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Aspects of vibrato and micromodulation in double reed instrument sounds

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The perceived naturalness of real and synthesized oboe and bassoon vibrato sounds has been investigated in several perception experiments. The stimuli were generated by means of a currently developed synthesis and analysis framework for wind instrument sounds (first presented at 152nd ASA meeting), based on the pulse forming theory. The framework allows the control of amplitude and frequency parameters at different sound production levels. The stimuli were rated by 60 subjects from "natural" to "unnatural". A conducted ANOVA showed ($p < .01$) that the different types of modulation significantly affect the perceived naturalness of vibrato sounds: The synthesized stimuli with combined pulse width and cycle duration modulation (source modulation) are perceived as natural as the real sounds. The subsequently modulated synthesized stimuli (AM and/or FM near the end of the signal path) are perceived significantly less natural ($p < .01$). The results support the hypothesis, that source-affected timbre modulation is an important factor for the perceived naturalness of oboe and bassoon vibrato sounds. The use of the developed framework for wind instrument sounds is an alternative method to analyze (micro-)modulation effects. Further investigations may be useful for exploring new sound synthesis algorithms as well as for other experiments in the field of timbre research.