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NYJavaSIG

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Making Music with the Java™ Programming Language

Frank D Greco
NYJavaSIG
www.javasig.com
PAN-5388

Java and Music
Creating music with Java

- Software developers and Musicians share traits
- JavaSound™, JMF, Java 3D sound API, JavaFX™
  - Good or bad??
- Panelists - demonstrations
  - Andrew Brown – jMusic
  - Robert Keller – Impro-Visor
  - Nick Didkovsky – JMSL
  - David Koelle – JFugue

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Java

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Java and Music: Libraries for User-Developers

Andrew R. Brown

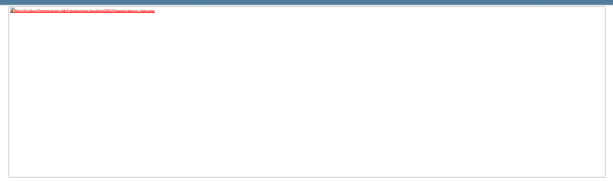
Queensland University of Technology

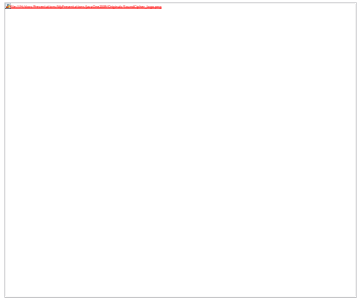
jMusic & SoundCipher libraries

QUT Queensland University of Technology
Brisbane, Australia

Java libraries for musicians

- Musicians as users/developers
- Developers as musicians
- Feature for music libraries:
  - Discipline-friendly language
  - Music and sound integrated
  - Timing is everything
  - “Simple things should be simple”
  - Tutorials and documentation
  - Play everywhere
  - Creation leads to capture





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Andrew r. Brown
a.brown@qut.edu.au

http://jmusic.ci.qut.edu.au
http://soundcipher.com

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Java Music Specification Language (JMSL): a Java API for Music

Nick Didkovsky

Algomusic.com

JMSL Features
Polymorphic Hierarchical Scheduler

- Polymorphic ("Composable" Interface):
  - MusicJob: sleep, do something, repeat
  - MusicShape: ordered multidimensional numeric data
  - Collection: Composables that contain Composables
- Hierarchical (parent/child relationships)
  - Parallel Collections (string quartet)
  - Sequential Collections (song form)
- Scheduler:
  - Parent gets launch() command and a timestamp, schedules children

```
SequentialCollection seqCol = new SequentialCollection();
seqCol.add(myMusicShape);
seqCol.add(myMusicJob);
seqCol.launch(JMSL.now());
```

JMSL Features
Instrument Interface

- JMSL supports various music devices
  - JavaSound MIDI
  - MIDIShare (midishare.sourceforge.net)
  - JSyn: Java API for sound synthesis (www.softsynth.com)
  - Other

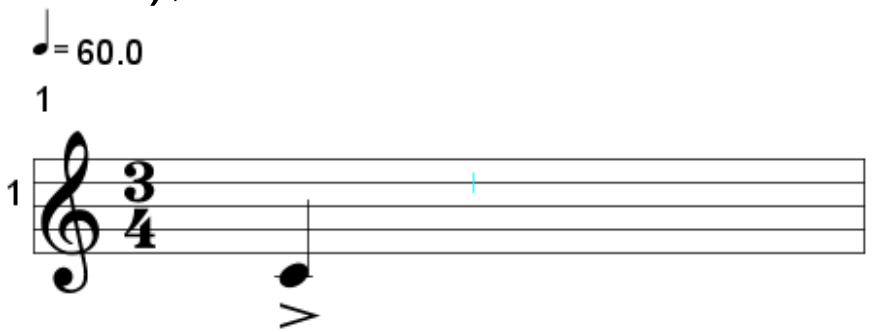
```
public double play(double timeStamp, double timeStretch, double[] perfData) {
    double duration = perfData[0];
    // do something with other perfData
    return timeStamp + duration * timeStretch;
}
```

JMSL Features

Notated music and non-notated music

- Standard Music Notation supported
  - Create scores programmatically, or with GUI
  - Plug-ins for note transformation
  - Export to MusicXML, Lilypond, SCORE, Midifile

```
Score score = new Score(1, 800, 600);
score.addMeasure(3, 4);
Note n = score.addNote(1.0, 60, 0.5, 0.8);
n.setMark(Note.MARK_ACCENT);
```



