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A NEW CONCEPT OF DEVICE FOR ACOUSTIC EMISSION ANALYSIS OF HUMAN JOINTS

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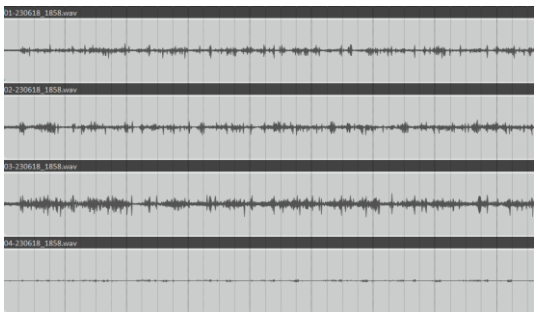
The examination of joints is crucial for diagnosing and monitoring various joint conditions and assessing the overall health of patients. Physicians rely on a range of diagnostic devices to evaluate joints and identify abnormalities. Contemporary diagnosis primarily relies on imaging techniques including X-ray, CT (Computed Tomography), MRI (Magnetic Resonance Imaging), USG (Ultrasonography), and Arthroscopy. However, these methods require expensive, stationary devices, specific workplace settings, and qualified staff to perform the examinations.

An alternative approach to joint examination involves the use of acoustic emission devices. In this study authors present innovative, inexpensive and portable medical device which detects the sound emitted from joint during movement. One such device utilizes small electret microphones to capture the joint's acoustic signals. It enables the synchronous recording of signals from four areas of a single joint or from four different joints through the skin surface. The advantage of this method is its non-invasiveness and the fact that it does not require a specific workplace, except for ensuring a silent environment during the study.

The instrument was developed, and electret microphones were connected to special sound cables. The power supply was established by connecting basket with three batteries. Afterward, the microphones were connected to the four-channel USB sound card, Focusrite Clarett+ 4Pre. The picture below shows the device's appearance. The instrument was tested on the knee joint, and the recorded signals are also presented in the picture.



The new device is specifically designed for orthopedists and physiotherapists and can be used to examine all human joints, particularly the larger ones such as the shoulder, elbow, hip, knee, and ankle. Its development is part of a completely new diagnostic method that involves recording sounds emitted from the joints, measuring the signal, and applying spectral analysis to it. This innovative analysis will aid in faster and more autonomous patient diagnoses, while also providing the ability to objectively compare results.