Data Descriptor

Educational Dataset of Handheld Doppler Blood Flow Recordings

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Abstract

Vital signals registration plays a significant role in biomedical engineering and education process. Well acquired data allow future engineers to observe certain physical phenomena as well learn how to correctly process and interpret the data. This dataset was designed for students to learn about Doppler phenomena and to demonstrate correctly and incorrectly acquired signals as well as the basic methods of signal processing. This paper presents three corresponding datasets consisting of 21 recording of signals acquired from the neck area with USG gel applied and 21 distorted recordings acquired without gel.

Keywords: Doppler; biosignals; education

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Specification table (data records)

Subject area	Biosiognals processing
More specific subject area	Education on biosignals processing based on audio recordings
Type of data	raw recordings time series time-frequency domain
How the data was acquired	Three data sets were created, a dataset containing RAW recordings from a portable Doppler blood flow detector, a dataset containing the time series representation of the recorded signals, and finally a dataset containing the time-frequency representation of the recorded signals.

Data format	“.wav” (raw recordings) “.csv” (time series) “.jpg” (time-frequency domain)
Data source location	MOST Wiedzy Open Research Data Catalog, Gdańsk University of Technology, Gdańsk, Poland
Data accessibility	CC BY-NC

Background

Handheld Doppler allows blood flow to be measured and the heart rate to be assessed. In comparison to other medical devices (such as electronic fetal monitors) these devices are easy to operate. It was observed that a handheld Doppler monitor causes less maternal discomfort than the Pinard foetal stethoscope and therefore its reliability is being evaluated for foetal heart rate monitoring (Kamala et al., 2018), (Dyson, Jeffrey and Kluckow, 2017), (Byaruhanga et al., 2015). The simplicity and availability of handheld Doppler monitors makes it a good source of vital sign measurements.

Vital signals registration plays a significant role in the biomedical engineering and education process. Medical professionals rely on valid and reproducible information for their clinical assessments. The validity of the measurement reflects the ability to provide information on the assessed value of real phenomena, while the reproducibility refers to the ability to perform repeated measurements of the phenomenon (Fletcher R., Fletcher S. and Fletcher G., 2012), (Worster et al., 2003). Well acquired data allow future engineers to observe certain physical phenomena as well learn how to correctly process and interpret the data. However, data processing and data acquisition often require different sets of skills. Biomedical engineering professionals should be well trained in data processing. Therefore it is crucial for their education to provide reliable data recorded in a control environment. It reduces potential distortion within the data that can appear during data recordings.

Methods

The data were acquired by means of a portable Doppler blood flow detector. Utilised device allows a fast assessment of blood flow in the peripheral vessels to be performed, including in a patient with a weak pulse. The used device was equipped with a universal 5 MHz ultrasound probe. The data were recorded from the neck area with and without gel. The raw signals were recorded through line-in input/output with a 22050Hz sampling rate. These data were recorded for educational purposes and are intended for biomedical engineering students and students interested in data science. The sole purpose of these data is to demonstrate the difference between correctly and incorrectly recorded data and to show basic signal processing methods.

Data records

This data set was designed for students to learn about Doppler phenomena and to demonstrate correctly and incorrectly acquired signals. Three data sets were created, a dataset containing RAW recordings from a portable Doppler blood flow detector, a dataset containing the time series representation of the recorded signals, and finally a dataset containing the time-frequency representation of the recorded signals. This dataset contains a visual representation of the performed analysis. The files are stored in '.jpg' file format. The length of each window segment was set to 200; overlapping was introduced. The overlap between windows was set to 120.

The first dataset contains the raw recording. Each recording contains 20 seconds of well established signal. The whole set consists of 21 recording of signals acquired from the neck area with USG gel applied and 21 distorted recordings acquired without gel. The raw data are stored in .wav file format.

The time series are stored in .csv file format. Samples are separated with commas (the ',' character). The time-frequency analysis has a graphic representation stored in .jpg file format.

The exemplary wave form representation is presented in Fig. 8.1 while Fig. 8.2 shows its time-frequency analysis.

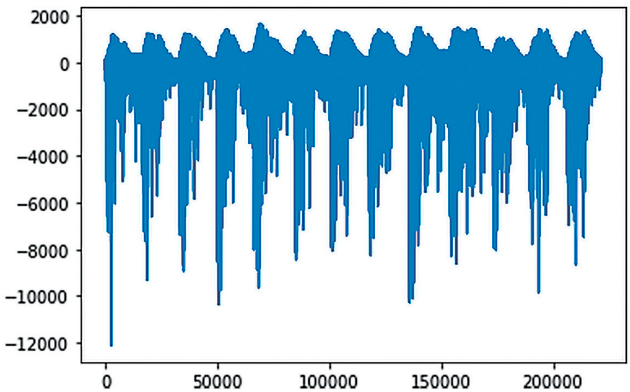

Fig. 8.1. Waveform of exemplary recording

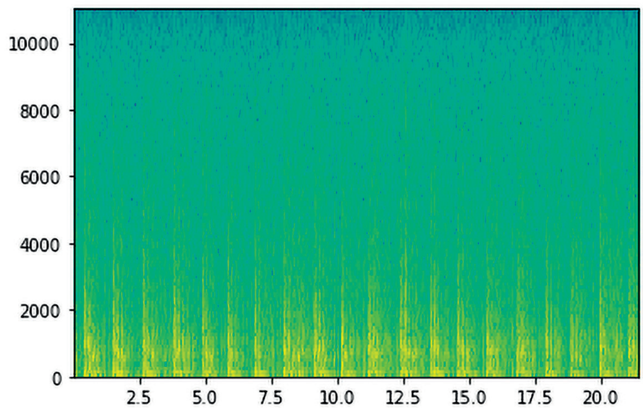

Fig. 8.2. Time-frequency analysis of exemplary recording

Data quality and availability

Dataset DOI
10.34808/nmgg-xm45
10.34808/z8vj-sg17
10.34808/hx3e-nh64

Dataset License
CC-BY-NC

References

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