HRVtool V1.0Internal English preview release (Feb. 2002)

This package contains the English language version of the software which was originally developed for our own investigations to determine fractal heart rate variability parameters from recorded ECG-signals.

This is just a preliminary, though stable release, without comments on the code and without any warranty or support.

A COMMENTED VERSION WITH MORE DETAILED USERS GUIDE WILL BE RELEASED ON THIS WEBSITE EARLY APRIL 2002. REGISTERED USERS WILL GET INFO ON THIS UPDATE.

System requirements:

This software was tested on the following configurations:

- PIII 450 MHz/W98/128MB RAM
- Celeron II 600MHz/W2K&WinXP/640MB RAM

It might work with any system capable to run Matlab v5.2, however YOU MIGHT NEED TO USE the Matlav v5.2.1 updater for compatibility with the GUI. As ECG-data can be really large at least 128MB RAM is recommended, the more the better.

Legal matters:

This program is written by **Lajos R Kozak** MD, MSc Biomed. Eng. The fractal analysis parts are developed and coded by **Peter Herman** MD, **Andras Eke** MD, PhD, and **Lajos R Kozak**, see detailed information in file headers.

This program is provided for free use for research purposes as long as the readme files provided with the code are intact, and if the following reference is cited in any publication for which this software or any derivatives of it is used, and a reprint is sent to Dr. Andras Eke, Institute of Human Physiology and Clinical Experimental Research, Semmelweis University, Ulloi ut 78/A, H-1082, Budapest, Hungary.

A Eke, P Herman, L Kocsis and L R Kozak (2002) *Fractal characterization of complexity in temporal physiological signals*, Physiological Measurement, Vol. 23, R1-R38

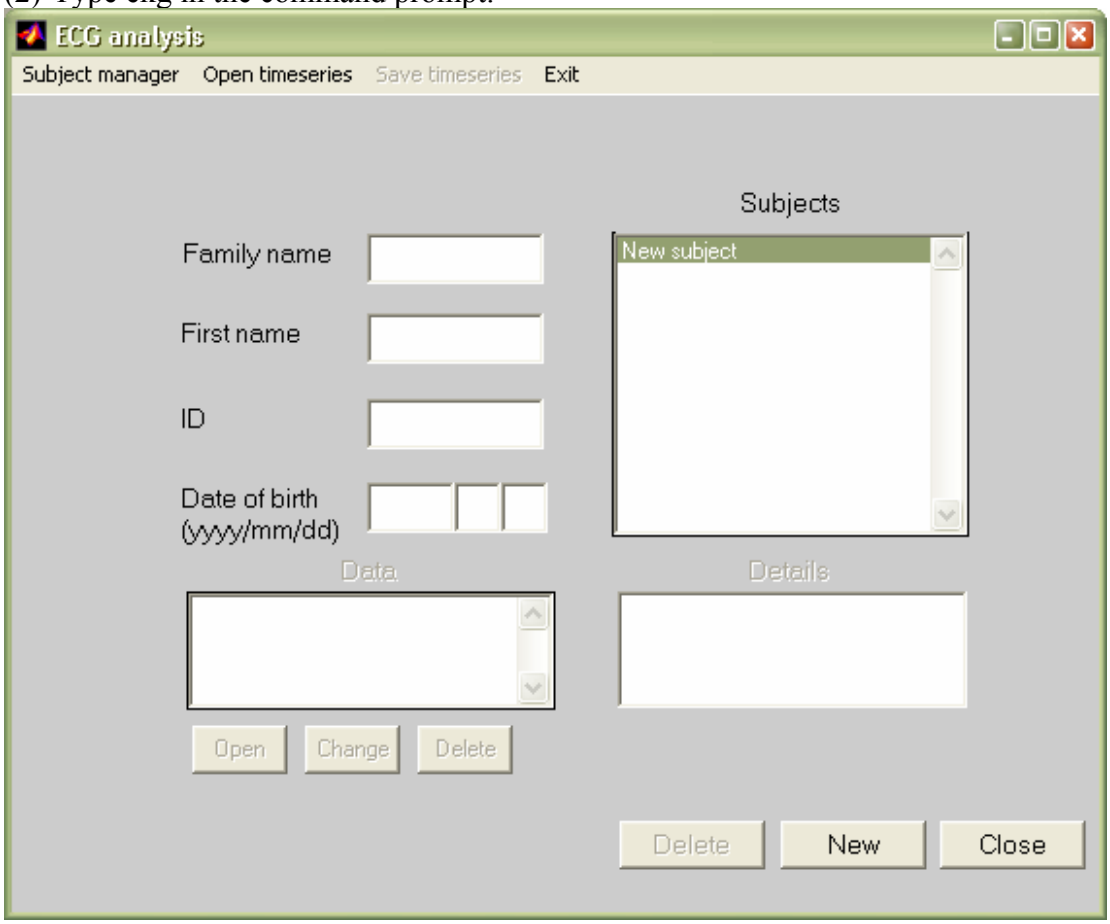
Commercial software development based on this code is not allowed without the copyright holders consent.

