CSSE4630 Week 8 Lab: Steensgaard's Pointer Analysis

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Version 1.0

1 Introduction

This workshop is focussed on Pointer Analysis. In the second part of this workshop, please also continue working on your assignment and asking questions about it.

2 Implementing Steensgaard's Algorithm

The TIP system does not fully implement Steensgaard's pointer analysis algorithm yet. To see this, run the following command and read the exception it generates:

```
tip -steensgaard examples/ptr7.tip
```


Implement the five missing cases in the `visit` method in `SteensgaardAnalysis`. See page 116 of the textbook for the rules you should implement.

Hints:

1. The `solver` is already created for you, so you can just call its `unify` method.
2. The *address-of* constructor in the textbook (`&X` corresponds to `PointerRef(_)` in the Scala code (down the bottom of the file).

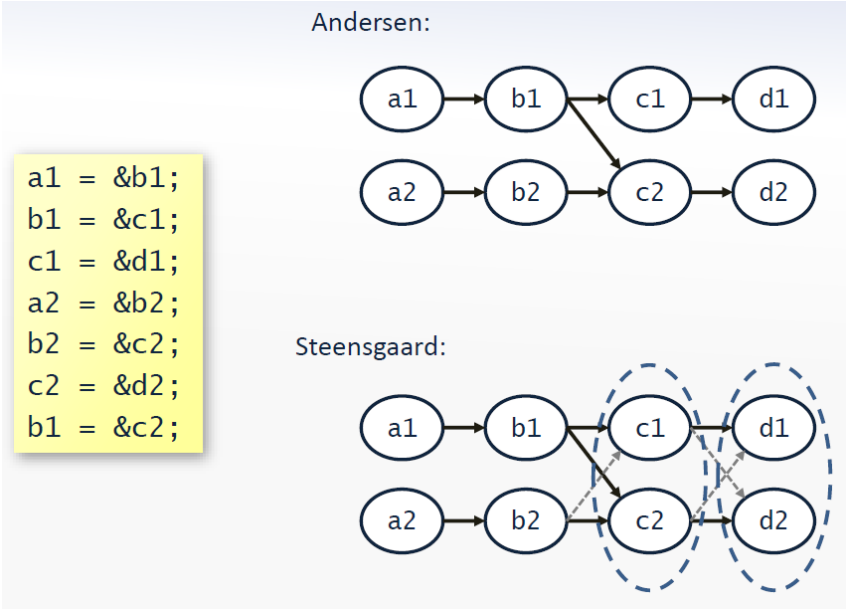
3. You should use the `identifierToTerm` method to convert an identifier into an abstract term that represents a set of pointers, and `allocToTerm` to turn an 'alloc' expression into an abstract term.
4. The first three cases can be implemented with a single line of code, but the last two cases will require about 3 lines of code, as you must allocate a fresh variable (called α in the textbook) using `FreshVariable()` and then use it.

3 Evaluating Pointer Analysis

Use your Steensgaard algorithm to analyse the `examples/ptr7.tip` program. You should see standard output being printed that includes the following results:

```
[info] Points-to:
c1:3:25 -> { d1:3:33,d2:3:37 }
b1:3:17 -> { c1:3:25,c2:3:29 }
a2:3:13 -> { b2:3:21 }
d1:3:33 -> {  }
a1:3:9 -> { b1:3:17 }
b2:3:21 -> { c1:3:25,c2:3:29 }
d2:3:37 -> {  }
c2:3:29 -> { d1:3:33,d2:3:37 }
```

Here is a nice visualisation of these results, from Slide 18 from the Week 8 lectures. Note how Steensgaard's analysis merges the $c1$ and $c2$ into one set, and therefore must also merge $d1$ and $d2$ into one set. It is less precise than the Andersen algorithm, but much faster.



4 Working on your Static Analysis Assignment

Please use the rest of this workshop to work on your assignment, and ask your tutor any questions that you have about it.