Chapter V
General Idea of the Proposed System

After an introduction and three chapters highlighting the present state of the art in computerized electrocardiography (Chapter II), methodological issues of medical and technical nature (Chapter III), and electronic management of medical data storage and exchange (Chapter IV), this chapter is a midway summary. This book might end here if it were a review of present achievements of tele-medical solutions in cardiology.

Fortunately, we are not only witness to the progress, but are also involved in the development of ubiquitous cardiology, so we want to share our ideas, realizations, and results of the research. The review made in previous chapters was not intended to cover the whole domain of computerized cardiology and it does not fulfill such a role. The presentation was done subjectively with a purpose of making foundations for our proposal of an intelligent tele-medical system whose several prototypes were conceived during the last few years. Being bioengineers in our hearts, we are particularly involved in observing nature in its systematic solutions and considering the medical, technical, and sociological observations based on bio-cybernetics.

Having in mind the main goal of technological support for medicine and not challenging current achievements, we observe a significant discrepancy between human and computer ways of “thinking.” The example is the development meth-
odology for ECG interpretive software. The outcome of the software under test is compared with the cardiologist outcome, and if the convergence is stated for a limited learning set, it is commonly assumed that the result will be of the same quality for any unknown input signal. Our approach would prefer the software that closely mimics the cardiologists’ reasoning. Nevertheless, this cognitive process is hard to extract and is influenced by the standardization of medical procedures. This is in turn driven by the algorithmic approaches close to contemporary computer programs. The first novelty of our proposal, probably hardly accepted, is that we propose the collaboration with doctors not only as advisory experts but also as subjects of our experiments. We hope to be well understood: similarly to the doctor not relying only on the interview and ordering additional examinations, we assume that nobody is able to formulate his or her way of reasoning objectively, and we use various methods of human behavior assessment to discover principles of the data processing during the visual interpretation of the ECG by an expert.

Another novelty of our approach is the use of agile software in the interpretation process. The software may be freely customized by the supervising process in order to provide optimal diagnostic descriptions of the patient. Current systems all use rigid software. Once programmed by the manufacturer, the executable code is only read from the memory and the interpretation flow is the same disregarding sex or race; the only factor sometimes considered is the age of the patient. Consequently, the interpretation process issues many diagnostic parameters not relevant for a particular patient, in order to minimize the risk of missing data. The agile software follows the patient, ‘gets accustomed’ to his or her features, and is aware of the signs of diseases he or she is suspected of.

The third novelty that should be mentioned is the measurement and use of various relevance coefficients of particular diagnostic parameters. It seems to be obvious and particularly dependent on patient status that some sections of the recorded signals and some variables in the diagnostic outcomes are more important than others. According to our knowledge there is no method to measure and quantify optimal patient description and even doctors’ preferences reported previously in the literature.

The technical feasibility of that idea is proven in the chapters that follow. However, its implementation in a wide-sense clinical or home care practice is not very easy because we reveal some unexploited areas that require research. Therefore this chapter ends with suggestions on possible medical investigation areas whose result would be welcomed in development of artificial intelligence-based applications for medicine.
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