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Nick Didkovsky
nick@didkovsky.com

www.algomusic.com

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Java meets Jazz

Robert M. Keller
Harvey Mudd College
Claremont, California 91711

Impro-Visor

Tool to assist musicians learning to improvise

- Conventional wisdom:
  - Transcribe solos of great masters from recordings
- Proposed alternate wisdom:
  - Compose one's own solos off-line
    - Don't play exactly as composed (improvise!)
    - Student learns more about the tune
    - More exploration encouraged
    - Student owns the result

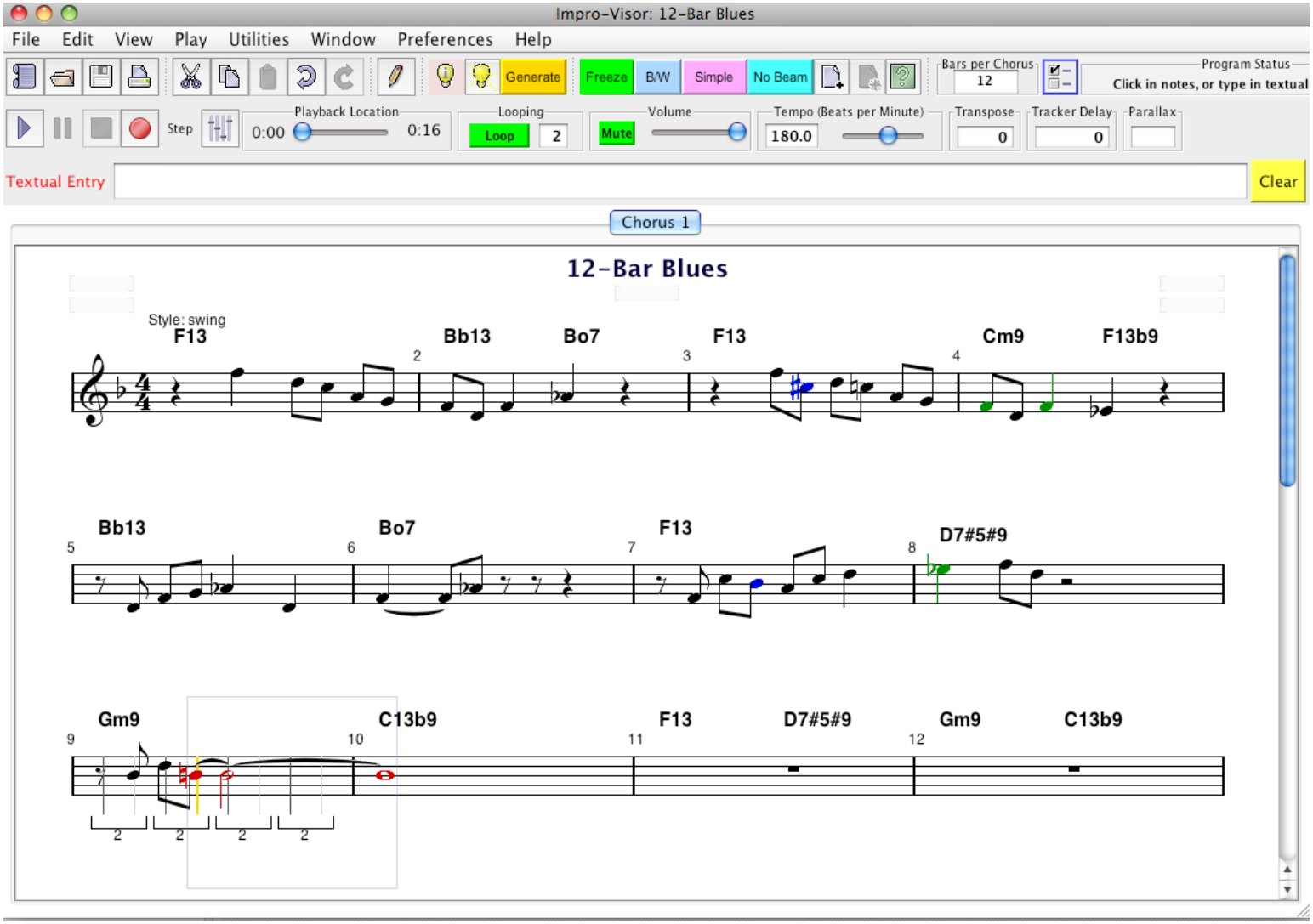
Impro-Visor Provides

- Musical knowledge (chord spellings, scales, etc.)
- Suggestions
  - Database of cells, idioms, licks, quotes
  - Instant generation of new licks (melodic material over chords)
- AI Elements
  - Style extraction (Derive styles from MIDI + chords)
  - Grammar learning (for lick generation)

