Tutorial 9

Tan Yee Jian

November 15, 2021

Contents

1 Q1 Register and address descriptors

Line	Ori	Gen	r1	r2	r3	r4	i	j	a	re
1	`t1 = 10 * i`						i	j	a	
		`LD r1, i`	i				i	j	a	ge
		`MUL r1, r1, \#10`	t1				i, r1	j	a	NU
2	`t2 = t1 + j`	`LD r2, j`	t1	*j			i	j, r2	a	ge
		`ADD r2, r1, r2`	t2	*j			i	j, r2	a	NU
3	`t3 = 8 * t2`	`MUL r1, r1, \#8`	t3	*j			i	j, r2	a	ge
4	`t4 = t3 - 88`	`SUB r1, r1, \#88`	t4	*j			i	j, r2	a	ge
5	`a[t4] = 0.0`	`LD r3, a`	t4	*j	a		i	j, r2	a, r3	
		`MUL r1, r1, 8`	t4*8	*j	a		i	j, r2	a, r3	
6		`ADD r1, r3, r1`	a + t4*8	*j	a		i	j, r2	a, r3	
		`ST r1, \#0`	a + t4*8	*j	a		i	j, r2	a, r3	
6	`j = j + 1`	`ADD r2, r2, 1`	...	t = *j + 1	a		i	r2	a, r3	
		`ST j, r2`	...	*j	a		i	j, r2	a, r3	

2 Q2 Spilling cost

Cost of spilling probably depends on

- how soon it is reused

3 Q3 Convert code into 3-add code and if-gotos

3-address code:

```
getCofactor:
int mat[N][N];
int temp[N][N];
int p;
int q;
int n;
int i = 0;
int j = 0;
int row = 0;
for_0:
if row >= n goto for_0_end;
int col = 0;
for_0_0:
if col >= n goto for_0_0_end;
bool t1 = row != p;
if !t1 goto if_0_0_0_end;
bool t2 = col != q;
if !t2 goto if_0_0_0_end;
int rowbyte = N * 4;
int rowoff = row * rowbyte;
int colbyte = col * 4;
int matoff = rowoff + colbyte;
int matadd = mat + matoff;
int rhs = *(matadd)
rowoff = i * rowbyte;
colbyte = j * 4;
j = j + 1;
matoff = rowoff + colbyte;
matadd = mat + matoff;
*(matadd) = rhs;
int t3 = n - 1;
bool t4 = j == t3;
if !t4 goto if_0_0_0_0_end;
j = 0;
i = i + 1;
if_0_0_0_0_end:
```

```
37 if_0_0_0_end:
38 col = col + 1;
39 goto for_0_0;
40 for_0_0_end:
41 row = row + 1;
42 goto for_0;
43 for_0_end:
```

CFG