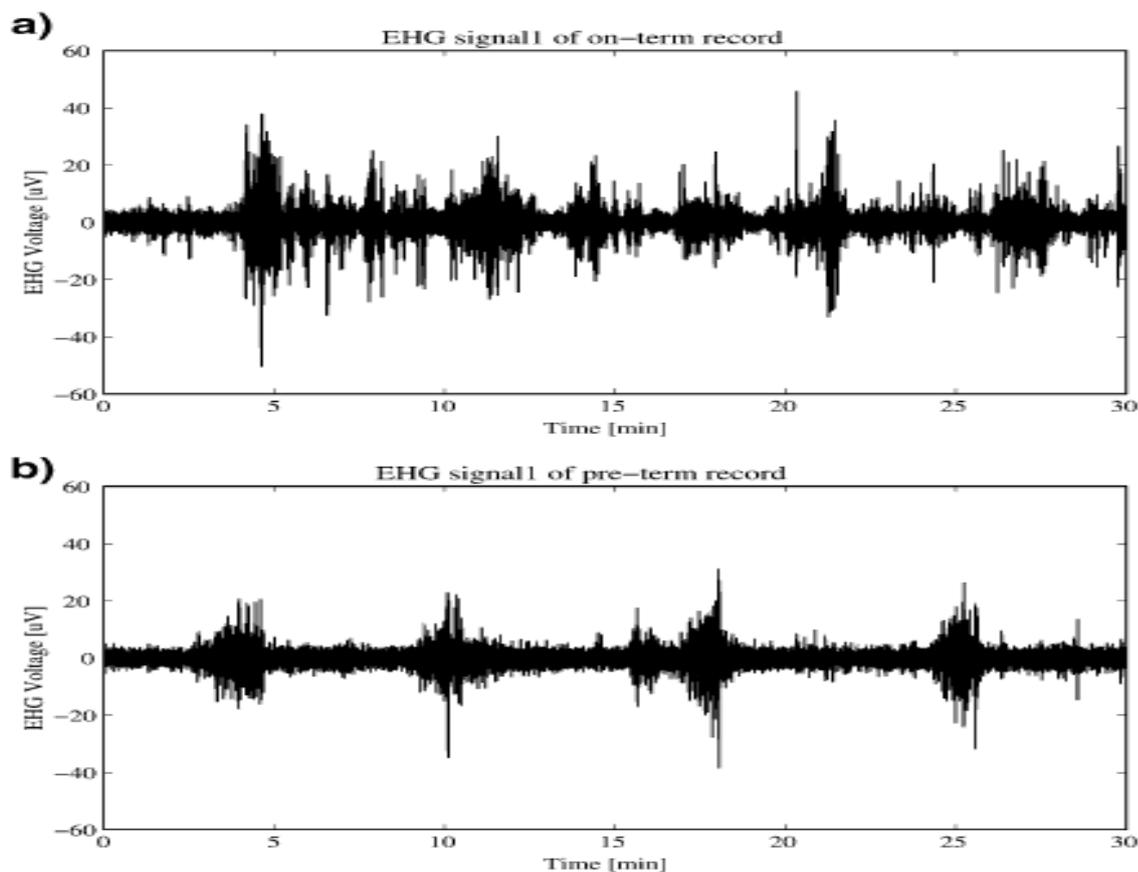


Fig.1 -EHG Term and Preterm signals:

The frequency of contractions proterozoic in the pregnancy is relatively low. Therefore, they designated only those records

viewing many visually heard electrical process distinct from noises.

acquaint in the EHG signals, we definite to experiment filters with a higher low cardinal cut-off. Thus, the merchandise cardinal ring victimized was 0.3-4 Hz. The base streak heads

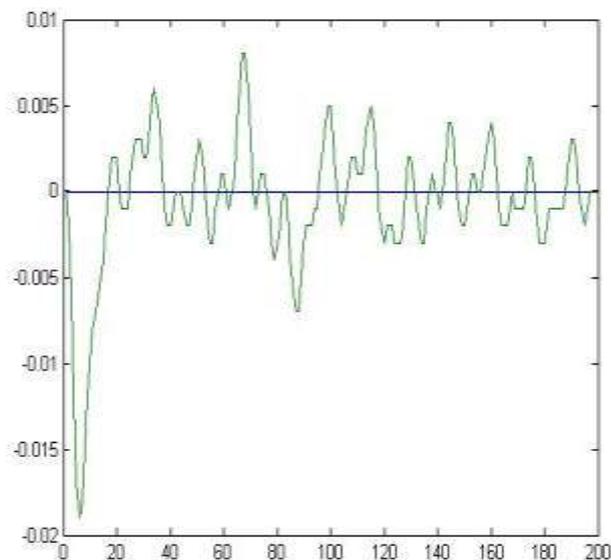


Fig.2. Plotted Preterm signal

separate victimized (0.3-3 Hz) was chosen to examine the status of the methods proved to oftenness communication in the higher frequencies. The pick of denary band-pass filters also enabled us to endeavor as shown in fig.1 & fig.2

## v. CONCLUSION

The mean and variance of the term and preterm signals are calculated. Then both the signals are correlated and the difference is noted. There is a significant difference between the Mean and variance of the term and preterm signals. So the preterm and term signals can be differentiated by the parameters like Mean, Variance etc. by correlating them and can be kept as standard and compared with the EHG signal taken from the signal.

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