d.o.t.s.
A graph language.

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September 2015

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1 Lexical Elements

2 Data Types

2.1 Primitive Types

2.1.1 num

The num data type represents all numbers in d.o.t.s. There is no distinction between the traditional data types of int and float, which means for example that there is no difference between the values 5 and 5.0. The comparative ordering of nums is the same as that of numbers in mathematics.

```
num x = 5;
num y = 5.0;
num z = x;

num q = 3.14159;

num a, b, c;
```

Listing 1: Declaration of "num" types.

In Listing 1 variables a, b, c, x, y, z, and q are all of the type num. Variables x, y, and z store equivalent values. Variables a, b, and c are all equal to null.

2.1.2 string

A string is a sequence of 0 or more characters. Comparative ordering of strings is determined sequentially by comparing the ASCII value of each character in the two strings from left to right.

```
string a = "alpha";
string empty = "";
string char = "a";
```

Listing 2: Declaration of "string" types.

2.1.3 bool

The bool type is a logical value which can be either the primitive values true or false.

```
bool t = true;
bool f = false;
```

Listing 3: Declaration of "bool" types.

3 Expressions and Operators

4 Statements

5 Functions

5.1 Function Declaration and Definition

Before a function can be used, it must be declared and defined. Functions are declared using the def keyword, followed by the data type the function will return, followed by the function name, followed by a list of parameters enclosed in parentheses. The function must then be immediately defined within a set of curly braces immediately follwing the parentheses of the parameter list.

```
\*
 * Outline of function declaration and definition.
 * ``return_type'' would be a data type.
 *\
def return_type function_name () {
  \* function implementation code *\
}
```

Listing 4: Function declaration and definition.

5.2 Return Statements

Each function must return a value that matches the declared return type using the return keyword. For functions with the null return type, indicating that nothing is returned by the function, the return statement can consist either of the keyword return as an expression by itself (line 2 of Listing 5), or it can explcitly return null (line 6 of Listing 5).

```
1  def null fnull1 () {
2    return;
3  }
4
5  def null fnull2 () {
6    return null;
7  }
8
9  def int fint () {
10   return 4;
11 }
```

Listing 5: Return statements of functions.

5.3 Parameter List

The declaration of a function must include a list of required parameters enclosed within parentheses. To define a function which requires no parameters, the contents of the parentheses can be left blank. Otherwise, each parameter requires the data type, followed by a variable name by which the parameter can be referenced within the function definition.

```
def null no_params () {
  return;
}

def num one_param (num x) {
  num b = x;
  return b;
}

def string multi_params (string s1, num y, string s2) {
  string statement = s1 + " " + " " + y + "s2";
  return statement;
}
```

Listing 6: Parameters in function declarations.

5.4 Calling Functions

The syntax for calling a function is: the name of the function, followed by a comma-separated list of values or variables to be used in paremter list enclosed within parentheses. Each value or variable passed in to a function call is mapped to the corresponding variable in the declared parameter list of the function.

A function-call expression is considered of the same type as its return type. Because of this, function-call expressions may be used as any other expression. For example a function-call expression can be used in the assignment of variables, as in line 11 of Listing 7.

```
 1 def num increment (num n, num incr) {
 2   return n + incr;
 3 }
 4
 5 num x = 4;
 6
 7 \* The following call maps ``x'' to the variable ``n'',
 8  * and ``2'' to the variable ``incr'' from the declaration
 9  * of the ``increment'' function
10  *\
11 num y = increment(x, 2);
12
13 print("y: ", y); # prints --> ``y: 6''
```

Listing 7: Function declaration and definition.

5.5 Variable Length Parameter Lists

The *only* function in d.o.t.s. that can have a variable number of parameters is the built-in `print` function. All other functions must be declared with a defined absolute number of 0 or more parameters.

The `print` function may be called using a comma-separated list of expressions which can be evaluated as or converted to the `string` type. Each of the built-in types may be used directly as an argument to the print function.

```
string alpha = "World";
print("Hello", alpha, "\n");

```

```
4 node x("foo");
5 num n = 20;
6 print("The node <", x, "> has an associated num equal to:", n, "\n");
```

Listing 8: The built-in “print” function.

In Listing 8, the `print` function was called on line 2 with 3 arguments and with 5 arguments on line 6. The number of arguments passed to `print` does not matter.

6 Program Structure and Scope

6.1 Program Structure

A d.o.t.s. program consists of a series of function declarations and expressions. Because d.o.t.s. is a scripting language, there is no `main` function. Instead, expressions are executed in order from top to bottom. Functions must be declared and defined before use.

6.2 Scope

7 Sample Program