

Abstract Submitted
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Spectrum and Acoustical Analysis of the Piano Using Mathematical and Physical Simulations EUGENE HONG, The Waldorf School of Garden City — Each musical instrument has unique acoustic characteristics such as resonance, volume, timbre, and different harmonics with different energies. String instruments show specifically strong first and third harmonic components and woodwind and brass have more energy focused in a certain harmonic than in the first harmonic frequency. While experimenting on the Piano, the characteristics of the harmonic components were studied. In this paper, the spectral analysis of the instrument piano was carried out using mathematics and physics principles. The wave forms and spectrums of each instrument were compared to effectively analyze the unique acoustic characteristics of Piano. In the spectral analysis, it is interesting to notice that most of the harmonics are found as equally spaced components. Also, the power or energy of all the harmonics change over time, but the pitch does not change a lot, so the frequencies of the spectral lines are constant. We found that Piano generates a more pure tone than the Violin, and generates more fuzzy tone compared to the other instruments analyzed in this paper. Because the entire plot was too lengthy to model with the Fast Fourier Transform (FFT) function in MATLAB, the analysis on a certain period of the plucked note has been performed.

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