Lecture 18

Semantics Analysis

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Take aways from the last class

- Type System and Type checking

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- Type checking for statements

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- Name equivalence: types can be given names
  - Two type expressions are equivalent if they have the same name

Function to test structural equivalence

Algorithm bool structureEquivalence(s, t)

```
1: if s and t are same basic types then
2:     return true
3: else if s == array(s1, s2) and t == array(t1, t2) then
4:     return return structureEquivalence(s1, t1) && structureEquivalence(s2, t2)
5: else if s == s1 × s2 and t == t1 × t2 then
6:     return structureEquivalence(s1, t1) && structureEquivalence(s2, t2)
7: else if s == pointer(s1) and t == pointer(t1) then
8:     return structureEquivalence(s1, t1)
9: else if s == s1 → s2 and t == t1 → t2 then
10:    return structureEquivalence(s1,t1) && structureEquivalence(s2,t2)
11: else
12:    return false
13: end if
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- Under structural equivalence all the variables are of the same type

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- Type names must be declared before they are used
  - However, allow pointers to undeclared structure types
  - All potential cycles are due to pointers to structure

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- Conversions are explicit if programmer has to write something to cause conversion

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  - Top down: narrow set of possible types based on what could be used in an expression

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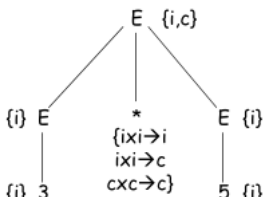

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- If this process does not result in a unique type for each subexpression, then a type error is declared for the expression

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  $t = E.unique$
  $S = \{s|s \in E_2.types$ and $(s \rightarrow t) \in E_1.types\}$
  $E_2.unique = if\ \ S == s$ then s else $type\_error$
  $E_1.unique = if\ \ S == s\ \ then\ s \rightarrow t$ else $type\_error$