

# REVIEW PAPER ON CHARACTERISATION OF UTERINE CONTRACTION SIGNALS DURING TRUE AND FALSE LABOUR

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**Abstract :** Preterm birth is the most common problem of unhealthy babies and death among in fact worldwide. Normally pregnancy lasts for 40 weeks. In this 31<sup>st</sup> to 40<sup>th</sup> weeks babies are healthy and normal. But pregnancy between 20<sup>th</sup> week and 30<sup>th</sup> week preterm birth takes place. The preterm baby is that the baby is not fully developed, some organs of body are not developed in mother's womb is lungs, the babies which are kept in ventilator. To avoid such mishaps preterm labor can be predicted an hour before. To predict preterm labor EHG (Electro hystero gram) signal can be used for diagnosis. The main aim in this paper is to review the papers and what the next can be done is summarized. Features are been extracted and neural network for simplifier.

**Index Terms** – Labor, EHG signals, Neural Network classifier.

## INTRODUCTION

In today's era the most common problem is preterm birth. It is the main cause of morbidity and mortality of newborns [4]. Normally pregnancy lasts for 40 weeks, where babies are healthy and normal, birth after 20<sup>th</sup> week and before 37<sup>th</sup> week are called premature birth. It is divided in different categories, less than 28<sup>th</sup> week tends to preterm, very preterm is between 28<sup>th</sup> to 32<sup>nd</sup> week, and pregnancy between 32<sup>nd</sup> to 37<sup>th</sup> week will be moderate. There are many causes of premature birth. To avoid such cases prediction and precaution is necessary. During active labor the uterine contraction signals are acquired is called prediction.

The most promising technique is Electro-hysterogram (EHG) [4]. Using EHG it is possible to detect uterine activity related to contractions during both gestation and active labor [6] [7]. At the time of pregnancy, EHG measurement has been proven to allow for accurate estimation of amplitude, frequency, direction and velocity of uterine contractions, even outperforming the diagnostic value of methods currently used in clinical practice [12]. In this the data is been collected from physionet databases it is clinically tested, feature is been extracted, once the feature is extracted neural network will be applied as a classifier to get the result.

## METHODOLOGY

In this paper there are three main component, data acquisition, features extraction, classifier. The aim of this paper is to predict an automatic method for preterm birth. In this MATLAB is been used to extract the features as well as for the classifier. Figure 1 shows the basic block diagram.



Fig: 1 Basic block diagram

## I. DATA ACQUISITION

The EHG signals recorded in this paper were downloaded from physionet database, which is included in term-preterm EHG dataset with tocogram (TPEHGT DS) the records are acquired since 1997 until 2005 at the department of obstetrics and gynecology, medical center Ljubljana Slovenia[9]. In this, the records are of 30-min and it comprises three type of channels i.e. non-pregnant, term and preterm. 20Hz is the sampling frequency, here it contain 300 EMG records from 300 pregnant women, selected from original database, 262 has full-term pregnancy, in which 143 records obtained before 26<sup>th</sup> week of pregnancy and 119 obtained later after or during pregnancy and 38 record of preterm birth and 19 record were taken before 26<sup>th</sup> week of pregnancy and

19 record where taken later after or during pregnancy [7]. For the records were assorted from abdominal surface using AgCl2 electrodes.

## II. FEATURE EXTRACTION

Feature extraction comprises of condense amount of data set. Feature extraction invokes morphological items from the documents to provide illustrative sample of that content. Features are special properties of input patterns that help in differentiating between the categories of input patterns. For detecting term-preterm birth, this feature extraction stage is an important stage, as the data acquired, features are extracted from each signal. The following features which will be extracted i.e. mean, RMS value, standard deviation, variance, maximum value, minimum value, entropy, cepstrum.

### 1. Mean

Mean is one of the oldest method, it describes entire data set with single value that specify mean of entire set. Mean can be calculated as the integral of function of one or more variables in the data set divide by the range of data set.

### 2. RMS Value

Root mean square also called as RMS value. It is another popular feature in EHG. In mathematical form derive average of constantly varying variables. It is also known as quadratic mean. It is defined as square root of mean square. The root mean square value of a set of values  $x_1 \dots x_n$ , is the square root of arithmetic mean of the square root of the values.

### 3. Standard Deviation

Standard deviation is a measure that is used to qualify the amount of variation or a set of data value [20]. It is the measure of dispersion of a set of data from its mean. Standard deviation is calculated because the root of variance by determinative the variation between every information relative to the mean.

Standard deviation is denoted by  $\sigma$

### 4. Variance

Variance measures the spread between numbers in data. It measures how far each set's number is from the mean. It is calculated by taking the difference between each number in the set and mean, squaring the differences and dividing the sum of the squares by the number of values in the set.

