Library for Managing and Processing ECG Signal Data: Design and Implementation in Delphi and C#

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Software development of systems for displaying and analyzing ECG signal data is often very repetitive because they generally consist of the same modules: acquire, display, filter, detect QRS, make measurements and propose an interpretation or diagnosis. That's why it's necessary to design a way to group and make easy to reuse the functionalities of these modules. The aim of this paper is to present the design of a class hierarchy for working with ECG signal data, and its implementation, using Delphi and C#. The base classes are: TFileHandler, TProcessor and TECGBrowser. TFileHandler is use as base in many classes for managing and processing very large ECG files and other related data, as QRS, Rhythm Event and ST segment information, which allow to create, read, write, sort, and perform searches and other specific operations on these files, having very small access times and improving the systems performance. Other classes were developed, using as base the TProcessor class, for detecting QRS complexes, making rhythm analysis, filtering, classifying and ST segment processing, allowing placing the process execution code on a different thread and maintaining a continuous feedback of the progress. On the other hand the TECGBrowser class has all the properties and methods needed to display an ECG on screen: the signal itself, different marks, any kind of grids and text labels. All of these classes became a library which was used in the development of three systems: a holter, a rest ECG study system and other for remote acquisition and diagnosis of ECG. The development times were reduced in a high percent comparing with the older versions, and results are very homogeneous, consistent and nowadays are working with good results. This library helps developers and investigators to focus their efforts on the main goal of their research, having the basic issues solved.