Compiladores, 2023/2024

Apêndice ao enunciado do trabalho 1

Fernando Lobo

Este documento apresenta alguns exemplos de inputs/outputs que obtive com a minha implementação do trabalho. Estes exemplos são meramente ilustrativos e não cobrem todo o tipo de erros que possam ocorrer. Compete a vós arranjar outros casos de teste de forma a testar o trabalho de forma apropriada.

1 Exemplos de inputs com erros semânticos

1.1 inputs/in-erro1.tasm

```
iconst 1
iconst 2
iconst 3
```

Ao ser executado, o tAssembler deveria dar um output deste género:

```
line 4:0 error: Source file must have a 'halt' instruction
inputs-tasm/in-erro1.tasm has 1 semantic errors
```

1.2 inputs/in-erro2.tasm

```
        iconst 1
L1, L2: iconst 2
        iconst 3
        ilt
        jumpt L3
        halt
```

Ao ser executado, o tAssembler deveria dar um output deste género:

```
line 5:14 error: label L3 not defined
inputs-tasm/in-erro2.tasm has 1 semantic errors
```

1.3 inputs/in-erro3.tasm

```
        iconst 1
L1, L2: iconst 2
        iconst 3
        ilt
        jumpt L1
        jump L2
        iconst 8
    L2: iprint
        halt
```

Ao ser executado, o tAssembler deveria dar um output deste género:

```
line 8:4 error: label L2 is already defined
inputs-tasm/in-erro3.tasm has 1 semantic errors
```

2 Exemplos de inputs correctos

2.1 inputs/in1.tasm

```
galloc 5
iconst 12
gstore 0
iconst 5
gstore 2
sconst "maria"
gstore 1
dconst 3.14159
gstore 3
tconst
gstore 4
sconst "ola"
sconst " "
gload 1
sadd
sadd
gstore 1
sconst "ola"
sconst " "
sadd
gload 1
sadd
sprint
halt
```

Ao ser executado em modo de "debug", o tAssembler deveria dar um output deste género:

```
Constant pool
    0: "maria"
    1: 3.14159
    2: "ola"
    3: " "
Generated code in text format
    0: galloc 5
    1: iconst 12
    2: gstore 0
    3: iconst 5
    4: gstore 2
    5: sconst 0
    6: gstore 1
    7: dconst 1
    8: gstore 3
    9: tconst
   10: gstore 4
   11: sconst 2
   12: sconst 3
   13: gload 1
   14: sadd
   15: sadd
   16: gstore 1
   17: sconst 2
   18: sconst 3
   19: sadd
   20: gload 1
   21: sadd
   22: sprint
   23: halt
Saving the bytecodes to inputs-tasm/in1.tbc
```

Output de tVM:

```
ola ola maria
```

Output de tVM a correr em modo “trace”:

```
Constant pool
    0: "maria"
    1: 3.14159
    2: "ola"
    3: " "
Disassembled instructions
    0: galloc 5
    1: iconst 12
    2: gstore 0
    3: iconst 5
    4: gstore 2
    5: sconst 0
    6: gstore 1
    7: dconst 1
    8: gstore 3
    9: tconst
   10: gstore 4
   11: sconst 2
   12: sconst 3
   13: gload 1
   14: sadd
   15: sadd
   16: gstore 1
   17: sconst 2
   18: sconst 3
   19: sadd
   20: gload 1
   21: sadd
   22: sprint
   23: halt
Trace while running the code
Execution starts at instrution 0
                        Globals: []
                        Stack: []
    0: galloc 5
                        Globals: [NIL, NIL, NIL, NIL, NIL]
                        Stack: []
    1: iconst 12
                        Globals: [NIL, NIL, NIL, NIL, NIL]
                        Stack: [12]
    2: gstore 0
                        Globals: [12, NIL, NIL, NIL, NIL]
                        Stack: []
```

```
 3: iconst 5
                    Globals: [12, NIL, NIL, NIL, NIL]
                    Stack: [5]
 4: gstore 2
                    Globals: [12, NIL, 5, NIL, NIL]
                    Stack: []
 5: sconst 0
                    Globals: [12, NIL, 5, NIL, NIL]
                    Stack: ["maria"]
 6: gstore 1
                    Globals: [12, "maria", 5, NIL, NIL]
                    Stack: []
 7: dconst 1
                    Globals: [12, "maria", 5, NIL, NIL]
                    Stack: [3.14159]
 8: gstore 3
                    Globals: [12, "maria", 5, 3.14159, NIL]
                    Stack: []
 9: tconst
                    Globals: [12, "maria", 5, 3.14159, NIL]
                    Stack: [true]
10: gstore 4
                    Globals: [12, "maria", 5, 3.14159, true]
                    Stack: []
11: sconst 2
                    Globals: [12, "maria", 5, 3.14159, true]
                    Stack: ["ola"]
12: sconst 3
                    Globals: [12, "maria", 5, 3.14159, true]
                    Stack: ["ola", " "]
13: gload 1
                    Globals: [12, "maria", 5, 3.14159, true]
                    Stack: ["ola", " ", "maria"]
14: sadd
                    Globals: [12, "maria", 5, 3.14159, true]
                    Stack: ["ola", " maria"]
15: sadd
                    Globals: [12, "maria", 5, 3.14159, true]
                    Stack: ["ola maria"]
16: gstore 1
                    Globals: [12, "ola maria", 5, 3.14159, true]
                    Stack: []
17: sconst 2
                    Globals: [12, "ola maria", 5, 3.14159, true]
                    Stack: ["ola"]
```

```
   18: sconst 3
                       Globals: [12, "ola maria", 5, 3.14159, true]
                       Stack: ["ola", " "]
   19: sadd
                       Globals: [12, "ola maria", 5, 3.14159, true]
                       Stack: ["ola "]
   20: gload 1
                       Globals: [12, "ola maria", 5, 3.14159, true]
                       Stack: ["ola ", "ola maria"]
   21: sadd
                       Globals: [12, "ola maria", 5, 3.14159, true]
                       Stack: ["ola ola maria"]
   22: sprint
ola ola maria
                       Globals: [12, "ola maria", 5, 3.14159, true]
                       Stack: []
   23: halt
                       Globals: [12, "ola maria", 5, 3.14159, true]
                       Stack: []
```

