

The database of the cardiovascular system related signals

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Abstract. The poster presents the design and development of a signal database used for the determination of hemodynamic parameters. The signals from the database are used for the evaluation of new algorithms determining hemodynamic parameters. The signal database consists of synchronously obtained independent signals – the records of oscillometric pulsations, the records of electrocardiograms (ECG) and the records of photoplethysmogram (PPG). Currently the signal database consists of signals from about 65 persons. The signals were recorded from persons in wide age range from 19 to 94 years. The signals were stored anonymously, but each set of signals was labeled by the ID number and the anamnestic data.

Keywords: hemodynamic parameters, oscillometric signals, electrocardiography, photoplethysmography

1 Introduction

The poster presents the design and development of a signal database used for the determination of hemodynamic parameters. The database is designed as a set of signals synchronously obtained using our own medical device. The signals from the database are used for the evaluation of new algorithms determining hemodynamic parameters. The aim of the research is to design new methods for primary screening of atherosclerosis based on the strictly non-invasive methods and without need to use advanced imaging methods.

2 Signal Database

The signal database consists of synchronously obtained independent signals – the records of oscillometric pulsations obtained with the arm cuff (the pulsations were obtained both during inflation and deflation of the cuff), the records of electrocardiograms (ECG) obtained by three leads system (three electrodes

for measuring signals from Einthoven triangle and the electrode placed on the right leg for the noise reduction) and the records of photoplethysmogram (PPG) obtained using the plethysmography sensor placed on the index finger.

Currently the signal database consists of signals from about 65 persons. The signals were recorded from persons in wide age range from 19 to 94 years, typically from the students of the university and from elderly persons in one of the Prague's senior houses. The signals were stored anonymously in the database. Each set of signals was labeled by the ID number and the anamnestic questionnaire labeled with the same ID was filled in with the measured person. The probands were asked for the age, sex, weight, height, life style, prescribed medications, smoking and related anamnestic data (hypertension or hypotension, diabetes, cardiovascular illnesses, respiratory illnesses etc.). Before the measurement each person was instructed about the method of measurement and about the aim of the research and subsequently the informed consent was signed.

3 Conclusion

The complex signal database of oscillometric signals, ECG and PPG signals has been created. The database consists of unique clinical data which have not been collected previously. The database is mainly intended for the research in the field of hemodynamic parameters and the primary screening of atherosclerosis. The signals from the database will be used for the evaluation of the algorithms developed for prediction of cardiovascular diseases. Several hemodynamic parameters such as pulse wave velocity (PWV), arterial stiffness index (ASI) or cardio-ankle vascular index (CAVI) will be determined using the signals.

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References

1. Lopes, A.A., OLeary, P.W.: Measurement, interpretation and use of hemodynamic parameters. *Cardiology in the young* 19(Supplement S1), 8 (2009), <http://dx.doi.org/10.1017/S1047951109003886>
2. National Heart, L., Institute, B.: What is atherosclerosis?, <http://www.nhlbi.nih.gov/health/health-topics/topics/atherosclerosis/>
3. Tholl, U., Forstner, K., Anlauf, M.: Measuring blood pressure: pitfalls and recommendations. *Nephrology Dialysis Transplantation* 19(4), 766 (2004)