muS

http://code.google.com/p/mus/source/browse/#svn%2Ftrunk%2Fsrc

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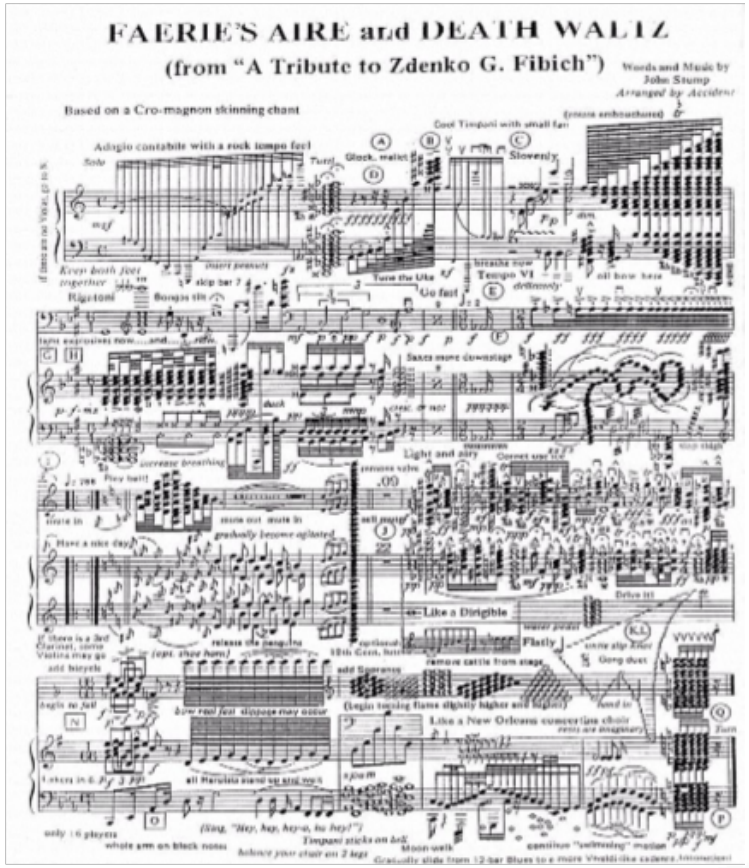
What Is muS?

♪ muS is a tool to help anyone build and analyze a piece of music in a simple, intuitive way.

Why muS?

♪ Reading sheet music is confusing, even for the experienced musician

♪ muS provides immediate visual feedback to the creator of the piece



Why muS?

♪ Other digital music software allows creation of music, but almost none provide a means to create useful visual analysis

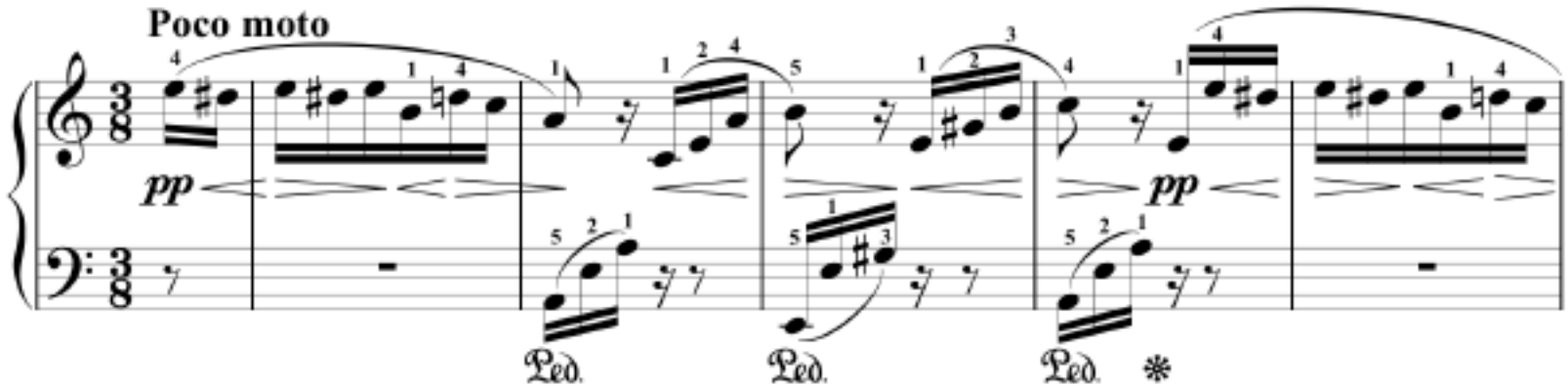
Why muS?