2.2 inputs/in2.tasm

```
iconst 5
iadd
halt
```

Ao ser executado em modo de "debug", o tAssembler deveria dar um output deste género:

```
Constant pool
Generated code in text format
    0: iconst 5
    1: iadd
    2: halt
Saving the bytecodes to inputs-tasm/in2.tbc
```

Output de tVM:

```
runtime error: iadd needs 2 elements at the top of the stack
```

Output de tVM a correr em modo "trace":

```
Constant pool
Disassembled instructions
    0: iconst 5
    1: iadd
    2: halt
Trace while running the code
Execution starts at instrution 0
                        Globals: []
                        Stack: []
    0: iconst 5
                        Globals: []
                        Stack: [5]
    1: iadd
runtime error: iadd needs 2 elements at the top of the stack
                        Stack: [5]
```

2.3 inputs/in3.tasm

```
            iconst 7
            dconst 3
            dadd
            halt
```

Ao ser executado em modo de "debug", o tAssembler deveria dar um output deste género:

```
Constant pool
    0: 3.0
Generated code in text format
    0: iconst 7
    1: dconst 0
```

```
    2: dadd
    3: halt
Saving the bytecodes to inputs-tasm/in3.tbc
```

Output de tVM:

```
runtime error: dadd needs 2 real values at the top of the stack
```

Output de tVM a correr em modo "trace":

```
Constant pool
    0: 3.0
Disassembled instructions
    0: iconst 7
    1: dconst 0
    2: dadd
    3: halt
Trace while running the code
Execution starts at instrution 0
                        Globals: []
                        Stack: []
    0: iconst 7
                        Globals: []
                        Stack: [7]
    1: dconst 0
                        Globals: []
                        Stack: [7, 3.0]
    2: dadd
runtime error: dadd needs 2 real values at the top of the stack
                        Stack: []
```

2.4 inputs/areaC.tasm

(NOTA: Este é o exemplo que está no enunciado do trabalho)

```
            galloc 3
            dconst 3.14159
            gstore 0
            iconst 1
            gstore 2
beginLoop:  gload 2
            iconst 3
            ilt
            jumpf endLoop
            gload 0
            gload 2
            itod
            dmult
            gload 2
            itod
            dmult
            gstore 1
            sconst "Area de circulo de raio "
            gload 2
            itos
            sadd
            sconst " = "
            sadd
            gload 1
            dtos
            sadd
            sprint
            gload 2
            iconst 1
            iadd
            gstore 2
            jump beginLoop
  endLoop:  sconst "Fim"
            sprint
            halt
```

