

Optimization Guide for Low Guitar Frequencies

Getting Drop F to Track Properly

Your plugin needs special consideration for Drop F tuning (about 21.83 Hz), which is incredibly low and challenging for real-time pitch detection and processing. Here are the key optimizations already implemented in the code:

1. Buffer Size Considerations

The code uses adaptive buffer sizing to handle different processing requirements. For optimal performance with extremely low frequencies:

- **Minimum Buffer Length:** To properly capture one full wavelength of Drop F (21.83 Hz), you need at least 2048 samples at 44.1 kHz (or 4096 at 96 kHz)
- **Implementation:** The code dynamically resizes buffers when needed, ensuring enough data is available for analysis

2. RubberBand Configuration Optimizations

These settings have been carefully tuned for guitar use:

```
cpp
```

```
// Real-time processing priority
```

```
options |= RubberBand::RubberBandStretcher::OptionProcessRealTime;
```

```
// Preserve transients to maintain pick attack
```

```
mStretcher->setTransientsOption(RubberBand::RubberBandStretcher::OptionTransientsPrese
```

```
// Phase-coherent processing for better low frequency handling
```

```
mStretcher->setPhaseOption(RubberBand::RubberBandStretcher::OptionPhaseLaminar);
```

```
// Compound detector for improved tracking of guitar fundamentals
```

```
mStretcher->setDetectorOption(RubberBand::RubberBandStretcher::OptionDetectorCompound)
```

3. Threading Considerations

The plugin uses:

- Thread-safe parameter updates with mutexes
- Single-threaded processing (OptionThreadingNever) for better real-time performance

- No dynamic memory allocations during audio processing

Optimizing Your Build Environment

For best results when building:

1. **Compiler Flags:** The CMake configuration uses `-O3` for release builds
2. **Platform Specific:** The code compiles for both Intel and Apple Silicon on macOS

Using the Plugin Effectively

To get the best tracking of low frequencies:

1. **DAW Settings:** Set your DAW buffer size to at least 256 samples (512 recommended for Drop F)
2. **Clean Signal:** Feed a clean guitar signal directly into the plugin
3. **Parameter Settings:**
 - **Latency:** Start with "Low Latency" and only switch to "High Quality" if needed
 - **Formant:** Higher values (>50%) will preserve guitar character when pitch shifting
 - **Mix:** 100% for full effect, or blend to taste

Comparing to Alternative Algorithms

If RubberBand is not tracking your low frequencies well enough, consider the following alternatives:

1. **SoundTouch:** May perform better for some real-time applications but with lower quality
2. **DIRAC LE:** Great quality but higher CPU usage
3. **Phase Vocoder:** Could be better for heavily distorted signals
4. **Elastique:** Commercial option with excellent low-frequency tracking

Performance Monitoring

You may want to add a simple performance monitor to watch CPU usage during processing. This would require adding timing code around the `ProcessBufferLists` function.