REALTIME AUDIO ANALYSIS FOR HUMANOID ROBOTICS AND DANCE

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Enabling a humanoid robot to dance in response to live music is a complex task requiring contributions from multiple disciplines. In order to produce movements in coordination with music, the robot must be able to extract the appropriate beats from audio. We have implemented a system based on the work of Scheirer [1] and Klapuri [2] that employs a perceptual model of hearing to accurately determine beat locations and which is implemented in real-time. This information is then used to trigger motions from the robot's vocabulary of gestures, allowing it to dance in response to music. Our system uses the *RoboNova*, a small humanoid robot about one foot high. Because of the limited processing capabilities of the unit, the motions require a high degree of optimization. We also present a simplified user interface that allows a user to experiment with both choreographed movement sequences as well as simple generative behavior.

[1]   E. Scheirer, "Tempo and Beat Analysis of Acoustic Musical Signals," *The Journal of the Acoustical Society of America*, vol. 103, no. 1, pp. 588-601, 1998.
[2]   A. Klapuri, "Analysis of the Meter of Acoustic Musical Signals," *IEEE Transactions on Audio, Speech, and Language Processing*, vol. 14, no., 1, pp. 342-355, 2006.