HRV analysis by Acti4

By checking the option 'HRV analysis' in the Setup menu, Acti4 calculates a set of HRV parameters for 5 minutes intervals. The output from the analysis are not included in the standard output by Acti4, but saved in a separate file (csv) selected by the user.
Each interval from the setup file is divided into fixed 5 minutes interval with the start times (HH:MM) 00:00, 00:05, 00:10, ..., 23:55.
Frequency analysis can be done by two methods: Robust period detection (RPD) or Fast fourier analysis (FFT). FFT runs much faster than RPD, but is more sensitive to ectopic beats and artefacts. The RPD method is documented in: Skotte JH and Kristiansen J: Heart rate variability analysis using robust period detection, BioMedical Engineering OnLine 2014, 13:138.

Filtering of raw heart rate data (RR intervals) are based on the procedure of Kubios (www.Kubios.com, Kubios_HRV_Users_Guide.pdf, 2016-2019, Premium procedure, pp. 11-12) with some minor adjustments and amendments.

The output file made by the HRV analysis includes the variables:

LbNr: Subject identification number (5 digits)
Type: Type of interval
Date: Date of 5 minutes interval (dd:mm:yyyy)
Start: Start time of 5 minutes interval (HH:MM)
N5: Integer specifying start time (1,2,...,288, an alternative specification of 'Start')
OffThighPct: Percentage of time with thigh accelerometer off
OffTrunkPct: Percentage of time with trunk accelerometer off
LiePct: Percentage of time in lying position
SitPct: Percentage of time in sitting position
StandPct: Percentage of time standing still
AllMovePct: Percentage of time for move, walk, run, stairs, cycle and row
UprightPct: Percentage of time for stand, move, walk, run, stairs, cycle and row
Steps: Number of steps
TrunkMove: Range of trunk angle (max-min, degrees)
Nbeat: Number of heartbeats
BeatErrPct: Percentage of time with erroneous beats
Stationarity: p-value for test of equal variance in 5 one minute intervals (Brown Forsythe)
AVRR: Mean value of beat to beat intervals (ms)
RMSSD: Root mean square of successive differences
SDNN: Standard deviation of beat-to-beat intervals
pNN50: Proportion of adjacent beat-to-beat intervals differing more than 50 ms
Ptotal: Total power in the frequency range $0.003<f\leq0.5$

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VLF: Power in the frequency range $0.003<f\leq0.04$
LF: Power in the frequency range $0.04<f\leq0.15$
HF: Power in the frequency range $0.15<f\leq0.4$
VHF: Power in the frequency range $0.4<f\leq0.5$
LF/HF: LF to HF ratio
LFnu: Ratio of LF to sum of LF, HF and VHF
HFnu: Ratio of HF to sum of LF, HF and VHF

If BeatErrPct exceeds 50%, no calculation of HRV parameters are done.