

"Development of on-line ECG analysis and interpretation services based on well-established interoperable ECG formats"

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Data format is an inherent part of the database and both impose standards on clinical procedures specifying the relations of electrical signals, their digital representation and their corresponding diagnostic outcome. The description of physiological parameters contains data of various origins (time sequences, text, still images, movies and audio) and the format has to support such diverse data. The existence of well-established common formats is of paramount importance to the patients because the examination possibility is no longer limited by the health center or by the equipment manufacturer.

The joint representation of signals with the medical knowledge was the principal area of applications for the early databases. Except for worldwide recognized standards as MIT-BIH Arrhythmia Database (issue 3, 1993) and the CSE Multilead Database (1990), many other databases resulted from clinical trials performed in the leading research centers. Currently these databases are used for training of cardiology students as well as for tuning and validating the software.

Currently the ECG processing should be standardized beyond the input and output points. Some similar ideas were already concerned as "open source" processing subroutines and published in several textbooks on biomedical signal processing or conference papers. Unfortunately, the open source software may be subject to custom modifications, which are a potential source of quality loss. Another drawback is the lack of flexibility for specific applications (medical research or teaching) and the need of download-installation-modification-validation sequence involving computer science specialists and considerable cost unless it leads to computation errors, misinterpretations of the results and ends in an erroneous conclusion.

The proposed alternative is an extension of the database to the Knowledge Space (KS), which integrates the signal with medical annotations as well as the information technology-based methods of data interpretation. The KS is accessible for wide range of medical researchers over the Internet and its main purpose is to provide a choice of the most recent interpretation methods. The server interface is able to perform the requested computation on the uploaded user data and to return the result without the disclosure of the software code. Instead of download or installation, the code is ready to use in multiple asynchronous threads remotely launched and controlled by the users via limited set of options. Any modern graphic-based web browser is suitable as user interface if only supports user file transfer, the selection of methods and options and the presentation of the results. The transfer of computation results as a file is also under consideration, making support for text interface-based terminals. The graphics may be then reconstructed from the file in the vector format more suitable for publishing for its unlimited quality.

The user manual and the knowledge guide are provided in HTML format and contain links to the original papers. Although the medical library is not the main function of the KS server, the collection of publications provides the medical researcher with the most appropriate knowledge facilitating the preparation of the experiment and the right choice of data processing method and options.

The remote computation service combines the software accessibility and flexibility with the quality control. The procedures are reliable and their use respects the intellectual property rights. Therefore anyone (individuals, universities, commercial manufacturers) may contribute to the KS in the future. All contributions subject the validation procedure and assessment by the International Scientific Committee in order to guarantee the representation of the state-of-the-art. The KS is supposed to get soon wide recognition in centers of medical research confirmed by its impact in the development and standardization of electrocardiology. Thanks to the independent validation, the contribution to the KS may be considered as corresponding to a scientific paper.

