

FETAL ACTIVITY MONITOR

TECHNOLOGY OWNER

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INVENTORS

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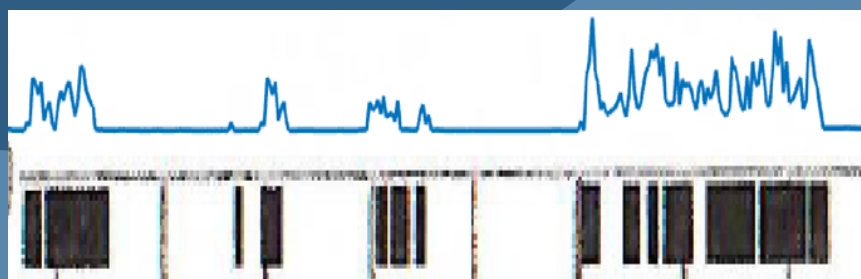
IPR STATUS

CZ patent application PV 2021-360
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STAGE OF DEVELOPMENT

Prototype testing in progress

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Background

Subjective monitoring of fetal movement activity of pregnant woman is simple and effective method to **verify physiological condition** of the fetus. Mother perceives the characteristics and frequency of fetal activity during the day throughout second half of pregnancy and is able to identify when fetal activity is present. By the time mother realizes that she no longer feels fetal activity or fetal heartbeat monitor refers an alert, it is usually too late and the fetus is dead (4 deaths per 1000 children born per year in Czech Republic). Despite comprehensive prenatal care of pregnant women, this number has not been reversed in the last 20 years. The aim of fetal movement activity monitors is to **provide monitoring of the fetal movement activity** (during the sleep and in case of certain doubts during the day) so that the pregnant woman visits the doctor in time whenever she suspects changes in natural characteristics of the movements in order to **prevent fetal death**. Fetal movement activity monitor seems to be a better option to monitor fetal health than fetal heartbeat monitors because whenever fetus doesn't feel well, **it reduces its movement activity first** while heart activity is still present or might not even be changed.

Description

A system of sensors placed under the mattress of the pregnant women was developed. The system is based on measurement of human body recoil movements **generated by heart contraction and pulse wave propagation through cardiovascular system**. The data obtained from the sensors were compared with the actograms of pregnant women (fetal movement activity records) obtained by the CTG (cardiotocography). The use of standard actogram is limited by the need for active involvement of the pregnant woman in the process of monitoring the physical activity of the fetus. This proposed system will make it possible to monitor the physical activity of the fetus **continuously, without the need for active involvement** of the pregnant woman and **regardless of whether the pregnant woman is asleep or awake**. Information about pulse arrival time is extracted after the preprocessing (small body movements and small changes in sensor position are omitted). Then time series of differences between pulse arrival times are prepared. Those time series are analyzed using multiple different methods such as spectral characteristics of time differences and/or convolutional neural networks. The graph shows a comparison of the output from the actogram (black curve indicating fetal movement activity) with calculated fetal movement activity detected by the sensors in the pad. From calculated activity is then possible to determine a threshold value above which the fetal movement activity is considered relevant. Further development would consist in optimizing the parameters of the algorithm to determine present movement activity in order to improve basic characteristics of the method, sensitivity, resp. specificity, which is now 80%, resp. 60%.

Advantages

- **Simple and easy to use:** Non-wearable- Homecare / Medical facility use
- **Automatic evaluation** giving an information when the last sufficiently intense activity of the fetus occurred after about 15 minutes of measurement
- **CE mark** (ČSN EN 61326-1 ed.2:2013)

This device is intended to be used by all pregnant women (with physiological or pathological pregnancies) either for **non-medical home care area** or as a **medical device** class Im for monitoring fetal activity.

