



Integrated biomedical information for better health



FETAL HEART RATE VARIABILITY INDEX AS A PARAMETER FOR HOME MONITORING NETWORKS

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Research objectives

- Registration of fetal heart rate and estimation of stress;
- Calculation of fetal condition diagnostic index;
- Monitoring of the selected diagnostic index throughout the gestation, labor and neonatal period;
- Capability of transmitting the monitoring parameters over the network



Challenges

- Individual distribution of the FECG signal along the abdomen surface;
- Choice of a unique parameter for the fetal monitoring during gestation, labor and neonatal period for complex diagnostics;
- Compatibility and safety of data transmission

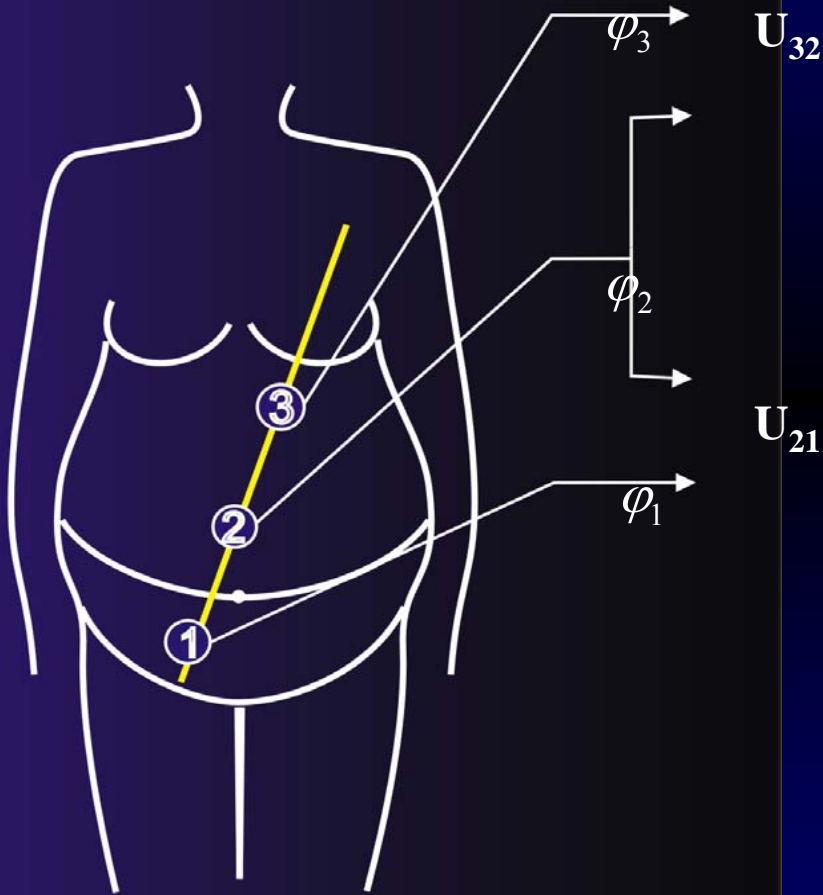


System design

- Fetal ECG (FECG) acquisition system (covers monitoring during 16-39 weeks of gestation);
- In-labor pulse oximetry using a fetal sensor;
- Neonatal pulse oximetry using a peripheral sensor

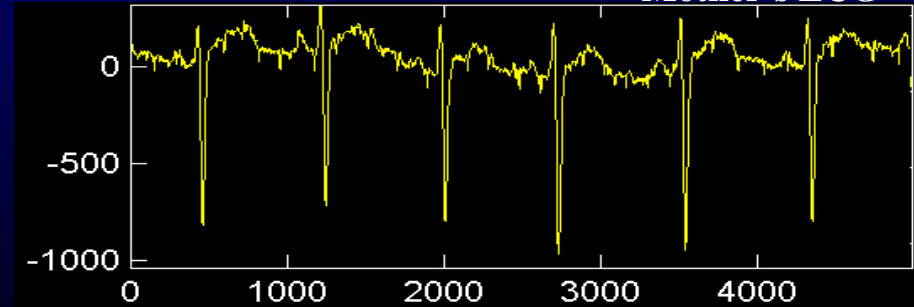
Each of the three components allows to calculate the same diagnostic indice

FECG leads positioning:



