Summary

The recording and analysis of sounds coming from the inside of the human body has been the object of interest of scientists and physicians for years. The pneumatic stethoscope, developed in 1816 by the French scientist Rene Laennec, has served doctors over the years to carry out basic auscultation examinations of internal organs through the patient's skin. On the other hand, literature reports emphasize that despite over 200 years of tradition, this seemingly outdated diagnostic method is still widely used and constitutes an indispensable element of the physicians's diagnostic toolset. It is worth mentioning that, in paralel to the well-known examination of the heart and lungs, auscultation also supports the diagnosis of other organs, such as joints or intestines.

Due to the ongoing technological progress, the standard pneumatic stethoscope is gradually being replaced by its electronic counterpart, allowing for the digitization of the measurement and thus solving a number of problems characteristic to analog domain.

The subject matter of the dissertation is a comprehensive discussion of issues related to digital auscultation, including both the design of bioacoustic recorders and transducers, as well as digital processing of auscultatory signals. On the other hand, special emphasis was placed on the analysis of temporomandibular joints' sounds, which constitute a niche topic. As part of the literature review, it turned out that the diagnosis of the masticatory system with the use of auscultation is an issue that requires improvement and better understanding. Therefore, in the dissertation an attempt was made to broaden the knowledge concerning the analysis of digital acoustic signals of the mandibular joints. a number of problems related to this subject were also solved. These were consulted with the medical Staff of the Dental Clinic of Collegium Medicum of the Jagiellonian University. The main achievements described in the dissertation include:

- construction of a bioacoustic recorder, along with a dedicated measuring head, allowing the measurement of acoustic signals with infrasonic frequencies,
- development of a database of acoustic signals of the temporomandibular joint and a computer software that allows for the automation of diagnostics of the masticatory apparatus based on standard clinical procedures,
- development of a method of synchronizing acoustic signals recorded from both temporomandibular joints at the same time,
- design of two method of segmentation of acoustic signals in the temporomandibular joints,
- a method of detecting the hypermobility of the masticatory organ based on mandibular accoustic signal.

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