Usage instructions:

Installation:

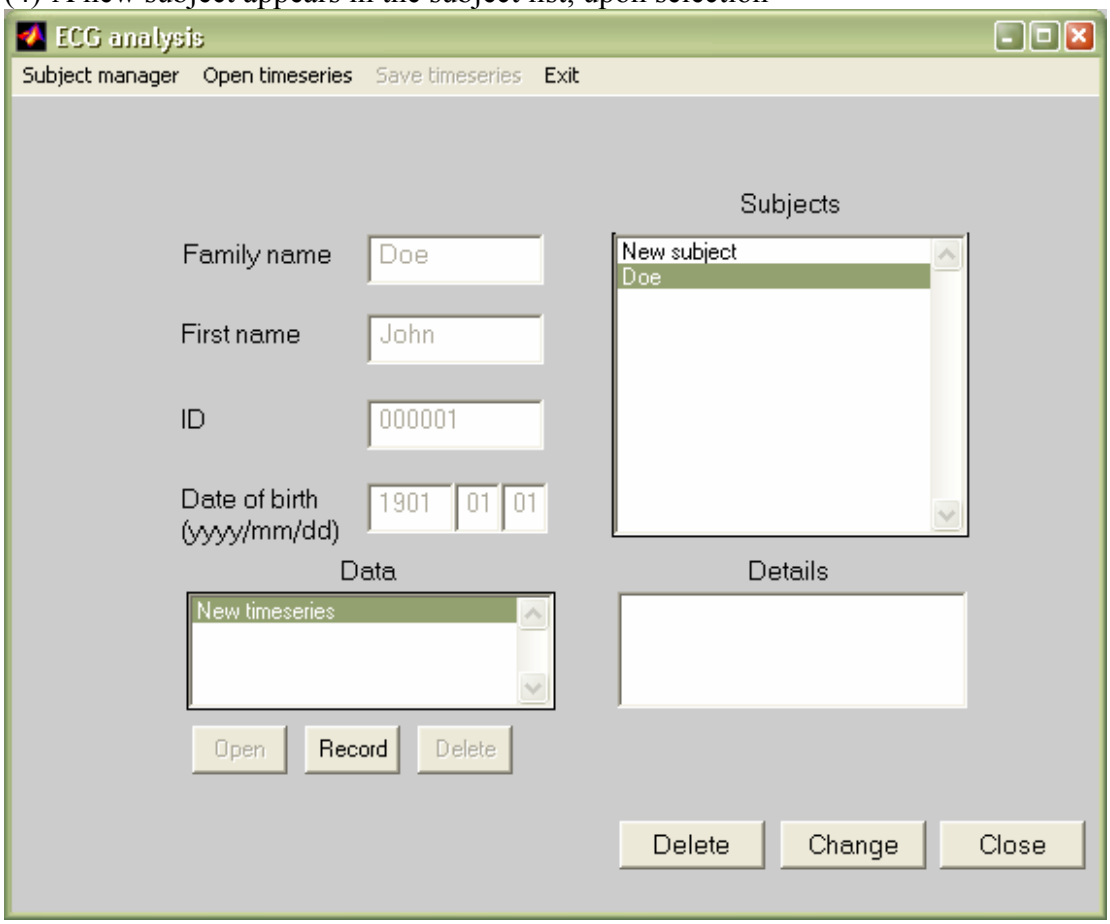
(1) Copy the contents of prog and frac subdirectories in a common directory and put this latter in Matlab's path.

