COMP 520 - Milestone 3

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Implementation

We chose to generate WebAssembly TextFormat (`.wast`) code which uses an AST representation in S-expression syntax. For this milestone we have implemented function declarations, declaration statements, short declaration statements, if-else statements, assignment statements, post-op assignments, parenthesized expressions, unary operations, binary operations, and literals.

Note that some of the implementations mentioned above are partially implemented. For example, WebAssembly does not have `string` as the base type, and certain GoLite operations are not found in the WebAssembly specification and design documentation [1,2]. We'll implement the rest in milestone4.

The following is an example GoLite program (left) and the corresponding WebAssembly output (right). WebAssembly requires that variable declarations in a function to be defined at the top of the function body (`local`) before they are used, so we append the GoLite type and scope level to the variable names.

GoLite:

```
package main

func main() {
  var x, y int = 2, 3
  if z := 1; z == 0 {
    x = y * (-z + 4)
  } else {
    y++
  }
}
```

WebAssembly:

```
(module
  (func $main
    (local $x_int_1 i32)
    (local $y_int_1 i32)
    (local $z_int_2 i32)
    (set_local $x_int_1(i32.const 2))
    (set_local $y_int_1(i32.const 3))
    (block
      (set_local $z_int_2 (i32.const 1))
      (if (i32.eq (get_local $z_int_2) (i32.const 0))
        (then
          (set_local $x_int_1 (i32.mul (get_local $y_int_1)
            (i32.add (i32.neg (get_local $z_int_2))
            (i32.const 4)))))
        (else
          (set_local $y_int_1 (i32.add (get_local $y_int_1)
          (i32.const 1)))))))))
```

References

1. https://github.com/WebAssembly/spec/blob/master/ml-proto/README.md

2. https://github.com/WebAssembly/design/blob/master/AstSemantics.md