PROGRAMMING LANGUAGES

Assignment 7: Type Checker in Prolog

In this assignment, you will write a type-checker for a simple functional language.

You need to write a Prolog predicate *hastype(Gamma, E, T)*, where

- *Gamma* is a list of variable-type pairs, representing type assumptions on variables
- *E* is an object language expression,
- *T* is a type.

This predicate is mutually recursively defined with another Prolog predicate

typeElaborates(Gamma, D, Gamma')

where *D* is a definition.

E ranges over (at least)

- variables, modelled as say *variable(X)*
- constants, both numerical and boolean (at least)
- arithmetic operations over numerical expressions
- boolean operations over boolean expressions
- comparison operations over numerical expressions
- equality over arbitrary expressions, where equality can be decided
- conditional expressions **if_then_else**
- qualified expressions of the form **let** *D* **in** *E* **end**
- function abstractions *\X.E* with functions as first-class citizens
- function application (*E1 E2*)
- *n*-tuples *(n >= 0)*
- expressions using projection operations.
- ....possible *extensions to constructors, and case analysis expressions*

and

D ranges over (at least)

- simple definitions *X* =**def**= *E*
- sequential definitions *D1**;** D2*
- parallel definitions *D1* || *D2*

- local definitions **local** *D1* **in** *D2* **end**
- *... possible extension to recursive definitions*

and

T ranges over (at least)

- Type variables modelled as say TypeVar(A)
- Base types **tint**, **tbool**, ...
- Arrow types *T1 -> T2* |
- cartesian product types *T1 * ... * Tn (n>1)*
- *... possible extension to union types and recursive types...*

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You will need to define suitable constructors for expressions, definitions, types, etc.

You need to provide enough test examples to show your type checker works correctly.

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Note that this checker can work as a type inference engine. However it does not work for polymorphic type inference. Show with counter-examples that this is the case.

Submission status

Submission status	Submitted for grading
Grading status	Not graded
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Time remaining	Assignment was submitted 2 hours 9 mins early
Last modified	Friday, 21 August 2020, 9:49 PM
File submissions	Assignment7.zip
Submission comments	Comments (0)

Feedback

Grade	6.00 / 6.00
Graded on	Wednesday, 26 August 2020, 9:21 PM