MAlice Language Specification

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1 BNF Grammar

Program	→	Statements Output
Statements	→	Statement Terminator Statements | ϵ
Terminator	→	`,` | `.` | `and` | `but` | `then`
Output	→	`Alice found` Exp `.`
Statement	→	*Id* `was a` Type Too
	|	*Id* `became` Exp
	|	*Id* `ate`
	|	*Id* `drank`
Type	→	`number`
Too	→	`too` | ϵ
Exp	→	Exp `|` Exp1
	|	Exp `^` Exp1
	|	Exp `&` Exp1
	|	Exp1
Exp1	→	Exp1 `+` Exp2
	|	Exp2
Exp2	→	Exp2 `*` Exp3
	|	Exp2 `/` Exp3
	|	Exp2 `%` Exp3
	|	Exp3
Exp3	→	`~`Val | Val
Val	→	*Int* | *Id*

- *Int* is an integer, matching the regular expression pattern `[0-9]+`
- *Id* is a variable identifier, matching `[a-zA-Z_]+`

2 Semantics

2.1 Types

2.1.1 Number

Numbers are unsigned integers of length 8 bits (ie: they can hold the range 0-255). Furthermore underflow and overflow are undefined behaviours. All operators listed in the operators section can be used.

2.1.2 Letter

Although `letter` appears as a type in the given examples, there are no working exapmles in which its functionality is exhibited. Consequently, nothing can be inferred about this possible type, including whether it is a valid type or not!

As such, it is not included in this version of the language specification.

2.2 Statements

An Alice program is defined as a list of statements followed by the output statement.

2.2.1 Output

The `Alice found` statement is analogous to the return statement of other languages. It evaluates its parameter (an expression) and returns the value.

For example:
```
Alice found 3.
```
returns the value 3.

2.2.2 Declaration

The `was a` statement declares the preceding identifier as a variable of the given type.

Declaring the same variable name multiple times is not permitted and will result in a compile-time error.

For example:
```
x was a number
```
declares a variable called x as a number

2.2.3 Assignment

The `became` statement assigns the value of an expression to the given variable.

The type of the expression must match the type of the variable, otherwise a compile-time error will result.

For example:
```
x became 5
```
assigns 5 to x.

2.2.4 Increment and Decrement

The `drank` statement decrements the given variable by 1.

The `ate` statement increments the given variable by 1.

For example:
```
x drank
```
if x is 5, x will become 4

For example:
```
x ate
```
if x is 5, x will become 6

2.3 Expressions

Operator	Operation	Precedence
`|`	Bitwise OR	1
`^`	Bitwise XOR	1
`&`	Bitwise AND	1
`+`	Addition	2
`*`	Multiplication	3
`/`	Division	3
`%`	Modulo	3
`~`	Bitwise NOT	4

- Numerically higher precedences bind more tightly.
- All operators are mathematically associative, and implemented as left-associative.
- Division by 0 is undefined and will be handled by the operating system.
- All operators are binary, except for Bitwise NOT which is unary.
- The only precedences that were determinable from the example files given were those for the `+` and `*` operators. All other precedences have been

taken from the common usage, or where none is obvious, from the C language.