DSPJockey

Brian Bourn, Abhinav Mishra
Addisu Petros, Vanshil Shah

COMS 4115 Programming Languages & Translators
Prof. Stephen Edwards
December 17, 2014

Motivation

- Digital Signal Processing used in fields of Electrical Engineering, Audio mixing, and even algorithmic trading
- Many useful operations that can be done in signal processing such as convolution, filtering, time shifting
- Lack of tools to build and manipulate signals easily
- Notion of global time for a signal only apparent in languages that model hardware such as SystemC

Why DSPJockey?

- Provides a simple framework for creating and manipulating signals using Signal data type
- C-like syntax including primitive data types
- Includes built in functions common in DSP
- Global time for each signal: easy to access signal at current time or at a previous time (past)

Language Tutorial

- DSPJockey uses C/C++ like syntax
- Includes the primitive data types, int, float, string, and bool
- Aggregate data types are Array and Signal
- Functions must have a return type

Array

Arrays are similar to C as they are lists that are of a fixed size and contain float values.

To create and initialize the array of a given size, say 10

let arr = Array[10];

To access the third element in this array

float x = arr[2];

Signal

Signals are similar to arrays are implemented as a circular buffer and its values are accessed by using the time keyword.

To create a signal:

let sig = new Signal[];

To access the value of signal at current time:

float y = sig[time];

The value at a previous time can be accessed by subtracting the number of time units from time:

If we want to access the value at 2 time units before current time

float z = sig[time-2];

Signal (cont'd)

When an operation is performed on a signal, it is done over the whole signal.

Example:

sig[time] = sig[time] +1

will increment all the samples in the signal by one.

Control Flow

- If/else, while and for loops follow the same exact syntax as C.
- If/else statements are exactly similar to C and the else statement is not required.

```
if ( boolean_condition ) {
}
else {
}
```

- While loop:

```
while ( boolean_condition ) {
}
```

- For loops :

```
for(initialization; boolean_condition; iteration_step){
}
```

Functions

- Functions are similar to C/C++ but there are two types of functions,
- 1. normal functions, return a primitive type
- int x(args){

      }
- 2. stream functions used for manipulating signals

      stream x(args){
      }
- Every single .dj file must contain a main function.
- Calling a function is done in the same way as C/C++

      int result = function(float a);

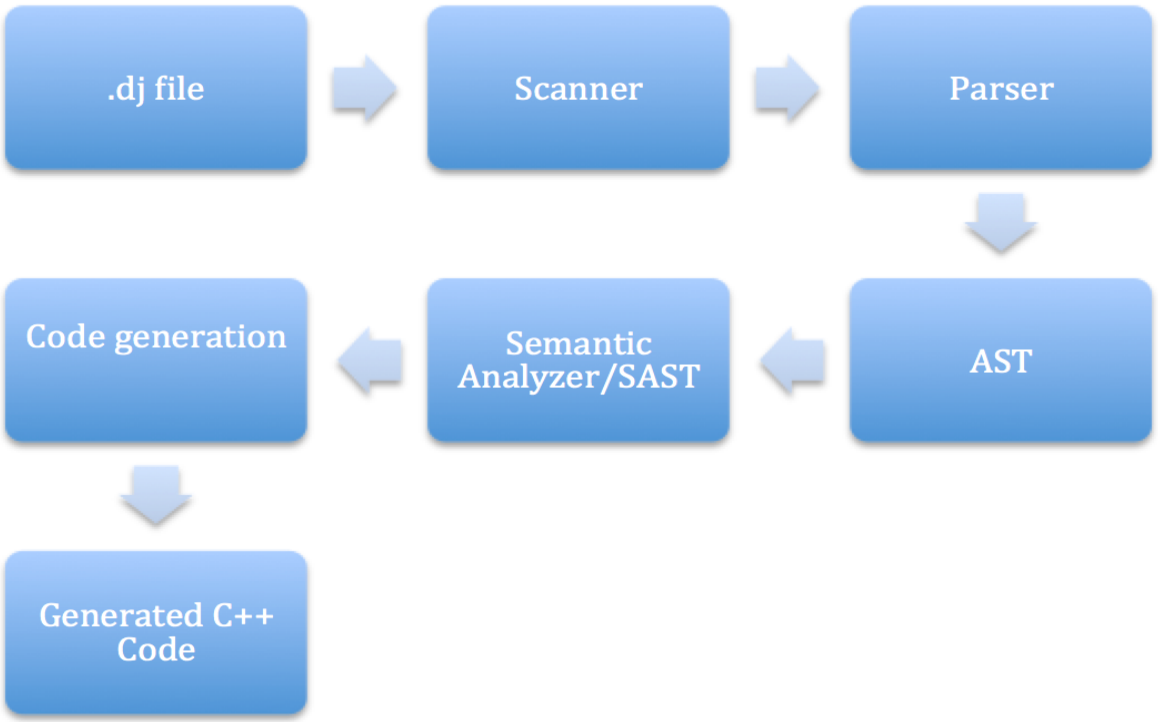
Built-in Functions

- The print is just used for printing to standard output

```
print "hello world";
print 5;
```

- The Sum function takes in a id, starting index, ending index and expression and evaluates the summation
- sum x = 1 to 2:x+1;//5

Language Implementation



Lessons Learned

- Start on time!
- Understand components of compiler before beginning
- Develop in smaller chunks
- Learn Ocaml before or right at the beginning of the course
- Think about how all the components connect so that you don't have to end up going back to previous sections

DEMO!!!

Any Questions???