Requirement Specification

Section 1: Introduction
Product Name: The Audio Data Visualizer
Programmed By: Justin Corn

Section 2: Purpose
This version of the Audio Data Visualizer displays three modes of visual representation of pitch comparison for the optimization of a user’s vocal pitch accuracy: a simple Oscilloscope Display, and an Oscilloscope Display expressed through the Lissajou and 3D Lissajou figures.

Section 3: Scope
The figures are produced by the harmony of the input tone of a vocalist with a computer generated output tone chosen by the user, in context of a calculated fundamental tone. The ADV then captures the data from the system’s audio stream in real-time. The pattern displayed reflects the accuracy of a vocalist’s pitch, corresponds in real-time to changes in the tonal input, and may persist for up to five minutes with no visual inconsistencies detectable by the user. If a Lissajous figure is produced, its pattern definitively represents a perfect harmony by its stability, a flat harmony by rotating left, or a sharp harmony by rotating right.

Section 4: Definitions
1. Input frequency: Vocal pitch generated by the user.
2. Output frequency: Computer generated, user determined frequency.
3. Fundamental frequency: Calculated frequency of which the output frequency is one harmonic and the input frequency is another harmonic.
4. Interval: Relationship of the input and the output frequencies, based on the fundamental frequency.
5. Oscilloscope Display: A visual representation of a sound wave.
6. Lissajous Figure: A circular pattern representing the full cycle of a sine wave.

Section 5: Specific Requirements
5.1 User runs Audio Data Visualizer executable.
5.2 GUI Appears with All Components.
5.3 User is able to select:
   5.3.1 The Output Frequency:
       5.3.1.1 Output Frequency is Audible.
       5.3.1.2 Output Frequency is Accurate.
   5.3.2 The Interval: Name (Relationship to Fundamental)
       5.3.2.1 The Interval Selection Presents the Following Selectable Intervals:
           a. Unison (1:1)
           b. Octave (2:1)
           c. Perfect 5\textsuperscript{th} (3:2)
           d. Perfect 4\textsuperscript{th} (4:3)
           e. Major 3\textsuperscript{rd} (5:4)
           f. Minor 3\textsuperscript{rd} (6:5)
           g. Major 6\textsuperscript{th} (5:3)
h. Minor 6th (8:5)

i. Minor 7th (7:4)

j. Major 2nd (9:8)

5.3.2.2 Intervals Correspond to Intended Actual Intervals.
5.3.2.3 An Inaudible Fundamental (LCD) Tone is Calculated Based on Selection.

5.4 User Attempts Pitch Defined by Selected Interval.
5.4.1 The Tone is Captured and Processed by the ADV.
5.4.2 Sampling Frequency Limit: 11025Hz.

5.5 Figure Presentation:
5.5.1 All of the Following Figures are Displayed:
5.5.1.1 Oscilloscope Display
5.5.1.2 Lissajous
5.5.1.3 3D Lissajous

5.5.2 The Patterns are Produced Accurately from the Processed Data.
5.5.3 The Patterns Appear for Five Minutes without Visual Defect.

Section 6: Hardware Interface
6.1 Memory: 256 MB
6.2 CPU Speed: 1.0 GHz
6.3 Display Resolution: 1024 X 768
6.4 Machine Type: IBM or Macintosh
6.5 Sound Card
6.6 Microphone

Section 7: Software Interface
7.1 Runs on Windows XP.
7.2 Runs on Suze Linux OS.