



Compiler Construction/Fall 2014/Homework 10

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Assigned Thursday 11/13/2014, due Thursday 11/20/2014 at 8am

Reading Assignments

- Lecture on October 13: Dragon Book 8.8 (5p), advanced HACS.
- Lecture on October 20: Dragon Book 4.5 + 4.8 (17p).

Homework Assignments

The following assignments should be submitted for a maximum of 15 points.

1 Simple Register Allocation

Consider the following program fragment with input i , output a , and the two basic blocks shown:

```

1: j = 1

2: k = 10 * i
3: m = k + j
4: n = 8 * m
5: p = n - 88
6: a = a + p
7: j = j + k
8: if j <= 100 goto 2

```

We will consider this program below.

Question 1.1 (5 points). We say that j is a *local variable* and that k, m, n, p are *temporaries*. Explain why.

Question 1.2 (10 points). Generate code with good register allocation for the basic block from lines 2-8 in the example above, following the pattern of the Dragon Book §8.6 and Figure 8.16 (as also shown on the blackboard during the lecture), and only using three registers $R1, R2, R3$. Here is the table as it should look after generating code for the first intermediate instruction:

<i>IR</i>	<i>ARM32</i>	<i>R1</i>	<i>R2</i>	<i>R3</i>	<i>a</i>	<i>i</i>	<i>j</i>	<i>k</i>	<i>m</i>	<i>n</i>	<i>p</i>
2: k = 10*i	LDR R1, [R11, &i]	<i>i</i>			<i>a</i>	<i>i</i>	<i>j</i>				
	MOV R2, #10	<i>i</i>	10		<i>a</i>	<i>i, R1</i>	<i>j</i>				
	MUL R2, R1, R2	<i>i</i>	<i>k</i>		<i>a</i>	<i>i, R1</i>	<i>j</i>	<i>R2</i>			

Finish the table and generated code. You may use more than the suggested three registers, if you wish.

Note: Here we have used our ARM instruction subset but you may use the Dragon Book assembly language if you wish (if you do use the ARM language then assume all local variables addressed relative to a frame pointer in $R11$, as we have suggested in the initial instructions).