Table of Figures

Figure 3.1 Spectrogram for Natalie Cole singing the chorus of ***Fever*** 30

Figure 3.3 Audio Data, Window Function and Composite Result for FFT 34

Figure 3.4 ICA Autocorrelation Plot Showing Identification of Pandeiro 35

Figure 3.6 Zero Crossings in a Pandeiro Note Event (close-up) 37

Figure 3.8 Pandeiro Waveform, First and Second Derivatives 40

Figure 5.3.1.1 Specgram for Introduction to ***Fever*** 50

Figure 5.3.1.2 Time Series Plot for Events in Original Version of ***Fever*** 51

Figure 5.3.1.3 Time Series Plot for Events in Straight Version of ***Fever*** 51

Figure 5.3.1.4 Note Timing Chart for Events in Original Version of ***Fever*** 52

Figure 5.3.1.5 Note Timing Chart for Events in Straight Version of ***Fever*** 52

Figure 5.3.1.6 Close-up: `diffdot` Pulse Events for Original Version of ***Fever*** 53

Figure 5.3.1.7 Fever missed conga note 54

Figure 5.3.1.8 Extreme Close-up of Conga/Finger Snap Timing Anomaly 54

Figure 5.3.2.1 Specgram for ***Graceland*** 56

Figure 5.3.2.2 Specgram for ***Graceland*** (close-up one) 56

Figure 5.3.2.3 Specgram for ***Graceland*** (close-up two) 57

Figure 5.3.2.4 ***Graceland*** bass drum and electric guitar events 57

Figure 5.3.2.5 ***Graceland*** Note Event Time Deltas (`diffdot`) 58

Figure 5.3.2.6 ***Graceland*** Close-up of Electric Guitar Time Deltas (`diffdot`) 58

Figure 5.3.3.1 Specgram of Swingee Pandeiro Batida 62

Figure 5.3.3.2 Specgram of Straight Pandeiro Batida 62

Figure 5.3.3.3 Time Series Plot for Events in Swingee Pandeiro Batida 63

Figure 5.3.3.4 Time Series Plot for Events in Straight Pandeiro Batida 63

Figure 5.3.3.5 Note Timing Chart for Events in Swingee Pandeiro Batida 64

Figure 5.3.3.6 Note Timing Chart for Events in Straight Pandeiro Batida 64

Figure 5.3.3.7 Close-up of Events in Swingee Pandeiro Batida 65

Figure 5.3.3.8 Close-up of Events in Straight Pandeiro Batida 65

Figure 5.3.4.1 Events for ***It Don't Mean a Thing if it Ain't Got that Swing*** 66

Figure 5.3.4.2 Event Times: ***It Don't Mean a Thing if it Ain't Got that Swing*** 67

Figure 5.3.4.3 Time Series Plot Showing Rhythm and Trumpet Events 67

Figure 5.3.4.4 Specgram Intro: ***It Don't Mean a Thing if it Ain't Got that Swing*** 68

Figure 5.3.4.5 Close-up of Specgram of Intro Showing Piano and Drums 68

Figure 5.3.4.6 Close-up of Specgram Showing Trumpet Note Events 69

Figure 5.3.5.1 Tamborim Batida: Playing Around the Beat 72

Figure 5.3.5.2 Tamborim Batida: Playing Around the Beat (close up) 72

Figure 5.3.6.1 Time Series Plot for Swingee Shuffle Batida 74

Figure 5.3.6.2 Time Series Plot for Straightened Shuffle Batida 74

Figure 5.3.6.3 Note Timing Chart for Swingee Shuffle Batida 75

Figure 5.3.6.4 Note Timing Chart for Straightened Shuffle Batida 75

Figure 5.3.7.1 Specgram for Intro of ***Stir it up*** 77

Figure 5.3.7.2 Ten Channel Events Time Series for ***Stir it up*** 78

Figure 5.3.7.3 Close-up of Pulse and Drum Channels for ***Stir it up*** 78

Figure 5.3.7.4 Close-up of Pulse and Drum Break for ***Stir it up*** 79

Figure 5.3.7.5 Close-up of Pulse for ***Stir it up*** 79

Figure 5.3.7.6 Specgram of Vocal for ***Stir it up***: “C’mon Cool me down baby ...” 80

Figure 5.3.7.7 Specgram of Vocal for ***Stir it up***: “When I’m thirsty” 81

Figure 5.3.7.8 Tempo change in ***Stir it up*** 82

Figure 5.4.1 Standard Notation for Pandeiro Batida 83

Figure 5.4.2 Swingee Notation for Pandeiro Batida 84

Figure E.1.1 Overview of Human Auditory Data Collection System 115

Figure E.1.2 The Human Cochlea 116

Figure E.1.3 Cross Section of Cochlea 117

Figure E.1.4 Extreme Close-up of a Section of the Organ of Corti 118

Figure E.1.5 Extreme Close-up of Frequency Sensing Cells 119

Figure E.1.6 Eardrum and Middle Ear Bones 122

Figure E.1.7 Power vs Distance Curves in Cochlea for Several Frequencies 123

Figure E.1.8 Traveling Wave for 200 Hz at Several Moments in Time 123

Figure E.1.9 Waveform, First, Second Derivatives, and Integral for 200 Hz 124

Figure E.1.10 Traveling Wave, Showing Generation of Eddy Currents 124

Figure E.1.11 Mathematical Model of Vibrations in the Basilar Membrane 127