(2) Type ekg in the command prompt.



(3) Fill in the subjects details (name/id/birthday) and press new

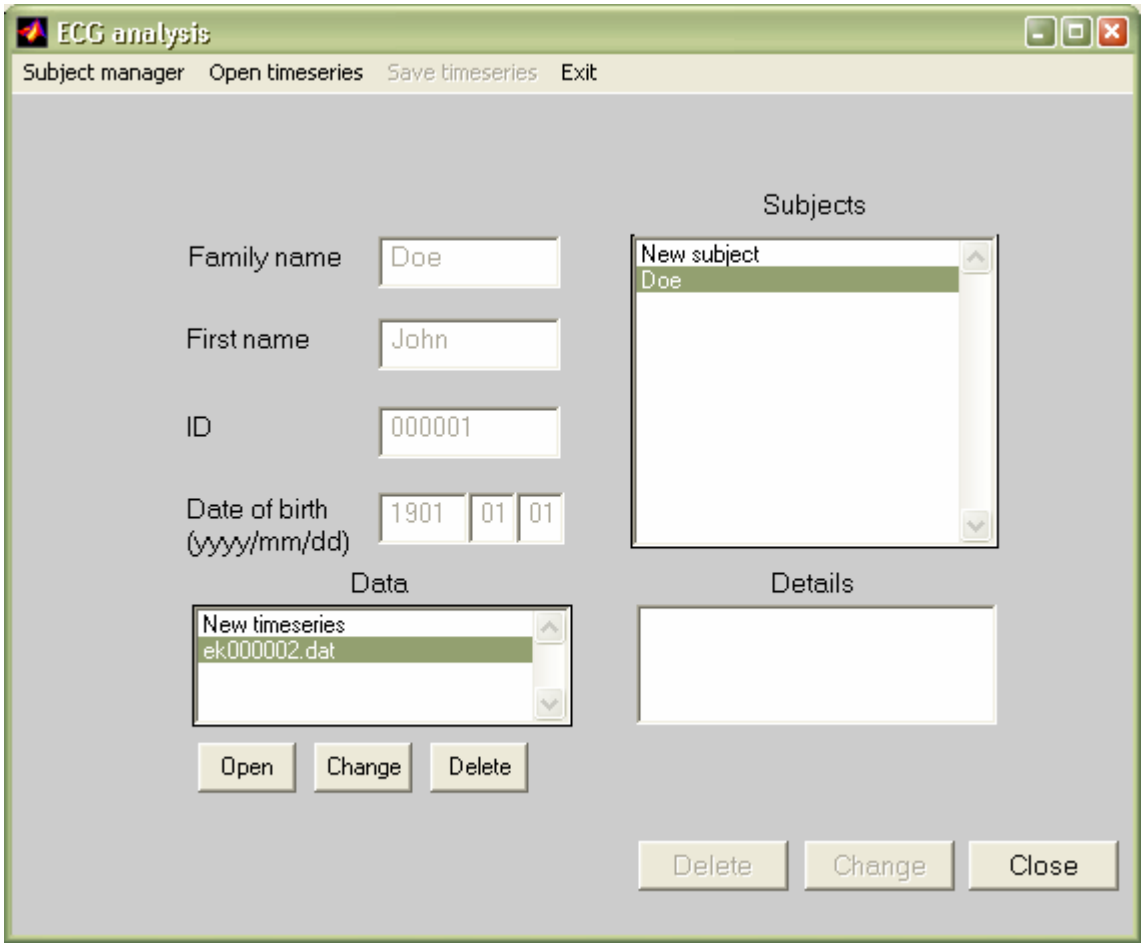
(4) A new subject appears in the subject list, upon selection