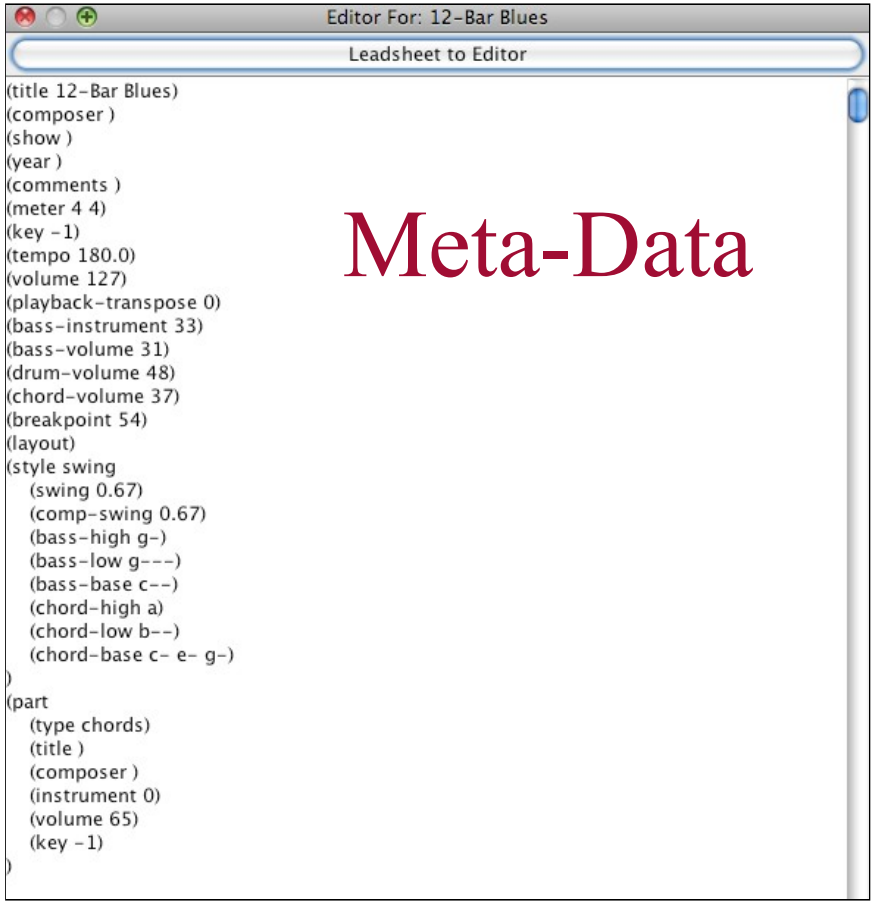
Impro-Visor Provides

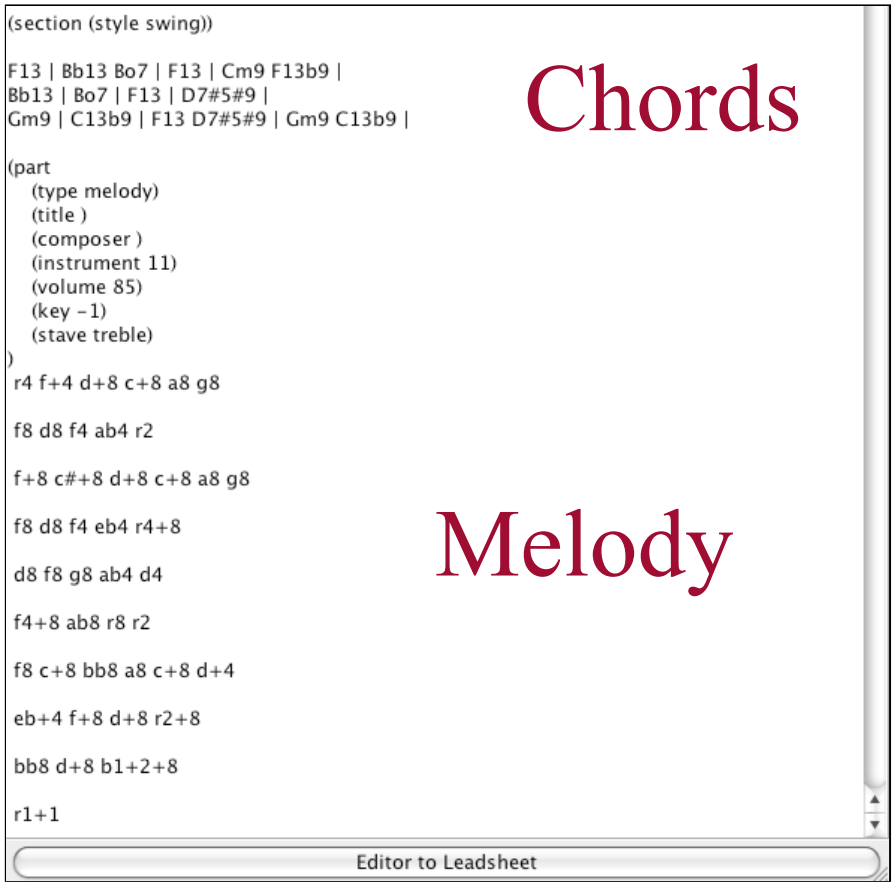
- Visual feedback (“in” vs “out” notes)
- Aural feedback (chord accompaniment on entry)
- Auto-generated accompanying rhythm section
  - piano, bass, drums

