Code Sonification Simulator User Guide

Overview

The Code Sonification Simulator provides auditory feedback for programming activities, designed to assist visually impaired developers. This guide explains how to use the simulator and experience all its features.

Basic Usage

1. **Editor Panel**: Type code in the main editor to trigger real-time audio feedback
2. **Control Panel**: Adjust settings on the right side to customize your experience
3. **Status Display**: View current audio and error information at the bottom

Sound Demonstration

Click "Start Sound Demo" to cycle through all available sounds:

- Keypress tones
- Indentation level sounds (0-2 levels)
- Function call notification
- Loop detection sounds (for/while/do)
- Error sounds (5 different types)
- Chord progression

Experiencing Different Scenarios

1. Syntax Error Detection

How to experience:

- Type code with deliberate errors (missing brackets, semicolons)
- Or load "Syntax Errors" from test data

Audio feedback:

- Different error types have distinct sounds:
    - Brackets: Square wave at 196Hz
    - Punctuation: Sawtooth at 246Hz
    - Spelling: Triangle wave at 174Hz
    - Whitespace: Sine wave at 233Hz
    - Default: Sawtooth at 220Hz

2. Indentation Levels

How to experience:

- Create nested code blocks
- Or load "Indentation Levels" from test data

Audio feedback:

- Base frequency (220Hz) increases by 110Hz per level
- Sine wave tones indicate depth

3. Code Structure

How to experience:

- Write functions and loops
- Or load "Function Calls" or "Loops" from test data

Audio feedback:

- Functions: 660Hz sine wave
- For loops: 330Hz triangle wave
- While loops: 330Hz sine wave
- Do-while loops: 297Hz sine wave

Sound Parameters

Each feedback type modifies these audio parameters:

1. **Frequency**:
    - Base: 220Hz (A3)
    - Indentation: +110Hz per level
    - Errors: 174-246Hz range
    - Functions: Higher frequencies (660Hz)
2. **Waveform**:
    - Normal events: Sine wave
    - Errors: Varies by type (square, sawtooth, triangle)
    - Keypresses: Clean sine wave
3. **Duration**:
    - Short: 0.05-0.1s (keypresses)
    - Medium: 0.2-0.3s (functions, loops)
    - Long: 0.5s (errors)

4. **Volume**:
    - Master: 70% default
    - TTS: 80%
    - Sonification: 60%

Error Sonification Details

Error Type	Frequency	Waveform	Duration
Brackets	196Hz	Square	0.4s
Punctuation	246Hz	Sawtooth	0.25s
Spelling	174Hz	Triangle	0.35s
Whitespace	233Hz	Sine	0.3s
Default	220Hz	Sawtooth	0.3s

Advanced Features

1. **Sound Profiles**:
    - Standard: Balanced feedback
    - Minimal: Simpler, shorter sounds
    - Detailed: Richer, longer tones
    - Custom: Modify your own
2. **Challenge Mode**:
    - Timed error-fixing exercise
    - Tracks completion time
    - Provides audio progress updates
3. **Data Playback**:
    - Replay pre-recorded coding scenarios
    - Experience timed audio feedback

Tips for Best Experience

1. Start with "Standard" profile
2. Try the sound demo first
3. Use headphones for best audio clarity
4. Adjust volumes to your preference
5. Begin with simple test cases before writing complex code