SCHOOL OF ADVANCED TECHNOLOGY

ICT - Applications & Programming

Computer Engineering Technology – Computing Science

A11

Language Specification

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MAGENTA LANGUAGE

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Magenta is a modern,fast, domain specific programming language focused on game development with traits obtained from C, Java and python. The file extension **.mgt** is used for Magenta. Magenta will have the speed of C and compatibility of C language with the easiness and Dynamically Typed traits of python. This creates a small runtime and easier to read code with easy maintenance which makes it a cost-effective solution for game developers to implement the language.

Comments

Single line comments are made with “//” while multiline comments are made starting with “*/” and ends with “/*” this inspiration is gathered from Java.

Reserved Keywords

There are 14 keywords reserved for Magenta

if	return
else	CONSTANT
for	var
while	float
match	int
continue	boolean
break	string

Data Types

There are four data types in Magenta String,int,float and boolean.

Strings are a sequence of characters.

Int is an integers that are whole number they can be positive or negative

Float is a number that contains decimal

Bool is a variable which holds two values, either true or false which can be represented as 1 or 0.

The sizes of each data type in a 64 bit systems are as follows

Int 8 bytes
Float 8 bytes
String (dependent to the variable)
Boolean 2 bytes

Expressing data types

When declaring a variable, the syntax is var Name:datatype; the colon used when declaring a variable accesses the var property and sets the data type.

An example would be

Int = var number:int = 0;

String = var words:String = “0”;

Float = var decimal:float = 0.0;

Boolean = var bool:boolean = true;

Casting is certainly possible with int being casted into boolean with the syntax boolean, an example would be bool = boolean(3); would return true while bool = boolean(0); would return false

Many other data type can be casted by simply writing the data type such as numberToString = String(34); would initialize variable numberToString into the string “34”. While typing float = float(34); would convert the integer 34 into a float of 34.0.

Defining constants

Constants are declared using all capitals "CONSTANT" once declared it is immutable.

Int = CONSTANT var number:int = 0;

String = CONSTANT var words:String = “0”;

Float = CONSTANT var decimal:float = 0.0;
Boolean = CONSTANT var bool:boolean = true;

Defining the most common statements

Initializing variables

Declaring a variable would be
var amount:int;

while initializing a variable would be
amount = 50;

Declaring if statements

if statements are done without an opening and closing parenthesis, so an example would be

```
if amount > 100;{
amount -= 100
}
else
Print("not enough")
```

If statements including logic gates would be interpreted as similar to java language syntax wise.

OR gate

```
If studentDebt > 0 OR creditCardDebt > 0;
{
print(“You have account deficit”)
}
else
print (“You have NO account deficit”)
```

AND gate

```
If studentDebt <= 0 AND creditCardDebt <= 0;{
print (“You have NO account deficit”)
}
```

Loops in the Magenta language can be written as

```
for I = 0; I < 5; I++;
{
Print("Hey")
}
```

similar to most languages

Writing a function is similar to python it would be
Func function name “()” “:”

An example would be

```
Func printName():
Print("Jonathan Jones");
```

Calling the function would be printName();

While accessing a property within a function would be using the semicolon.
Name classObject;

Name:surname = “Jones”;

User input can be obtained by accessing system properties such as

Var a:String = system:input

Implementation examples

Hello World
```
main{
print(“Hello World”);
}
```

Sphere volume
```
main{
var pi:float = 3.14;
var radius:float = system:input;
var volume:float = 4.0 / 3.0 * pi * (radius * radius * radius);
print(volume);
}
```

Architectural Aspects

Advantages and disadvantages

The main idea of this domain specific language is to create a strongly typed programming language aimed towards game production with easy to memorize syntax with performance on par with different languages and small runtime.

There exist many challenges in this project, creating a strongly typed language may be confusing to implement and figuring out how parallelism and memory hierarchies could be challenging. Also considering that the programming language we are accustomed to today is object oriented languages, we have to consider data abstraction and properties. Which is harder to implement compared to a non-object oriented language.

Implementation aspects

tokens for the programming languages are detected from the Lexical scanner aspect from the compiler. For instance if we declared a variable in the programming language we can detect it by splitting the characters into sequences called lexemes. Usually in the format “token name - Attribute value”, and attach the attribute value into the appropriate truth table. The lexical analyzer also helps to scan keywords such as “print” or “scan”. Considering that Magenta is a strongly typed language, the type checking aspect of the Semantic Analysis helps with certain coercions that may happen. An example would be, adding an int to a float, while these two data types are different from each other adding these two data types would result in a float variable. This feature is used in programming languages used as R and javaScript. Writing strings are always preceded with “ and ended with “. The compiler can detect this by lexemes and consider anything between those to be of string data type.

There is also a need for Magenta to detect the order of operation in a mathematics formula. The syntax analyzer labels the nodes in an assignment and applies the correct order of operations. As opposed to languages such as python, Magenta follows the indentation style of the C language. There are two types of scopes, local and global. Local scopes are variables that are defined within a method or a block while global scopes are declared within a scope outside of any methods.Essentially, it is similar to java or c which has a static scope.

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