

Abstract Submitted  
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**Frequency Analysis of the Cello Using Acoustics and Physical Simulations** JUNGHOON HAN, HYUN JEE LIM, TAEKWON KONG, Choice Research Group — In this paper, Fourier transform and physics knowledge were used to carry out the spectral analysis and to create a synthetic sound note of Cello. First, the wave forms and spectrums of Cello and other instruments were found to compare them each other. It was interesting to see that several instruments, such as brass instruments have much more energy in their second, third, and/or third harmonics than in the first frequency. Most of them generate a fuzzy tone. The brass and woodwind instruments show most of their energy in the second and third harmonics rather than the first frequency. Specifically, the string instrument shows strong first and third harmonic components. In the spectra, it is interesting to notice that the harmonics of the Cello are shown as equally spaced components. In the second section of the research, we have focused on accurately modeling the pluck of a Cellos C4 note, to create synthetic wave using mathematical transformation. Because the entire plot is tool lengthy to model with the Fast Fourier Transform (FFT) function in Matlab, analysis on the first 20 periods of the plucked cello note was carried out. And we successfully created the synthetic wave using mathematical transformation.

Richard Kyung  
Choice Research Group

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