Interpretation and Compilation

TEST 2B

Luis Caires

Universidade Nova de Lisboa

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Test Statement

The goal of the exercise is to discuss how to extend your interpreter / compiler with an additional **`for`** construct (described in the last page).

PART I

This part is about programming language design and implementation.

You will be required to add the `for` construct to your current interpreter code. For this you need to

- extend your LL(1) grammar and parser,

- define the additional AST node class(es),

- implement the evaluation and typechecking methods

IValue eval(Environment e)

IType typecheck(TyEnvironment e)

Test Statement

The goal of the exercise is to discuss how to extend your interpreter / compiler with an additional `for` construct (described in the last page).

PART 2

This part of the test must be answered in a separate text file “answer.txt”, that you should add to the answer tar file.

Q1:

Write the typing rule for the `for` construct.

Q2:

Define a compilation scheme for the `for` construct, targeting the JVM.

$[\![$ **for** id:=e_1 **until** e_2 **step** e_3 **do** e_4 **end** $]\!]_E = ?$

for construct

1 - Concrete syntax of the `for` construct

`for` `id:=`e_1 **`until`** e_2 **`step`** e_3 **`do`** e_4 **`end`**

2 - Semantics of the `for` construct (informal).

The identifier **`id`** denotes an integer reference (of type **`ref int`**) and is **locally declared** in the **`for`** ... **`end`** construct, with scope the until condition e_2, the step e_3 and the body e_4. The evaluation is as follows:

Initially, expression e_1 is evaluated and its integer value assigned to **`id`**.

Then, while the condition e_2 is **false**, the body e_4 and (in sequence) the step command e_3 are **repeatedly** executed.

The loop terminates as soon as e_2 evaluates to true.

Example 1

```
for i:=0 until (!i==20) step i:=!i+1 do
  print !i;
  println
end;;
```

Example 1

```
decl
   s = new 1
in
   for i:=0 until !s>128 step i:=!i*2 do
      s := !i + !s
   end;
   print !s;
   println
end;;
```

Instructions

Send your solution in a tar.gz or zip compressed archive to

lcaires@fct.unl.pt

with

SUBJECT: IC TEST2 xxxxx

where xxxxx is your FCTUNL student number.

Thanks!