Ao ser executado em modo de "debug", o tAssembler deveria dar um output deste género:

```
Constant pool
    0: 3.14159
    1: "Area de circulo de raio "
    2: " = "
    3: "Fim"
Generated code in text format
    0: galloc 3
    1: dconst 0
    2: gstore 0
    3: iconst 1
    4: gstore 2
    5: gload 2
    6: iconst 3
    7: ilt
    8: jumpf 32
    9: gload 0
   10: gload 2
   11: itod
   12: dmult
   13: gload 2
   14: itod
   15: dmult
   16: gstore 1
   17: sconst 1
   18: gload 2
   19: itos
   20: sadd
   21: sconst 2
   22: sadd
   23: gload 1
   24: dtos
   25: sadd
   26: sprint
   27: gload 2
   28: iconst 1
   29: iadd
   30: gstore 2
   31: jump 5
   32: sconst 3
   33: sprint
   34: halt
Saving the bytecodes to inputs-tasm/areaC.tbc
```

Output de tVM:

```
Area de circulo de raio 1 = 3.14159
Area de circulo de raio 2 = 12.56636
Fim
```

Output de tVM a correr em modo "trace":

```
Constant pool
    0: 3.14159
    1: "Area de circulo de raio "
    2: " = "
    3: "Fim"
Disassembled instructions
    0: galloc 3
    1: dconst 0
    2: gstore 0
    3: iconst 1
    4: gstore 2
    5: gload 2
    6: iconst 3
    7: ilt
    8: jumpf 32
    9: gload 0
   10: gload 2
   11: itod
   12: dmult
   13: gload 2
   14: itod
   15: dmult
   16: gstore 1
   17: sconst 1
   18: gload 2
   19: itos
   20: sadd
   21: sconst 2
   22: sadd
   23: gload 1
   24: dtos
   25: sadd
   26: sprint
   27: gload 2
```

```
   28: iconst 1
   29: iadd
   30: gstore 2
   31: jump 5
   32: sconst 3
   33: sprint
   34: halt
Trace while running the code
Execution starts at instrution 0
                       Globals: []
                       Stack: []
    0: galloc 3
                       Globals: [NIL, NIL, NIL]
                       Stack: []
    1: dconst 0
                       Globals: [NIL, NIL, NIL]
                       Stack: [3.14159]
    2: gstore 0
                       Globals: [3.14159, NIL, NIL]
                       Stack: []
    3: iconst 1
                       Globals: [3.14159, NIL, NIL]
                       Stack: [1]
    4: gstore 2
                       Globals: [3.14159, NIL, 1]
                       Stack: []
    5: gload 2
                       Globals: [3.14159, NIL, 1]
                       Stack: [1]
    6: iconst 3
                       Globals: [3.14159, NIL, 1]
                       Stack: [1, 3]
    7: ilt
                       Globals: [3.14159, NIL, 1]
                       Stack: [true]
    8: jumpf 32
                       Globals: [3.14159, NIL, 1]
                       Stack: []
    9: gload 0
                       Globals: [3.14159, NIL, 1]
                       Stack: [3.14159]
   10: gload 2
                       Globals: [3.14159, NIL, 1]
                       Stack: [3.14159, 1]
   11: itod
```

```
                    Globals: [3.14159, NIL, 1]
                    Stack: [3.14159, 1.0]
12: dmult
                    Globals: [3.14159, NIL, 1]
                    Stack: [3.14159]
13: gload 2
                    Globals: [3.14159, NIL, 1]
                    Stack: [3.14159, 1]
14: itod
                    Globals: [3.14159, NIL, 1]
                    Stack: [3.14159, 1.0]
15: dmult
                    Globals: [3.14159, NIL, 1]
                    Stack: [3.14159]
16: gstore 1
                    Globals: [3.14159, 3.14159, 1]
                    Stack: []
17: sconst 1
                    Globals: [3.14159, 3.14159, 1]
                    Stack: ["Area de circulo de raio "]
18: gload 2
                    Globals: [3.14159, 3.14159, 1]
                    Stack: ["Area de circulo de raio ", 1]
19: itos
                    Globals: [3.14159, 3.14159, 1]
                    Stack: ["Area de circulo de raio ", "1"]
20: sadd
                    Globals: [3.14159, 3.14159, 1]
                    Stack: ["Area de circulo de raio 1"]
21: sconst 2
                    Globals: [3.14159, 3.14159, 1]
                    Stack: ["Area de circulo de raio 1", " = "]
22: sadd
                    Globals: [3.14159, 3.14159, 1]
                    Stack: ["Area de circulo de raio 1 = "]
23: gload 1
                    Globals: [3.14159, 3.14159, 1]
                    Stack: ["Area de circulo de raio 1 = ", 3.14159]
24: dtos
                    Globals: [3.14159, 3.14159, 1]
                    Stack: ["Area de circulo de raio 1 = ", "3.14159"]
25: sadd
                    Globals: [3.14159, 3.14159, 1]
                    Stack: ["Area de circulo de raio 1 = 3.14159"]
26: sprint
```

```
Area de circulo de raio 1 = 3.14159