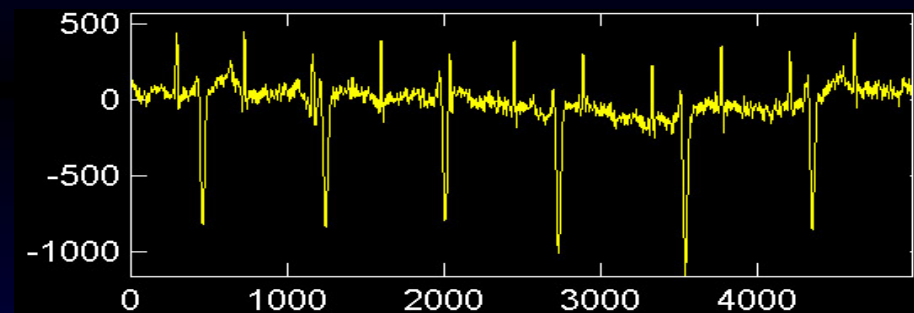
$$U_{32} = \phi_3 - \phi_2$$

Mother's ECG



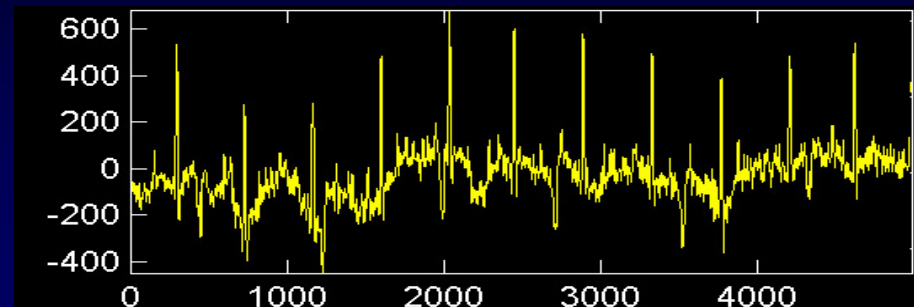
$$U_{21} = \phi_2 - \phi_1$$

Mother's + fetal ECG

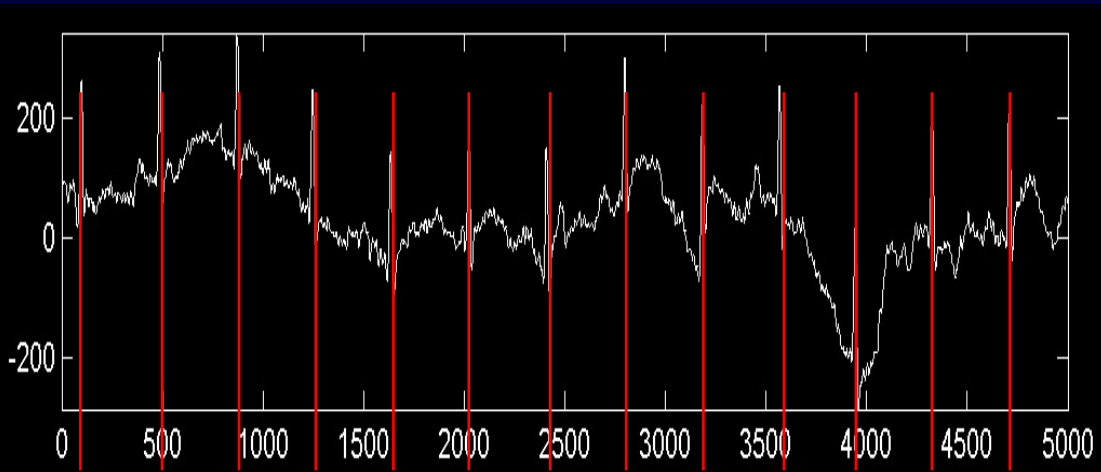


$$U = U_{21} - U_{32}$$

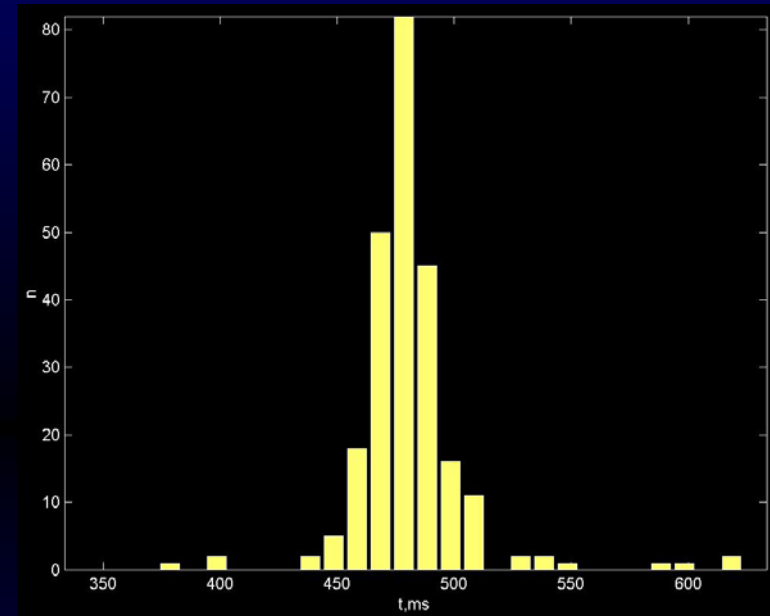
Fetal ECG



Monitoring data interchange using network



Fetal abdominal ECG signal
(duration 5 sec, sampling at 1000 Hz)



KI distribution histogram

TINN = 52 ms

TCP/IP



Medical information center



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Innovative Aspects

- Development of home monitoring system for the pregnant;
- Building up a diagnostics base for further clinical treatment of the same patient;
- Reduction of involvement of medical service provider;
- Consistent diagnostics and patient surveillance during prenatal and postnatal treatment.



Results

- FECG acquisition system;
- Development of real-time algorithm for calculation of diagnostic index;
- Clinical evaluation of the system performance



Proposal for partnership

- Development of front-end interface for the medical professional and patient;
- Finishing of the system as a standalone device;
- Preproduction sample design;
- Market investigation



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