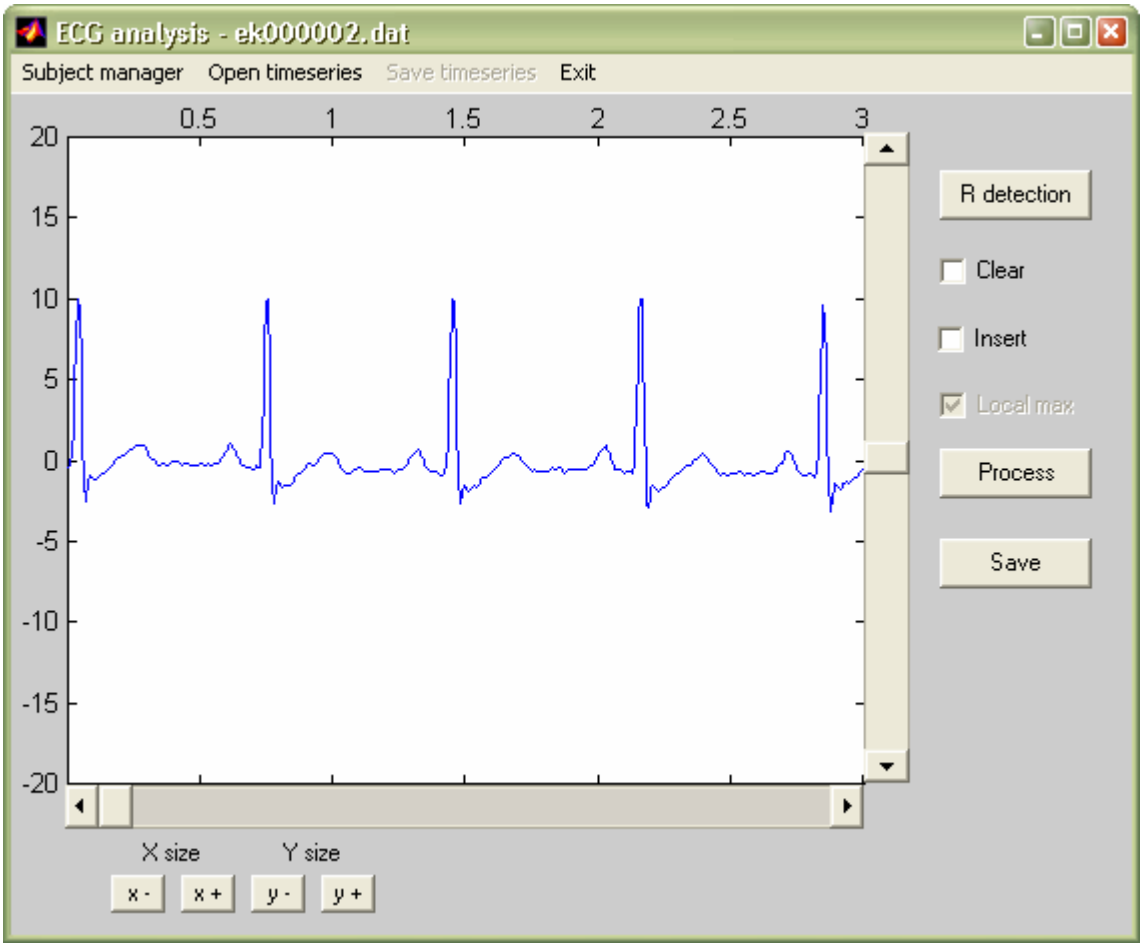
(5) Pressing the record button a new time series can be added to the patient's records.

LIMITATION: The raw ECG data shoul be in a Matlab (.mat) file recorded under variable name TS, and it shold be in 1xn vector format. To date no ascii import is possible. However this can be done manually in Matlab in the following steps:

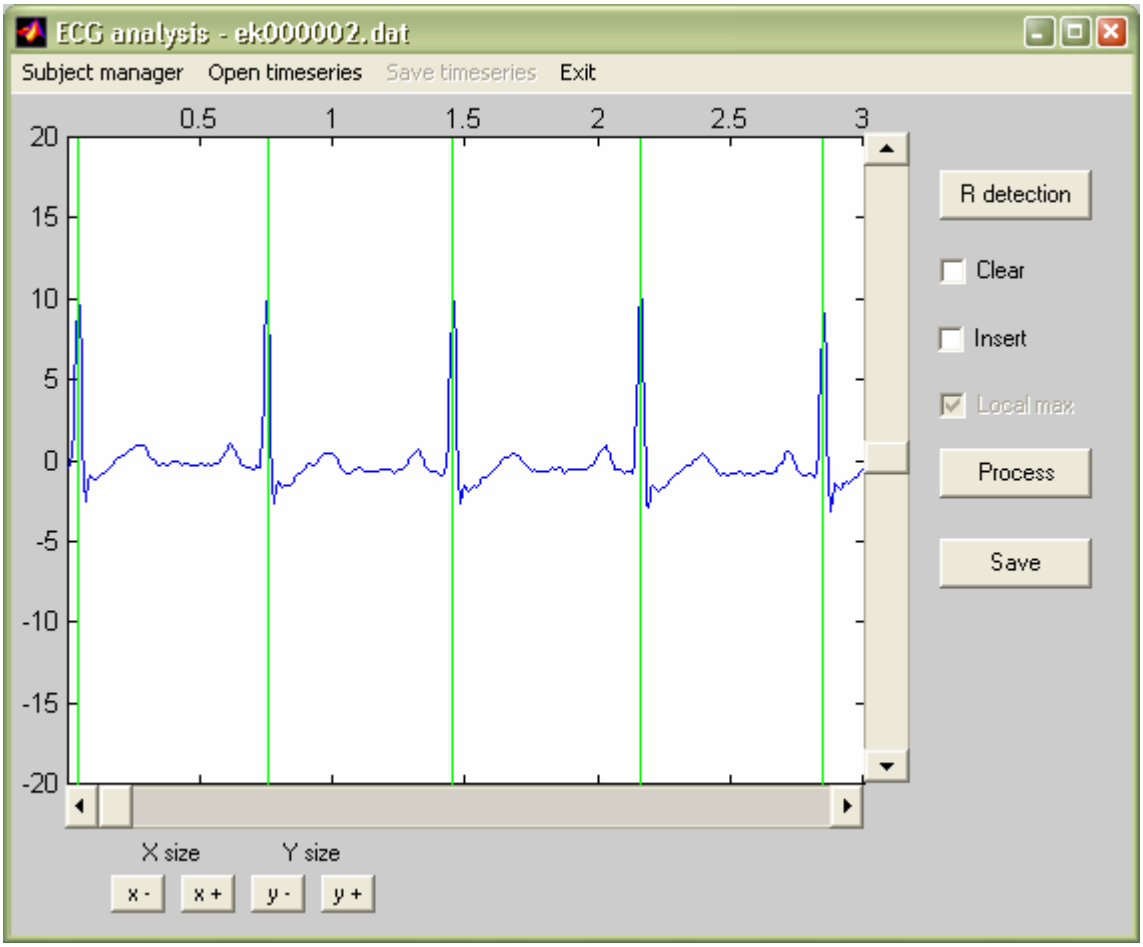
(a) If the data is in mydata.txt, type `load mydata.txt -ascii`, then
(b) type `TS=mydata`
(c) type `size(TS)` , if the first number of the result is 1 go to step (e)
(d) type `TS=TS'`
(e) type `save filename TS`, then filename.mat is created



(6) Pressing open opens the ECG for R-peak detection:



(7) The X and Y size buttons are for changing the plot parameters, R detection button is for automatic R-peak detection based on Friesen GM, Jannett TC, Jadallah MA, et al., *A comparison of the noise sensitivity of nine QRS detection algorithms*. IEEE Transactions on Biomedical Engineering, 1990. **37**(1): p. 85-98.