Impro-Visor Screenshot



Pure-Text Lead-Sheet Files





Implementation

- Java 1.5 (on MacOSx, Windows, Linux)
- Adapted version of jMusic circa June 2005
- All sound is MIDI
- Netbeans IDE
- Musical information is open-format text files
  - Readable S-expressions (no XML)
  - Exports MIDI
- GPL

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- Kevin Tang (Cornell U.)
- Chad Waters (Winthrop U.)
- John Goodman (U.K.)

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Thank You

Robert M. Keller
keller@cs.hmc.edu
www.impro-visor.com

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Teaching and Tabbing Guitar with JFrets

Matt Warman
Creator of JFrets
Senior Consultant
STARBASE Consulting Inc.

What Is JFrets?

- Teaches guitar in an interactive desktop tool
- Displays notes, chords, and scales
- Plays sounds to aid in learning process
- Provides tutorials and exercises
- Ability to create and save guitar tablature
- Guitar tablature playback

JFrets Capabilities

- Creates songs in tab or note format
- Provides a Metronome
- Provides a Scale Player
- Contains a guitar tuner with various tunings
- Displays left-handed chords
- Prints tabs or songs

Audio Streaming Code

```
try
{
    File audio = new File(getClass().getResource("/org/jfrets/sounds/" + file).toURI());
    float sample = 128000;
    AudioInputStream ais = AudioSystem.getAudioInputStream(audio);
    AudioFormat af = ais.getFormat();
    AudioFormat target = new AudioFormat(AudioFormat.Encoding.PCM_SIGNED, af.getSampleRate(), 16, af.getChannels(),
    af.getChannels() * 2, af.getSampleRate(), false);
    AudioInputStream decode = AudioSystem.getAudioInputStream(target, ais);
    DataLine.Info info = new DataLine.Info(SourceDataLine.class, target);
    SourceDataLine line = (SourceDataLine) AudioSystem.getLine(info);
    line.open(target);
    if (line != null)
    {
         byte[] data = new byte[4096];
         line.start();
         int bytesRead;
         while ((bytesRead = decode.read(data, 0, data.length)) != -1)
         {
            line.write(data, 0, bytesRead);
         }
         line.drain();
         line.stop();
         line.close();
         decode.close();
    }
} catch (IOException e) {
    /* handle this exception */
} catch (LineUnavailableException e) {
    /* handle this exception */
} catch (URISyntaxException e) {
    /* handle this exception */
} catch (UnsupportedAudioFileException e) {
    /* handle this exception */
}
```

Don't worry, you're not supposed to be able to read this.

And you certainly shouldn't have to program it.

JFugue Code

```
Player player = new Player();
String patternString =
  getMidiType((String)this.voiceBox.getSelectedItem())
  +  noteName;
patternString = "T" + bpm + " " + patternString;
Pattern pattern = new Pattern(patternString);
player.play(pattern);
```

Thank You

Matt Warman
mattwrock@gmail.com
https://jfrets.dev.java.net

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NYJavaSIG

Frank D. Greco
NYJavaSIG
fgreco@javasig.com

www.javasig.com

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