♪ MuS attempts to address this void by allowing the programmer to specify color and shape to notes in order to see music in a different way

♪ More control than other visual editors, but better visual analysis than robust .midi programming

Music Composition

♪ Manually write out each note/GUI with software



♪ Insert notes?

♪ Change the pitch for every other note?

♪ Increase octave of last 2 notes in every measure?

♪ Generate new song w/ similar sub-sequences?

Our language: muS

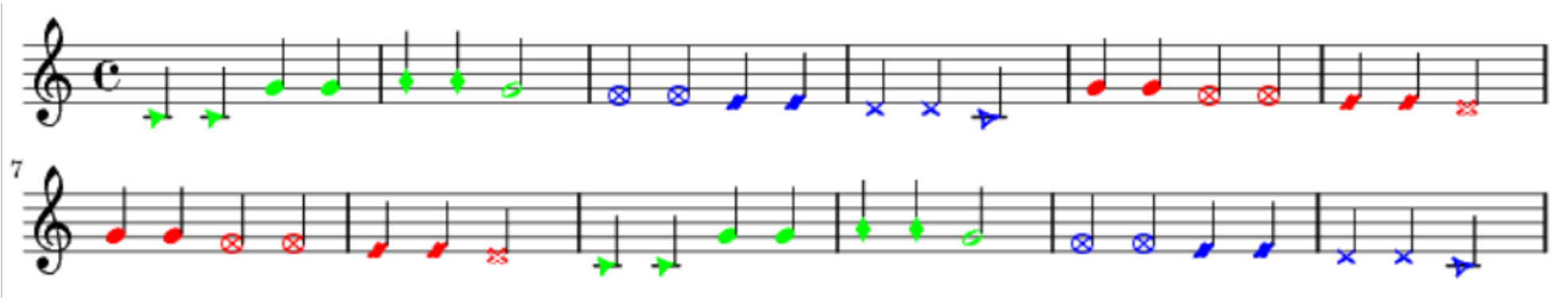
- Easily change attributes of a set of notes
- A brand new way to explore music composition
- Use appropriate data structures to represent music
  1. *Efficient storage for notes, chords, measures, and attributes*
  2. *Ease of access*

- Provide suitable operators and built-in functions

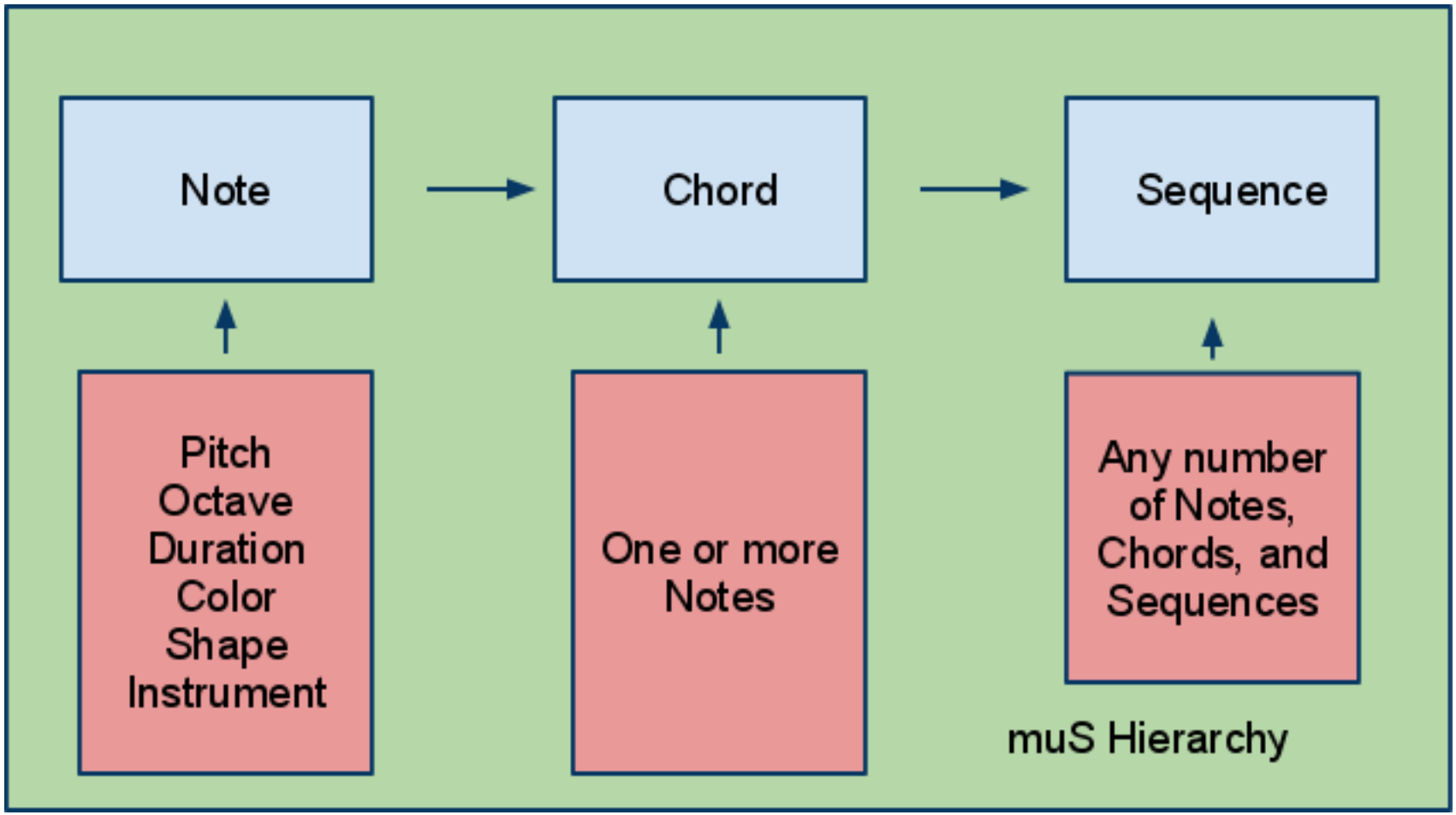
```
seq1 << seq2[3:10] + seq2[0,4,5] + [seq3,seq4]
```

Graphical Representation

- ♪ Manually change the shape/color of any note
- ♪ Change representation for entire sequences
- ♪ Immediate visual clues to help analyze the music that has just been created



muS Hierarchy



Notes

- Attributes
  - Pitch
  - Duration
  - Octave
  - Shape
  - Color
  - Instrument

- Example syntax

```
Note n1 = new Note (A,4,4);
n1<Instrument('guitar');
   n1<Color('green');
   n1<Shape('triangle');
```

Chords

- Comprised of any number of Notes
- Played simultaneously
- Example syntax:

```
Note a = new Note(A,4,4);
Note b = new Note(B,4,4);
Note c = new Note(C,4,4);
Chord c1 = new Chord (a,b,c);
```

Sequences

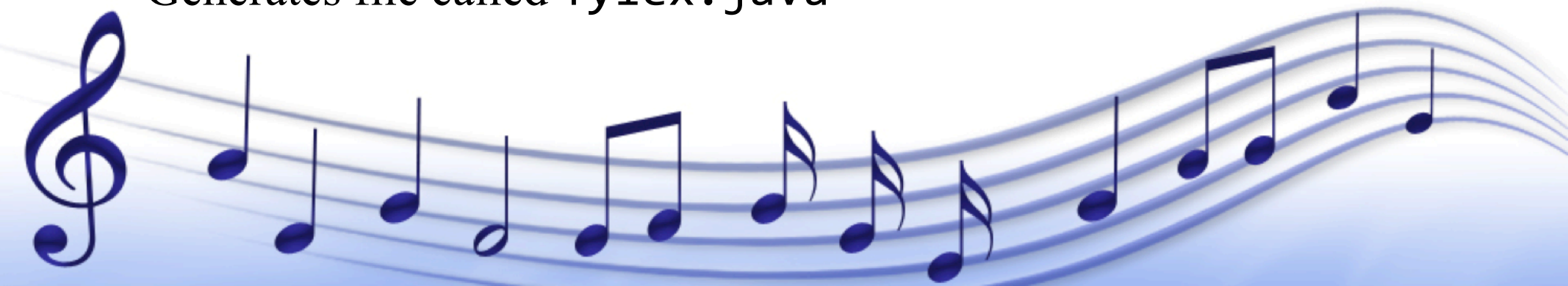
- Creation
  - Sequences are built up from Notes, Chords and Sequences
  - Allow for Repeating Melodies
  - Built in functions allow for easy manipulation
    - Subsequences
    - Subsets
    - Single Chords, or Notes
    - Changing attributes
- Analysis
  - midi Output
  - Visual Patterns

Built in functions

- foreach
  - Allows for changing of an attribute of an entire sequence
  - `foreach(seq1)<Instrument('bird tweet');`
- Subsequence and Subset
  - Allows the programmer to get a certain portion of a sequence
  - `seq[0:4];//Subsequence`
  - `seq[0,4,7];//Subset`

Lexical Analyzer

- ♪ Built using JLex (.lex file)
  - ♪ The Java equivalent of Lex for C
- ♪ Breaks muS code into token
  - ♪ ID
  - ♪ Numbers
  - ♪ Keywords
  - ♪ Grammatical symbols and operators
  - ♪ Quoted Text
  - ♪ Comments (ignored)
- `next_token()` returns a `java_cup.runtime.Symbol` object (compatible with CUP)
- Generates file called `Yylex.java`



Semantic Analyzer

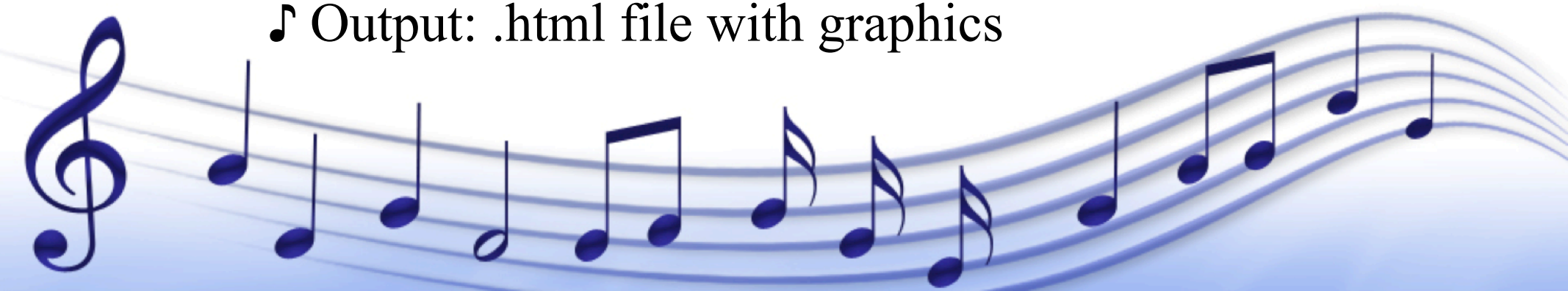
- Built using CUP (.cup file)
- Constructor of Useful Parsers
  - Defines terminals for each token in Lexical Analyzer
  - Defines non-terminals used in grammar
  - Constructs a new `ParseTree` object
- Defines grammar of muS and invokes Java code (in `ParseTree.java`)
- Generates two classes:
  - `ParserSym.java` → constant declarations for each token type
  - `Parser.java` → actually executes the parsing

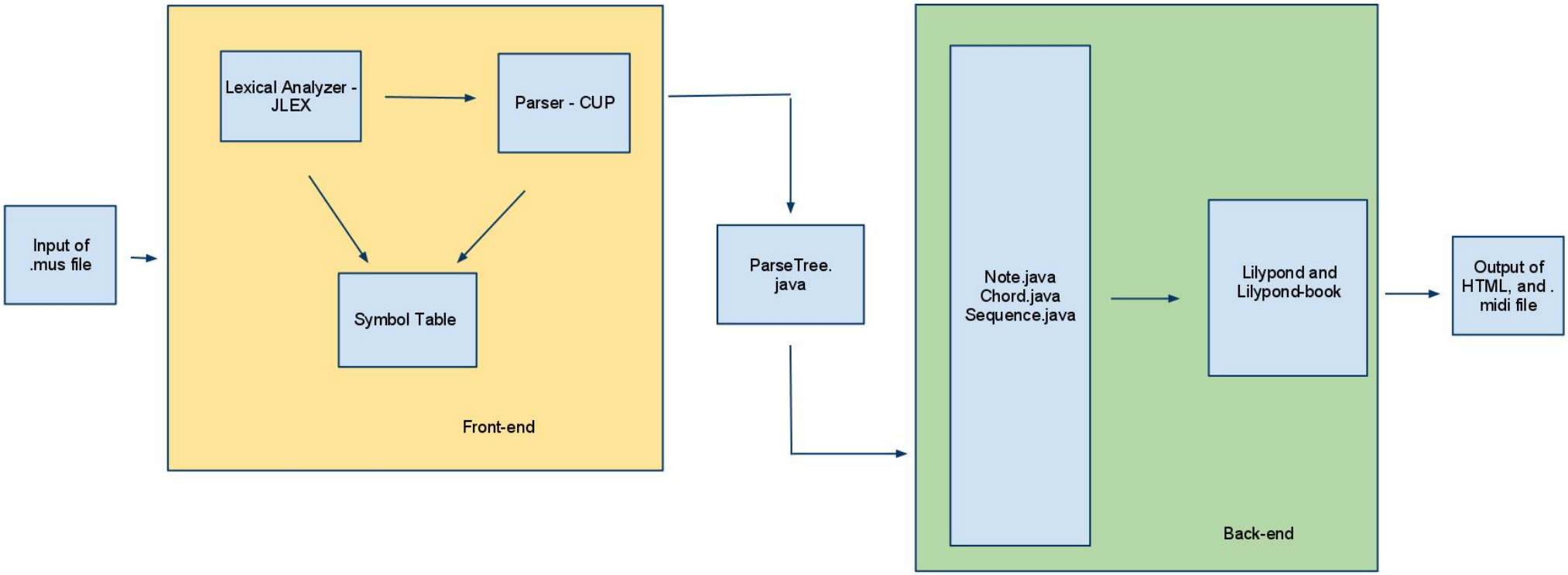
ParseTree.java

- Declares, initializes, and stores variables
- Code for built-in functions and operators
- Checks for errors, declarations, and initialization
- Works with all the other Java classes
  - Note.java → represents a Note
  - Chord.java → represents a Chord
  - Sequence.java → represents a Sequence
  - Reference.java → stores available colors, shapes, and instruments

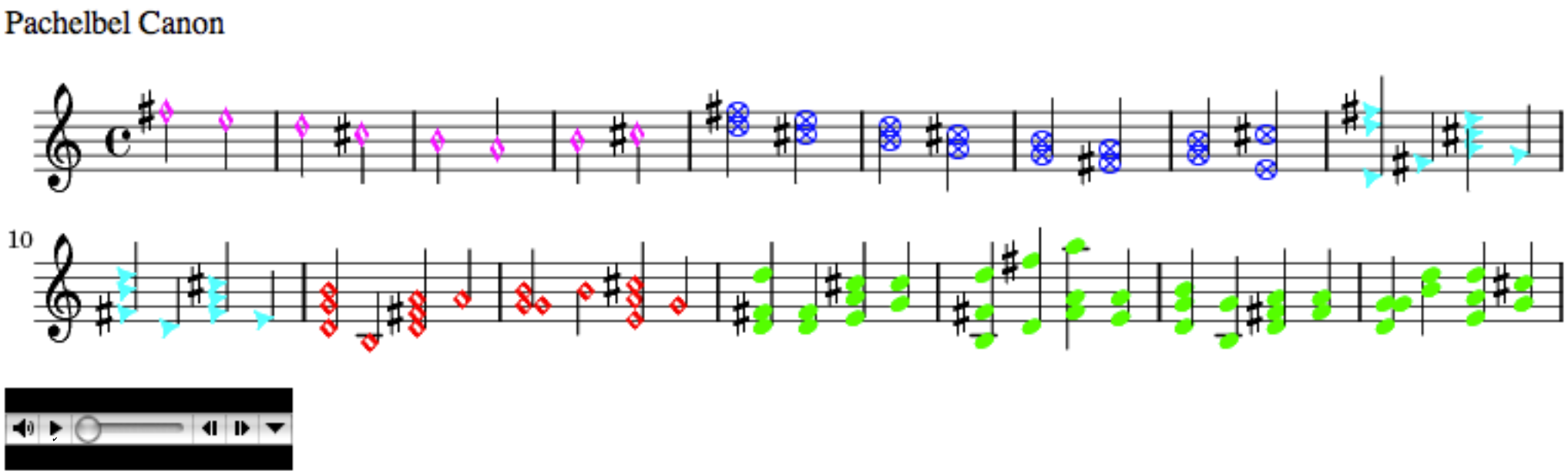
Lilypond

- Program used to produce displayed music score
- LilypondConvert.java
  - Converts sequence into acceptable format for lilypond
  - Lilypond:
    - Input: .ly file
    - Output: .midi file
  - Lilypond-book:
    - Input: .html file without graphics
    - Output: .html file with graphics




Input of .mus file
Lexical Analyzer - JLEX
Parser - CUP
Symbol Table
Front-end
ParseTree. java
Note.java
Chord.java
Sequence.java
Lilypond and Lilypond-book
Back-end
Output of HTML, and . midi file

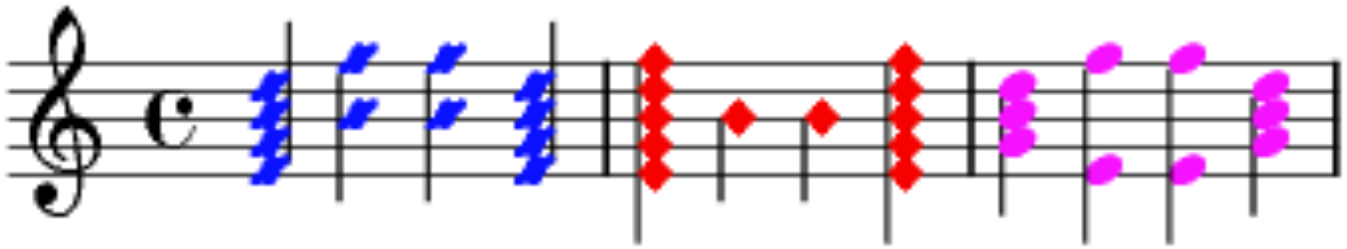
Example – Pachelbel.Canon.mus



http://mus.googlecode.com/svn/trunk/src/testfiles/Pachelbel.Canon/Pachelbel.Canon.html

Example – Aho.mus

AHO



http://mus.googlecode.com/svn/trunk/src/testfiles/Aho/Aho.html

Lessons Learned

- Communication and Version control
- Insufficient Planning ➔(Implementation Effort)^{N}
- Planning and Implementation is an Iterative Process
- Start Early!