Variance is denoted by  $\sigma^2$ .

### 5. Maximum Value

The value of function which reaches the highest point is called maximum value of function.

### 6. Minimum Value

The value of function which reaches the highest point is called maximum value of function.

### 7. Entropy

Entropy measures the disarrangement of the system due to molecule.

### 8. Cepstrum

A cepstrum is understood because the results of taking inverse Fourier remodel (IFT) of the algorithmic rule of the calculable spectrum of the signal

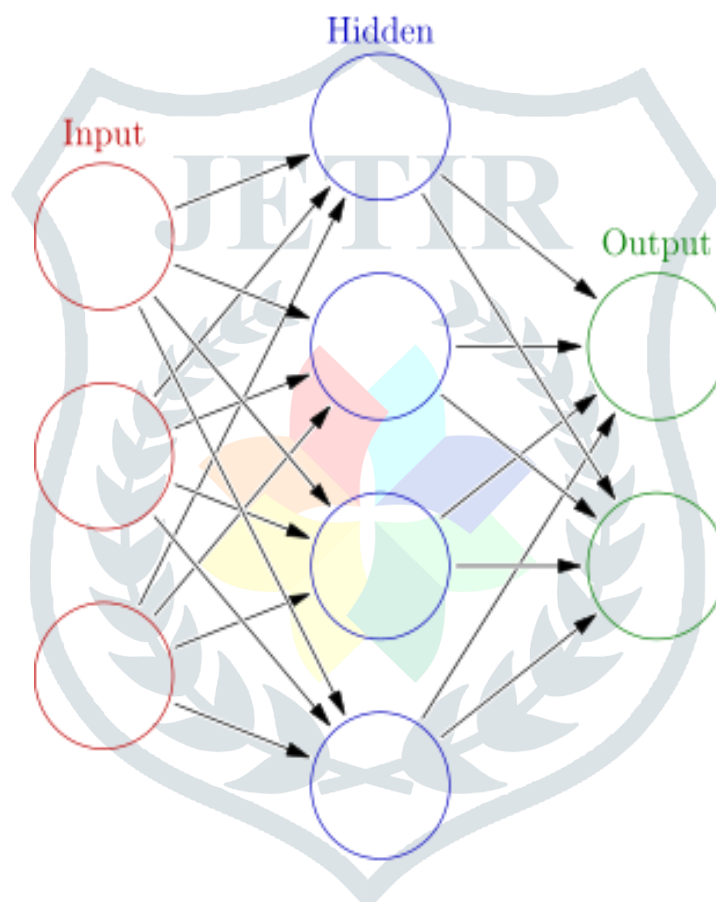
Sr. No	Features	Formulae
1	Mean	$\mu = \sum xP(x)$
2	RMS value	$x_{rms} = \sqrt{\frac{1}{n}(x_1^2 + x_2^2 + \dots + x_n^2)}$
3	Standard deviation	$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^N (x_i - \mu)^2}$ ; $\sigma$ : Standard deviation, x: individual data point, $\mu$ : mean of data points, N: Total numbers of data points
4	Variance	$\sigma^2 = \frac{\sum(x-\mu)^2}{N}$ ; $\sigma^2$ : variance, X: Individual data point, $\mu$ : mean of data points, N: Total number of data points
7	Entropy	$H(X) = \sum_{i=1}^n P(x_i)I(x_i) = - \sum_{i=1}^n P(x_i) \log_b P(x_i)$

8	Cepstrum	$ F^{-1}\{\log( F\{f(t)\} ^2)\} ^2$
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### III. CLASSIFIER

Classifier is an important step to determine non-pregnancy, term birth or preterm birth, and it is carried out using neural network. The classifier determines whether the signal is term or preterm. Neural is a system of hardware and software pattern which involves large number of processors operating in parallel and arrange in layers. Neural network is also called as artificial neural networks. Each neural unit is connected with each other. Each single neural unit computes using summation function. It is based on real numbers, with the value typically being a representation between 0.0 and 1. Here artificial neural network will be used to extract the features, and detect whether the signal is true or false.

#### Representation of Artificial Neural Network



### CONCLUSION

Premature birth is one of the most common problem of unhealthy babies and death all around the world. It is most dangerous problem in today's era, in accordance to use this technique, this gives us the indication of term or preterm. In this paper EHG signals are taken to detect term or preterm. Signals are taken from physionet database. For better result we have divided our work in three stages: Data Acquisition stage, Feature Extraction stage, Classification stage. Features are extracted using MATLAB. The result are fed into neural network classifier to determine whether pain is true or false.

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