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Overtone Analysis of a Holtkamp Organ Using Fourier Methods

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The graphs (comprising figures 2, 4, 6) show the plots of the overtone elasticity of the reed, it vibrates at a controllable frequencies, through a reed instead of a whistle. Depending on the to the flue pipes, but inside the pipe, the air is channeled mechanical mouthpiece. Air is passed through the pipe similar operates much a reed or brass instrument by use of a these families are derived from the material composition of the air passes into the pipe and is then split over a lip which other three families attempt to imitate sounds of other pipes primarily used and creates the unique organ sound. The four basic sound families of pipes; principal, flute, reed, and the organ that we analyzed belongs to the USU Caine School experiment and attempt to explain the variance and the most similarities to the “natural” series while the reed family organ, specifically, we used the organ located in the Kent Hall makes uniform to show the variations in slope of the trend lines. OBJECTIVE Our objective was to quantify the wave patterns of the major families of the organ and find the commonality that gives the organ its unique sounds. We took recordings and analyzed the Fourier transforms and compared the overtones using two criteria: 1) The relative peaks (first where the overtones are) 2) The trend of sound intensity in higher order harmonics (theory suggests that this should be negligible at a steady linear rate.) The graphs comprising figures 2, 4, 6) show the plots of the overtone frequencies against the sound intensity (in Decibels). The scaling has been made uniform to show the variations in slope of the trend lines. CONCLUSIONS The pipes that generate sound most typical to the organ, i.e. the principal pipes, shows the most natural sequence of the harmonic series which theory indicates. This is due to the simple design of the pipe, making it a near perfect harmonic oscillator. Following suite, the string family and the flute family also have fairly natural sequences with some variability. Musically, these two families are used to support the principal, which we can see. And finally, the reed family offers the most variation in the sequence of the harmonic series. We suspect this is due to the increased mechanisms used in producing the sound. This would explain why the reed family is mostly used as “pops of flavor” in the creation of the desired sound. Fig. 5. Computer generated graph of the fourier analysis. We can see that some harmonics (second and third) are barely discernable due to the background noise. Fig. 6. Shows the most unique collection of pipes, the reed family. As can be seen, The needs have the highest variance and is least like the “standard” pipes of the Organ, Fig. 7. This shows the fourier transform of a beacon (played by Amy Johnson, USU Caine college of the Arts, 11/7/2012). This shows the complexity of a reed instrument, the overtones are generated by both the instrument and the reed.