



C-major



A Music Production Language

The Ensemble



Stephanie Huang

syh2115

System Architecture



Andrew O'Reilly

ajo2119

Manager



Jonathan Sun

jys2124

Language Guru



Laura Tang

lt2510

Tester

Overview

- Musical Composition language with C-Style syntax
 - Common constructs - loops, conditionals
 - Dedicated types to represent musical elements
 - Designed to abstract computerized composition in a context of Turing-complete features
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The diagram illustrates the scientific pitch notation system. At the top, a piano keyboard is shown with labels (A0) and (A4) indicating specific octaves. Below the keyboard, the notes C1 through C8 are labeled, with C4 identified as middle C. The bottom part of the image shows musical notation for these notes. The notes C1 through C8 are shown on a grand staff (bass and treble clefs). The notes C1 through C4 are shown on the bass clef, and C4 through C8 are shown on the treble clef. The notes C1 through C8 are labeled below the staff.

(A0) (A4)

C1 C2 C3 C4 (middle C) C5 C6 C7 C8

C1 C2 C3 C4 C4 C5 C6 C7 C8

http://f.tqn.com/y/piano/1/S/B/F/-/Scientific-Pitch-Notation_layout.png

Pitches



http://alishagabriel.com/wp-content/uploads/2012/06/skipping_rope_rhythms.gif

Rhythm

Tutorial

1. Compile source code: `make`
2. Run test suite: `./test.sh`
3. Write your program: `*.cmaj`
4. Compile into CSV “bytecode” using the `cmajor` compiler
5. Use Java `CSVPlayer` to render audio output



Architecture

Program (*.cmaj) → Compiler (cmajor) → Bytecode (*.csv) → CSVPlayer

Language Implementation

<.cmaj file>

Scanner: scanner.mll

Parser: parser.mly

Semantic Analyzer / Translator :
compile.ml

MIDI Converter: CSVPlayer.java,
NotesPlayer.java

<MIDI file>

Data Types

- Int
- Dur
- Pitch
- Note
- Chord
- Phrase
- Score



Operators and Type Inferences

- **Arithmetic:** Addition, Subtraction, Multiplication, Division
 - No floating point numbers: all fractions treated as rational numbers consisting of two integers
 - **Advanced array manipulation:** Repeat/Fill, Concatenate
 - **Layer:** Two musical types to be rendered simultaneously in audio output
 - **Concatenate:** Provides audio sequencing
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Testing

test.sh

- System testing framework using shell script
 - Compares each .cmaj program in the Tests directory with a reference file of its expected .out output
 - Ends report by displaying number of passed tests and total tests run
 - Collects failed and total test outputs
 - Tests: interpreter, parser, semantics
 - [arithmetic, equality, array, pitch, array, array concat, function, compose, play, layer, blocks, statements, comments, etc]
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Demos

Row, Row, Row Your Boat

Demonstrates loops, assorted operators

An old favorite

WWW.MAMALISA.COM ROW ROW ROW YOUR BOAT

Row row row your boat gen - tly down the stream,
mer - ri - ly mer - ri - ly mer - ri - ly mer - ri - ly life is but a dream.

WWW.MAMALISA.COM

The image shows a musical score for the song 'Row, Row, Row Your Boat'. It consists of two systems of music. The first system has a treble clef staff with a melody and a bass clef staff with a simple accompaniment. The lyrics 'Row row row your boat gen - tly down the stream,' are written below the treble staff. The second system continues the melody and accompaniment with the lyrics 'mer - ri - ly mer - ri - ly mer - ri - ly mer - ri - ly life is but a dream.' The score is in common time (C) and features a simple, repetitive melody.

http://www.mamalisa.com/images/scores/row_your_boat.jpg

Shepard Scale

Demonstrates functions, loops, conditionals

A “sonic barber pole”

Eight tones gradually rise, then quickly jump down and repeat the cycle

The image shows a musical score for the Shepard Scale. It consists of two systems of music. The first system has a treble clef staff with a melody and a bass clef staff with a simple accompaniment. The lyrics 'Eight tones gradually rise, then quickly jump down and repeat the cycle' are written below the treble staff. The second system continues the melody and accompaniment. The score is in common time (C) and features a melody that rises and then falls, creating a 'sonic barber pole' effect.

http://www.cafemuse.com/soundgarden/images/shepard_tone2.gif

Summary and Lessons Learned:



- Weekly Meetings and Waffle
- Share and Listen to Ideas
- Ocaml: Do a lot with a little