ANALYSIS OF SOUND GENERATED BY CURLING STONES

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Curling is an Olympic winter team sport, in which players slide 20-kilogram granite stones over ice surface. Ice used in the game of curling must not be flat, in order to make it playable, water droplets are sprayed onto the surface. After freezing, they form so-called *pebbles*, which must be then nipped with a dedicated knife. Curling stones make contact with these *pebbles* during their travel in the fields of play and generate a characteristic sound.

In this research, we have used a microphone to analyze this sound generated by a curling stone. Acquired signal spectrum is presented in Fig. 1.

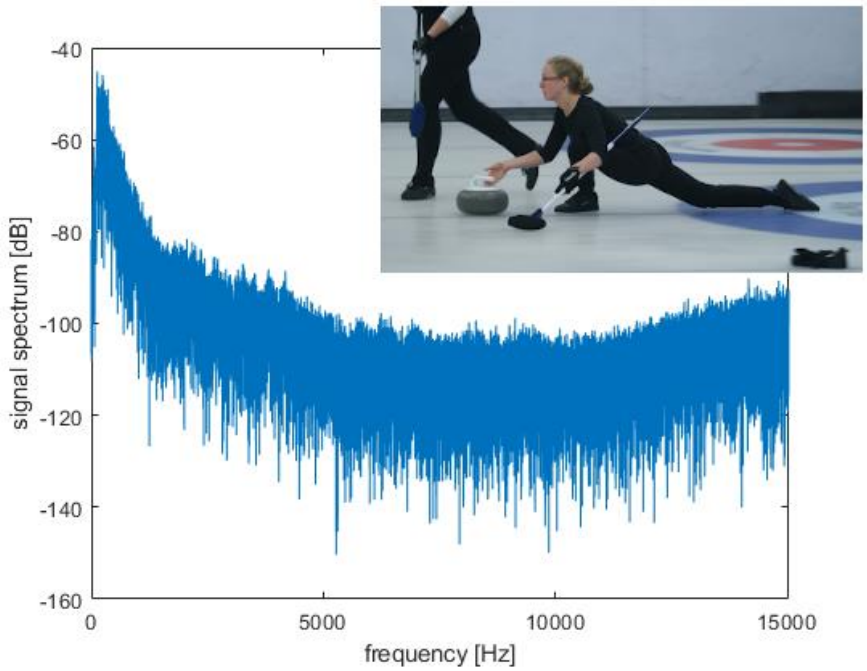

Fig. 1. Spectrum of sound generated by curling stone travelling on pebbled ice surface and curler delivering a stone during a game.

Acquired acoustic signal revealed a strong acoustic response of a curling stone in frequency range of 10 Hz up to 1 kHz, which shows that the stone makes contact only with a subset of pebbles (with the highest ones). More importantly, character of signal depends on ice type (pebbled ice, pebbled and nipped ice, flat ice). This dependence was also observed in acceleration signal [1].

We have observed that analysis of sound generated by curling stone and analysis of signal acquired by an accelerometer attached to a stone can be used to determine the type of ice surface and therefore can be used to decide whether ice surface is suitable for play. However, acquired sound is more prone to interference from other stones moving on other ice sheets as well as from players communicating during a game of practice than acceleration signal.

[1] Dzikowski, B., Pachwicewicz, M. and Weremczuk, J. (2018) Inertial Measurements of Curling Stone Movement. *2018 15th International Scientific Conference on Optoelectronic and Electronic Sensors, COE 2018*, IEEE. 2018–20. https://doi.org/10.1109/COE.2018.8435175