

Sport training system based on ECG monitor

Evgeny Stankevich

Yaroslavl State University

Target user

High motivated for sport achievements sportsman.

High motivated sportsman:

- Uncertain subjective health assessment
- Often underestimate real drill training load



Over training

Sportsman

- Feels tired
- Wants to stop training

Eventually it leads to decreasing his training productivity

Over training can lead to:

- Cold diseases
- Immunodeficient
- Withdrawal from the sport



How to prevent the over training?

Track functional state

Functional state:

- Determine level of organism vital activity
- Response for physical drills load



How measure functional state?

The most used functional state index is Heart Rate Variability (HRV)

Heart rate regulation:

- Rhythmic pacemakers activity
- Modulating effect of vegetative nervous system

Analysis of heart rate can allow to assess how well organism systems work



HRV scores parameters

Time domain parameters

- SDNN - the standard deviation of NN intervals
- RMSSD - the square root of the mean squared difference

Frequency domain parameters

- Total spectrum power (up 0.4 Hz)
- Low frequency power (0.04-0.15 Hz)
- High frequency power (0.15-0.4 Hz)
- LF/HF ratio



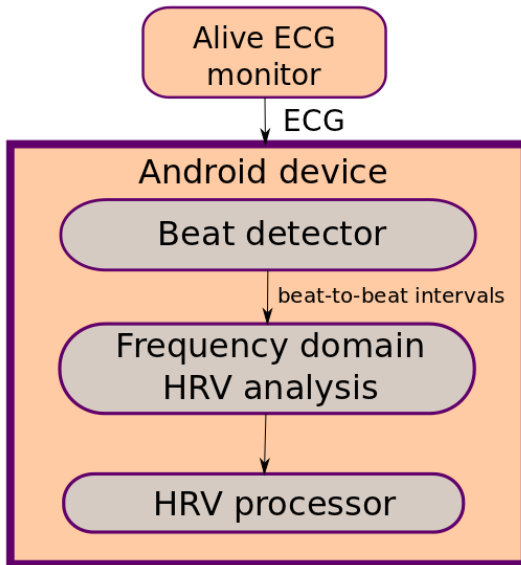
What is this system for?

The main purposes:

- Prevent fatigue
- Determine over training in early stages



System components



Functional state determination rules

Normal state

Unnormal state

Measures values for normal state

- Total spectrum power > 3000
- Low frequency power > 500
- High frequency power > 500
- LF/HF < 1



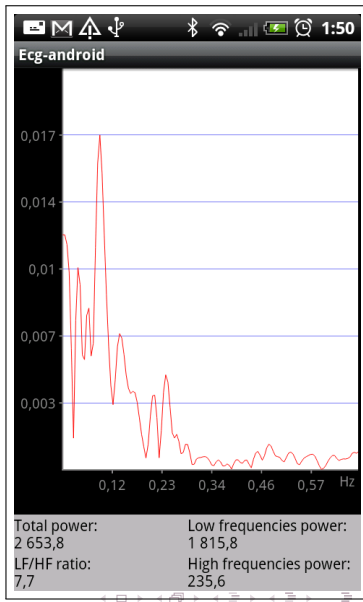
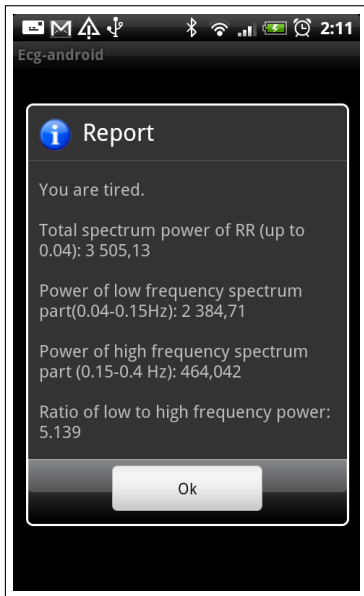
Functional state test

To make test user should:

- Attach ECG monitor electrodes to the body
- Lie horizontally and relax. Push the start button
- After 5 seconds user will hear beep sound. It means he has to not move.
- At the end of test system will play the same sound again and give report.



System in action



Feature proposal

- Support for other HRV measure and analysis approaches
- Support for other HR data source (oxymetry devices or using phone camera)
- Dynamic HRV tracking during exercises