INTRODUCTION TO CODE OPTIMIZATION - SCHEDULED ON 25.06.08 4th HOUR

The word optimization does not guarantee an optimal code under any mathematical measure. Optimizing compilers apply code-improving transformations so that we are trying to reduce the requirement of running time and space.

We can think of performing optimization in the following stages.

At the source program level

We can think of choosing better algorithm before writing the source program

At the Intermediate code level

Apply structure preserving transformations and algebraic transformations over the TAC sequence.

At the target code level

Use registers
Select suitable efficient instructions
Do peepholeoptimization

Example:

Consider the TAC sequence for the code fragment of Quicksort.

```
(1) i=m-1
(2) j=n
(3) t1=4*n
(4) v=a[t1]
(5) i=i+1
(6) t2=4*i
(7) t3=a[t2]
(8) if t3<v goto(5)
(9) j=j-1
(10)        t4=4*j
(11)        t5=a[t4]
(12)        if t5>v goto(9)
(13)        if i>=j goto(23)
(14)        t6=4*i
(15)        x=a[t6]
(16)        t7=4*i
(17)        t8=4*j
(18)        t9=a[t8]
```

```
(19)        a[t7]=t9
(20)        t10=4*j
(21)        a[t10]=x
(22)        goto(5)
(23)        t11=4*i
(24)        x=a[t11]
(25)        t12=4*i
(26)        t13=4*n
(27)        t14=a[t13]
(28)        a[t12]=t14
(29)        t15=4*n
(30)        a[t15]=x
```

Applying the algorithm for Basic block following are the **leaders.**

1, 5, 9, 13, 14, 23

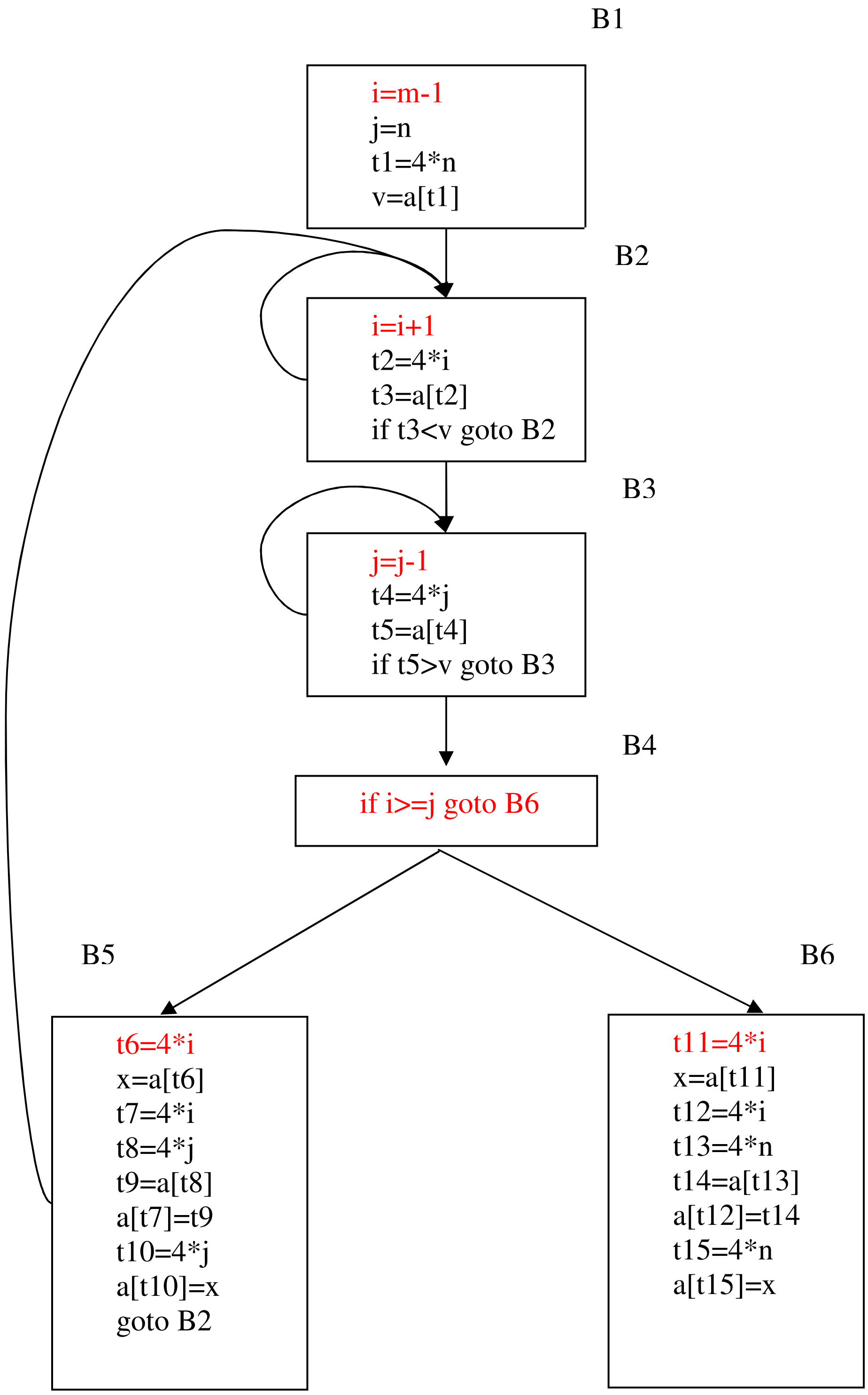
Basic blocks are

B1 = 1,2,3,4
B2 = 5,6,7,8
B3 = 9,10,11,12
B4 = 13
B5 = 14,15,16,17,18,19,20,21,22
B6 = 23,24,25,26,27,28,29,30

Flow graph

Give flow of control information to the basic blocks involved in TAC sequence by drawing the flow graph by taking basic blocks are nodes and links represents the flow of control information between the nodes.

Flow graph


B1
i=m-1
j=n
t1=4*n
v=a[t1]
B2
i=i+1
t2=4*i
t3=a[t2]
if t3<v goto B2
B3
j=j-1
t4=4*j
t5=a[t4]
if t5>v goto B3
B4
if i>=j goto B6
B5
t6=4*i
x=a[t6]
t7=4*i
t8=4*j
t9=a[t8]
a[t7]=t9
t10=4*j
a[t10]=x
goto B2
B6
t11=4*i
x=a[t11]
t12=4*i
t13=4*n
t14=a[t13]
a[t12]=t14
t15=4*n
a[t15]=x