**Script** generated by TTT

Title: Petter: Compiler Construction (25.06.2020) - 44: Symbol Tables

Date: Thu Jun 25 10:31:37 CEST 2020

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Pages: 14

## Refer Uses to Declarations: Symbol Tables

Check for the correct usage of variables:

- Traverse the syntax tree in a suitable sequence, such that
  - each declaration is visited before its use
  - the currently visible declaration is the last one visited
  - ⇝ perfect for an L-attributed grammar
  - equation system for basic block must add and remove identifiers
- for each identifier, we manage a *stack* of declarations
  1. if we visit a *declaration*, we push it onto the stack of its identifier
  2. upon leaving the *scope*, we remove it from the stack
- if we visit a *usage* of an identifier, we pick the top-most declaration from its stack
- if the stack of the identifier is empty, we have found an undeclared identifier



## Example: Decl-Use Analysis via Table of Stacks

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2  {
3    int a, b;
4    b = 5;
5    if (b>3) {
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10   } else {
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|---|---|
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| 2 | $c$ |



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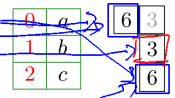




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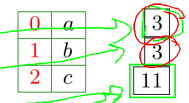




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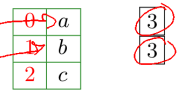




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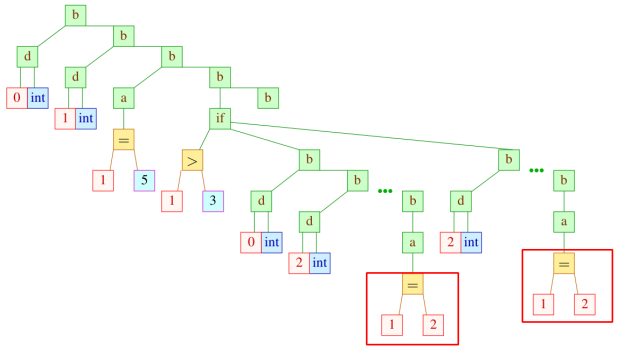
a assignment





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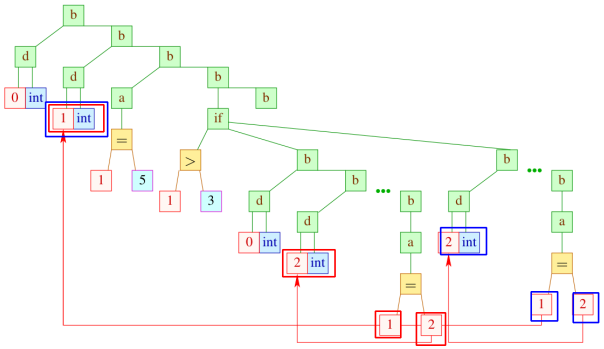



## Alternative Implementations for Symbol Tables

- when using a list to store the symbol table, storing a marker indicating the old head of the list is sufficient


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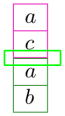


then-branch

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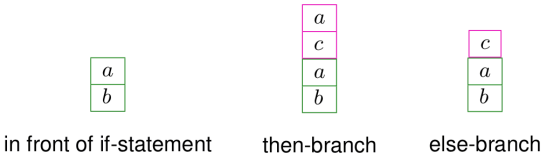




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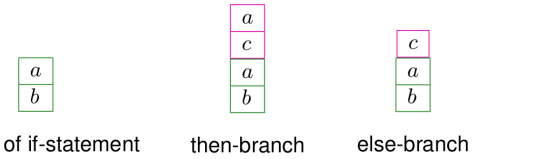


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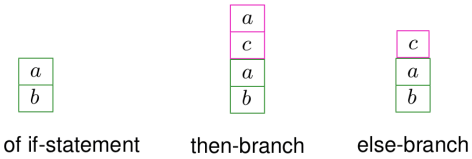


- instead of lists of symbols, it is possible to use a list of hash tables $\rightsquigarrow$ more efficient in large, shallow programs
- an even more elegant solution: *persistent trees* (updates return fresh trees with references to the old tree where possible)
  - $\rightsquigarrow$ a persistent tree $t$ can be passed down into a basic block where new elements may be added, yielding a $t'$; after examining the basic block, the analysis proceeds with the unchanged old $t$