                        Globals: [3.14159, 3.14159, 1]
                        Stack: []
   27: gload 2
                        Globals: [3.14159, 3.14159, 1]
                        Stack: [1]
   28: iconst 1
                        Globals: [3.14159, 3.14159, 1]
                        Stack: [1, 1]
   29: iadd
                        Globals: [3.14159, 3.14159, 1]
                        Stack: [2]
   30: gstore 2
                        Globals: [3.14159, 3.14159, 2]
                        Stack: []
   31: jump 5
                        Globals: [3.14159, 3.14159, 2]
                        Stack: []
    5: gload 2
                        Globals: [3.14159, 3.14159, 2]
                        Stack: [2]
    6: iconst 3
                        Globals: [3.14159, 3.14159, 2]
                        Stack: [2, 3]
    7: ilt
                        Globals: [3.14159, 3.14159, 2]
                        Stack: [true]
    8: jumpf 32
                        Globals: [3.14159, 3.14159, 2]
                        Stack: []
    9: gload 0
                        Globals: [3.14159, 3.14159, 2]
                        Stack: [3.14159]
   10: gload 2
                        Globals: [3.14159, 3.14159, 2]
                        Stack: [3.14159, 2]
   11: itod
                        Globals: [3.14159, 3.14159, 2]
                        Stack: [3.14159, 2.0]
   12: dmult
                        Globals: [3.14159, 3.14159, 2]
                        Stack: [6.28318]
   13: gload 2
                        Globals: [3.14159, 3.14159, 2]
                        Stack: [6.28318, 2]
```

```
   14: itod
                       Globals: [3.14159, 3.14159, 2]
                       Stack: [6.28318, 2.0]
   15: dmult
                       Globals: [3.14159, 3.14159, 2]
                       Stack: [12.56636]
   16: gstore 1
                       Globals: [3.14159, 12.56636, 2]
                       Stack: []
   17: sconst 1
                       Globals: [3.14159, 12.56636, 2]
                       Stack: ["Area de circulo de raio "]
   18: gload 2
                       Globals: [3.14159, 12.56636, 2]
                       Stack: ["Area de circulo de raio ", 2]
   19: itos
                       Globals: [3.14159, 12.56636, 2]
                       Stack: ["Area de circulo de raio ", "2"]
   20: sadd
                       Globals: [3.14159, 12.56636, 2]
                       Stack: ["Area de circulo de raio 2"]
   21: sconst 2
                       Globals: [3.14159, 12.56636, 2]
                       Stack: ["Area de circulo de raio 2", " = "]
   22: sadd
                       Globals: [3.14159, 12.56636, 2]
                       Stack: ["Area de circulo de raio 2 = "]
   23: gload 1
                       Globals: [3.14159, 12.56636, 2]
                       Stack: ["Area de circulo de raio 2 = ", 12.56636]
   24: dtos
                       Globals: [3.14159, 12.56636, 2]
                       Stack: ["Area de circulo de raio 2 = ", "12.56636"]
   25: sadd
                       Globals: [3.14159, 12.56636, 2]
                       Stack: ["Area de circulo de raio 2 = 12.56636"]
   26: sprint
Area de circulo de raio 2 = 12.56636
                       Globals: [3.14159, 12.56636, 2]
                       Stack: []
   27: gload 2
                       Globals: [3.14159, 12.56636, 2]
                       Stack: [2]
   28: iconst 1
                       Globals: [3.14159, 12.56636, 2]
```

```
                        Stack: [2, 1]
   29: iadd
                        Globals: [3.14159, 12.56636, 2]
                        Stack: [3]
   30: gstore 2
                        Globals: [3.14159, 12.56636, 3]
                        Stack: []
   31: jump 5
                        Globals: [3.14159, 12.56636, 3]
                        Stack: []
    5: gload 2
                        Globals: [3.14159, 12.56636, 3]
                        Stack: [3]
    6: iconst 3
                        Globals: [3.14159, 12.56636, 3]
                        Stack: [3, 3]
    7: ilt
                        Globals: [3.14159, 12.56636, 3]
                        Stack: [false]
    8: jumpf 32
                        Globals: [3.14159, 12.56636, 3]
                        Stack: []
   32: sconst 3
                        Globals: [3.14159, 12.56636, 3]
                        Stack: ["Fim"]
   33: sprint
Fim
                        Globals: [3.14159, 12.56636, 3]
                        Stack: []
   34: halt
                        Globals: [3.14159, 12.56636, 3]
                        Stack: []
```