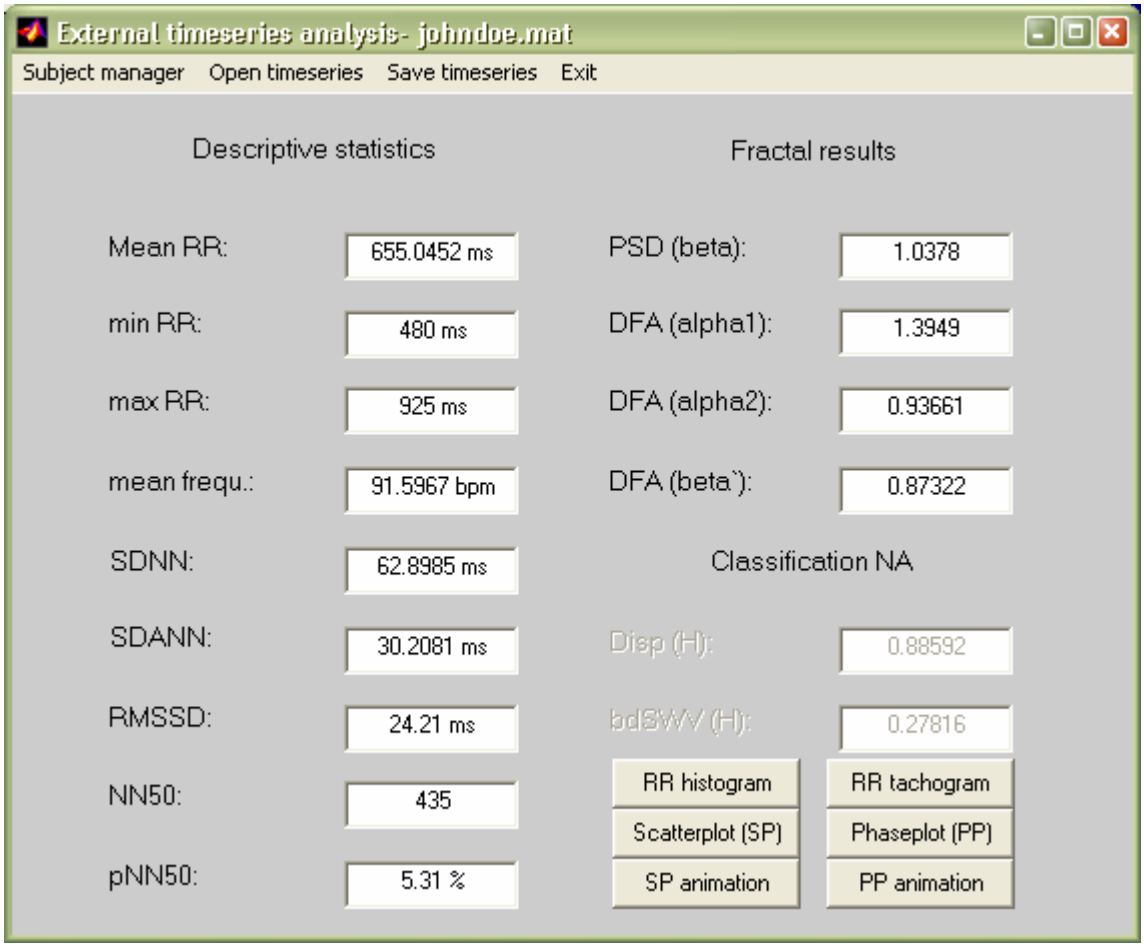
(8) Using the clear/insert checkboxes markers can be inserted or deleted. Insertion can even be done with the help of a local maximum finder algorithm

(9) Pressing the save button provides opportunity to save the annotated time series.

(10)The process button leads to fractal analysis of the time series.

LIMITATION: Due to the fact that the performance of fractal analysis degrades on shorter timeseries, the minimal acceptable length of data is 8192 points. However on longer series, only the middle 8192 points are used for analysis.

NOTE: Using the open timeseries option on the menu bar provides opportunity to open any timeseries for fractal analysis, WITH THE LIMITATION PRESENTED IN (5). However the fGn/fBm discrimination is optimized for the length of 8192, so on longer series the discrimination doesn't improve as it would be anticipated.



(11) If the classification possible, the class is determined, and a class specific method is used for estimatin Hurs-coefficient. The RR histogram / RR tachogram / Scatterplot / Phaseplot / SP animation/ PP animation buttons are for graphical data representation. For the simulated phaseplot and its animated version Matlab's cubic spline interpolation is used.

An example of a phaseplot: