Algonquin College Logo

# SCHOOL OF ADVANCED TECHNOLOGY

### ICT - Applications & Programming

### Computer Engineering Technology – Computing Science



A11

Language Specification

Lab Professor / Lab Session:

Paulo Sousa / 312

Team:

Sean Bradbury 041101614

Language Name [Chopin]

***This template is suggested (not mandatory) to answer A11 Specification.***

|  |  |
| --- | --- |
| **Part**  **1** | **Language User Reference** |

**EXPLANATION**

*The purpose of this assignment is to invent a new computer language.*

* *This language can have the syntax and structure of your choosing.*
* *Option 1: Adapt the ‘Sofia language to be R compatible (see* <https://www.r-project.org/>*).*
* *Option 2: Define a* ***DSL*** *– Proper to solve specific problems (ex: science, economy, music, etc.)..*

*This is going to be a basic language. There's a lot of functionality that we'll be skipping over, while we implement the basics. You will need to tell me those basics, of course. In this document, I'm going to explain the steps of what to do with a bit of detail.*

* 1. **User Manual**

**Element 1: Name / Extension**

*[Name your language! We suggest you use one "word" related to your “Go-like” language or DSL]*

Chopin

*[What is the filename extension of your language? For example, for C it is .c, and for Professor Paulo's “Sofia”* ***language*** *it is ".****sof****".]*

.cho

*[What is your language patterned after, or what is it similar to? What languages are inspiring your choice? It's okay if you're following R closely.]*

It will be similar to Java since I most familiar with it

**Element 2 – Comments**

“//” will start a single line comment

“///” will start and end a multi line comment

**Element 3 – Keywords**

Function

Return

Int

Dec (Decimal)

Value (positive float)

String

Boolean

For

Do

While

If

Else

**Element 4 – Datatypes**

*[Datatypes: Define integers, real numbers (float points) and strings. Determine their ranges]*

*[Remember to define the number of bytes – and, if possible, range]*

Integers are 4 bytes from -2,147,483,648 to 2,147,483,647

Floats are 4 bytes from 3.4 x 10^-38 to 3.4 x 10^+38

Value is a float that cannot be negative, also 4 bytes

Strings are 1 byte per character plus 8 bytes for the pointer

**Element 5 – Variables**

*[Variables: How would a programmer define variables that can hold integer numbers (numbers with no decimal point), floating point numbers (numbers with a decimal point) or text (ie: strings in Java). This is element 1. Consider if you want to flag the variables in a special way, like SOFIA or BASIC, or not, like C or Java.]*

Variables will be declared with the data type and then variable name ex.

int integerName

dec floatName

value valueName

string stringName

The # symbol should be allowed for variable names, since it is a common symbol in music. C#maj7 for example should be a valid variable.

**Element 6 – Methods / Functions**

*[Variables: How would a programmer define methods]*

The Function keyword will be used followed by the function name and parenthesis

function foo()

**Element 7 - Commands**

* ***Attribution / assignment****: How does your language let a programmer assign a value to a variable? (Will you allow casting? If so, how will it work?) How will your language handle math, and will it allow strings to be concatenated (merged)?*

To assign a variable the “=” symbol will be used ex.

int number = 10;

dec floatNumber = 10.1;

Strings will use double quotes.

string stringName = “Hello”;

casts will be allowed and will use parenthesis.

int myNumber = 5;

dec myDecimal = (dec) myNumber;

* ***Selection****: How does your language do if-style logic? (Optional: Do you want to do some kind of switch/case as well?). You will need to explain how "conditionals" work in your language. How do you write Boolean operations, such as "or", "and", "not", and other conditions, such as less than, greater than, etc?*

Conditionals will work the same as C.

if ( expression ) {

code;

}

Or is || and and is &&. < is less than, > is greater than, >= is greater than or equal, <= is less than or equal.

* ***Interaction****: How will your code handle looping? (You can do one or more of a for-style loop, a while/do loop, etc.)*

For loops will work require three parameters, the increment variable set to a value, the ending number, and the increment value. The ending number is inclusive.

for ( int i = 1, 10, 1) {

console(i + “ “);

}

Will print to the console

1 2 3 4 5 6 7 8 9 10

While loops will also be the same as c:

{

Code;

} while ( expression );

Do {

Code;

} while ( expression );

* ***Input****: How does your program get input from the keyboard? (Strings are easiest.)*

Input is interpreted as strings

* ***Output****: What would a programmer type to put output on the screen? What sort of variables or data will your code take?*

print() is used to output to the screen. It should take any variable or data type.

* ***Functions****: [Function definition: parameters and returning types]*
  + *What will be the syntax for making a function or subroutine?*
  + *How will it take parameters?*
  + *How will it return results?*

The syntax to write a function is as follows:

Function int foo ( parameters ) {

Code;

Return intValue;

}

The return keyword will be used to return a value

**Element 7 – Proper elements**

*[Include specific features / elements to be included in your language]*

* *What you could include / modify? Think about new datatypes / structures / commands, etc.*
* *Note: Do not share this info (it is supposed to be your proper elements in the language.*

I plan on including a “value” data type which is a non-negative float to be used for things like pitch and beat.

Some objects that should be implemented inherently are Notes, Tracks, and Projects. For example, a Note object would have a pitch, duration and velocity (volume). A track would have a map of Notes and the beats they are on.

|  |  |
| --- | --- |
| **Part**  **2** | **Language Comparison** |

**Comparing with C language**

**Differences**

|  |  |  |
| --- | --- | --- |
|  | Chopin is an interpreted language, while C is a compiled language. Chopin will only have strings, not chars. The Boolean data type exists in Chopin. Chopin is object oriented and c is functional. |  |

**Advantages / Disadvantages (in comparison with C)**

|  |  |  |
| --- | --- | --- |
|  | Chopin will have additional functionality for music data. Pitch, beats, notes, etc. will have support.  Chopin will be slower than C due to having to be interpreted. There will also be less features and libraries available. |  |

**Comparing with another language[[1]](#footnote-1)**

**Language Name: JavaScript**

**Differences**

|  |  |  |
| --- | --- | --- |
|  | JavaScript is loosely typed while Chopin is strongly typed. There are ints and floats (decimal) in Chopin while JavaScript has one type of number. JavaScript is able to manipulate html and css and Chopin will manipulate midi data. |  |

**Advantages / Disadvantages (in comparison with this second language)**

|  |  |  |
| --- | --- | --- |
|  | JavaScript allows you to do strange things like concatenate a number and a string together, Chopin should throw an error when data types are set properly. Chopin will have a data type for non-negative floats which ensures impossible things such as negative pitch are not allowed.  JavaScript is able to manipulate web pages which Chopin is not able to do. JavaScript is even able to operate databases and play games, while Chopin cannot. |  |

|  |  |
| --- | --- |
| **Part**  **3** | **Architectural Questions** |

**Advantages**

*[What's the goal of your language? Are you trying to make something simple, fun, complicated? My personal language, Chambly, is based around being useful to scientists. (You can just make something up here, honestly. Think about it a little bit, have a little fun.)]*

Chopin will be able to read MIDI data from a keyboard or computer. It will also be able to manipulate the data for things like transposing, changing tempo, and ai music creation. The resulting data will be able to be exported into a DAW (digital audio workstation). Having a standard language for this will allow the musical data to be compatible with different systems.

**Strategy: C Implementation**

*[How your language can be implemented in C – ex: datatypes]*

* *In plain English, or maybe even some high-level pseudocode, how are you going to parse your language? You will be writing a compiler for your language, so these are some things you need to think about.*

The compiler will first read the code looking for keywords, variable names, operands, and literal values. When a keyword for a data type like int or dec is found, it will expect the next string to be the variable name. When the keyword Function is found, it will look for a return data type and then the function name followed by parenthesis and optionally, parameters. Generally, a keyword will expect certain tokens afterwards. Operations like + - \* and / will expect a number before and after it. “=” will expect a variable to the left and a value to the right.

For the “value” data type, the compiler will have to check if the number is a negative and throw an error if it is.

***Note 1: C Datatypes***

*Remember that you are implementing your language in ANSI C. For this reason, you cannot create arbitrarily your language (from scratch). You need to use what is already provided by C Compiler. For this reason, think about using and defining the language obeying the datatypes.*

*[Your ideas about how to identify elements from language]*

* *Consider your "write to the console" command as an example. How will your compiler detect it? How will it sort out what to write to the console? What if there's some literal text (ie: "this is going to get printed") instead of variables?*

Chopin will use console(“text here”); to print to the console.

*[Your ideas about how to identify scope (ex: blocks between conditionals or functions)]*

* *How do you mark a block of code? If I use your loop logic, how do I control what portion of code gets looped through? In C, you might use { and }. In Python, the indentation is what matters. How does it work in your language?*

Chopin will use curly braces to identify scope.

**FINAL SUGGESTIONS**

*Here some ideas to think about your language....*

* *Don't make this assignment harder than it needs to be on yourself. Focus on making the syntax for your language that meets our requirements. Worry about extra features later.*
* *Don’t worry if your new language winds up having really difficult parts. You'll be allowed to change your language as you go along, as long as you make "patch notes" to explain those changes. We'll tell you about this later.*
* *There's a marking info in the Assignment Guide (CST8152\_Compilers\_242S--ASSAMG) that should steer you along for grades. Focus your efforts on where you'll get the best results.*
* *Finally, think about creating an “master-piece”: until now, you have used several languages. And if you have conditions to define yours, how it could be?*

**References**

1. Data type ranges and bytes: <https://www.tutorialspoint.com/cprogramming/c_data_types.htm>

|  |  |
| --- | --- |
|  | * ***NOTE****: Even if you use any AI tool (ex: ChatGPT), report here, including the references used.* |

Algonquin College

Summer, 2024

1. You can use any language (different from C). Ex: Java, Go, Python, etc. [↑](#footnote-ref-1)