



Compiler Construction/Fall 2014/Homework 7

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Assigned Thursday 10/16/2014, due Thursday 10/30/2014 at 8am

Reading Assignments

- Lecture on October 16: Dragon book 6.1, 6.2, 6.4, 6.6, 6.9 (34p).
- Midterm on October 23: Material covered so far.
- Lecture on October 30: Dragon book 7.1-7.4 (36p).

Homework Assignments

The following assignments should be submitted for a maximum of 25 points and 5 bonus points.¹

1 Representation

Question 1.1 (Intermediate representation, 6 points).

Translate the arithmetic expression $(a + b * c) + d + (a + b * c) - d + e$ into:

1. syntax tree,
2. DAG (Directed Acyclic Graph) representation,
3. Three-Address Code representation.

Question 1.2 (Data structure representation, 8 points).

Translate the arithmetic expression $a + -(b + c)$ into:

1. syntax tree,
2. quadruples,
3. triples,
4. indirect triples.

¹The bonus points are accumulated for the entire year and can be used to improve the final result (the precise formula is not decided yet).

2 Translation

Question 2.1 (Expression translation, 5 points).

Re-consider the expression translation SDD from the lecture:

PRODUCTION	SEMANTIC RULES
$S \rightarrow \mathbf{id} = E_1 ; S_2$	$S.code = E_1.code \parallel \llbracket \mathbf{id}' = ' E_1.addr \rrbracket \parallel S_2.code$
$\mid \epsilon$	$S.code = \llbracket \rrbracket$
$E \rightarrow E_1 + E_2$	$E.addr = \text{newTemp}()$ $E.code = E_1.code \parallel E_2.code \parallel \llbracket E.addr = E_1.addr + E_2.addr \rrbracket$
$\mid - E_1$	$E.addr = \text{newTemp}()$ $E.code = E_1.code \parallel \llbracket E.addr = -E_1.addr \rrbracket$
$\mid (E_1)$	$E.addr = E_1.addr ; E.code = E_1.code$
$\mid \mathbf{id}$	$E.addr = \mathbf{id} ; E.code = \llbracket \rrbracket$

1. Add a translation rule for the following expression production: $E \rightarrow E_1 * E_2$

Question 2.2 (Function call translation, 6 points).

Consider the translation of a function calls $x = f(E_1, \dots, E_n)$ to three-address code:

```

E1.code
...
En.code
param E1.addr
...
param En.addr
x = call f

```

Explain how the code is expected to evaluate, assuming parameters are passed **call-by-value**.

Question 2.3 (BONUS FEATURE, 5 points). For the control-flow construct, **for** ($S_1 ; B ; S_2$) S_3 , formulate appropriate SDD semantic rules as in the translation SDD of Figure 6.36, p. 402, in the Dragon book.