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Assignment 4
Compiler Design Project Course
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To translate control flow I used both conditional and unconditional jumps. In conditional jump I used the EQ constructor from rtl.sml.
To translate variable refrences I saved some information in the environment such as the global or local (using 0 for local and 1 for global), array or scalar using 0 for arrays and variable name (temp) for scalars.

Followong is the list of rtl output of selected Uc programs.

1)l05.c

```
int main(void) {
  int i;
  1!=!3;
  4&&(6);
  7* 8+10;
  (11-12)+(12/16);
  17<=18 <-20;
  i=21==22;
  25 >=27>28;
}
```

```
(procedure Pmain
      (formals)
      (locals t2 t3 t4 t5 t6 t7 t8 t9 t10 t11 t12 t13 t14 t15 t16 t17 t18 t19 t20
t21 t22 t23 t24 t25 t26 t27 t28 t29 t30 t31 t32 t33 t34 t35 t36 t37 t38 t39)
      (frameSize 0)
      (set t3 1)
      (set t4 0)
      (set t5 3)
      (if (eq t4 t5) (goto L100))
      (set t6 t0)
```

```
      (goto L101)
L100:
      (set t6 t1)
L101:
      (if (ne t3 t6) (goto L102))
      (set t7 t0)
      (goto L103)
L102:
      (set t7 t1)
L103:
      (set t8 4)
      (if (eq t8 t0) (goto L104))
      (set t9 6)
      (if (eq t9 t0) (goto L104))
      (set t10 t8)
      (goto L105)
L104:
      (set t10 t9)
L105:
      (set t11 7)
      (set t12 8)
      (set t13 (mul t11 t12))
      (set t14 10)
      (set t15 (add t13 t14))
      (set t16 11)
      (set t17 12)
      (set t18 (sub t16 t17))
      (set t19 12)
      (set t20 16)
      (set t21 (div t19 t20))
      (set t22 (add t18 t21))
      (set t23 17)
      (set t24 18)
      (if (le t23 t24) (goto L106))
      (set t25 t0)
      (goto L107)
L106:
      (set t25 t1)
L107:
      (set t26 0)
      (set t27 20)
      (set t28 (sub t26 t27))
      (if (lt t25 t28) (goto L108))
      (set t29 t0)
      (goto L109)
L108:
      (set t29 t1)
L109:
      (set t30 21)
      (set t31 22)
      (if (eq t30 t31) (goto L110))
      (set t32 t0)
      (goto L111)
L110:
      (set t32 t1)
L111:
      (set t33 t2)
      (store_l t34 t32)
      (set t35 25)
```

```
      (set t36 27)
      (if (ge t35 t36) (goto L112))
      (set t37 t0)
      (goto L113)
L112:
      (set t37 t1)
L113:
      (set t38 28)
      (if (gt t37 t38) (goto L114))
      (set t39 t0)
      (goto L115)
L114:
      (set t39 t1)
L115:
)
```

2)r01.c

```
int x;
char y;

int main(void) {
  int z;
  char w;

 x = 42;
 y = 43;

  z = 'A';
  w = '\n';
}
```

```
(data Vx 4)

(data Vy 1)

(procedure Pmain
      (formals)
      (locals t2 t3 t4 t5 t6 t7 t8 t9 t10 t11 t12 t13 t14 t15 t16 t17)
      (frameSize 0)
      (set t4 42)
      (set t5 x)
      (set t6 (load_l t5))
      (store_l t7 t4)
      (set t8 43)
      (set t9 y)
      (set t10 (load_l t9))
      (store_b t11 t8)
      (set t12 65)
```

```
      (set t13 t2)
      (store_l t14 t12)
      (set t15 10)
      (set t16 t3)
      (store_b t17 t15)
)
```

3)r02.c

```
int f(int x, int y) {
  return x+y;
}

int main(void){
  f(2,3);
}
```

```
(procedure Pf
      (formals t2 t3)
      (locals t4)
      (frameSize 0)
      (store_l t0 t4)
L100:
      (goto L100)
)

(procedure Pmain
      (formals)
      (locals t6 t7)
      (frameSize 0)
      (set t5 (call f t6 t7))
)
```

4)r03.c

```
int a[10];

int main(void) {
  char b[10];

  a[3] = a[5]+7;

  b[3] = b[5]+7;
}
```

```
(data Va 40)

(procedure Pmain
      (formals)
      (locals t2 t3 t4 t5 t6 t7 t8 t9 t10 t11 t12 t13 t14 t21 t20 t19 t18 t17 t16
t15 t22 t23 t24 t25 t26 t27 t28 t29)
      (frameSize 10)
      (set t2 5)
      (set t3 4)
      (set t4 (mul t2 t3))
      (set t5 a)
      (set t6 (add t5 t4))
      (set t7 (load_l t6))
      (set t8 7)
      (set t9 (add t7 t8))
      (set t10 3)
      (set t11 4)
      (set t12 (mul t10 t11))
      (set t13 a)
      (set t14 (add t13 t12))
      (store_l t14 t9)
      (set t21 (load_l t20))
      (set t20 (add t19 t1))
      (set t19 (add t18 t17))
      (set t18 0)
      (set t17 (mul t15 t16))
      (set t16 1)
      (set t15 5)
      (set t22 7)
      (set t23 (add t21 t22))
      (set t24 3)
      (set t25 1)
      (set t26 (mul t24 t25))
      (set t27 0)
      (set t28 (add t27 t26))
      (set t29 (add t28 t1))
      (store_b t29 t23)
)
```

5)r04.c

```
void f(char x[]) {
;
}

int main(void ) {
  char a[7];
  f(a);
}
```

```
(procedure Pf
      (formals)
      (locals)
      (frameSize 0)
)

(procedure Pmain
      (formals)
      (locals)
      (frameSize 7)
      (set t2 (call f))
)
```

6)r05.c

```
void f(int x[]) {
  x[3] = x[5]+7;
}

int a[10];

int main(void ) {
  f(a);
}
```

```
(procedure Pf
      (formals)
      (locals t8 t7 t6 t5 t4 t3 t2 t9 t10 t11 t12 t13 t14 t15 t16)
      (frameSize 0)
      (set t8 (load_l t7))
      (set t7 (add t6 t1))
      (set t6 (add t5 t4))
      (set t5 0)
      (set t4 (mul t2 t3))
      (set t3 4)
      (set t2 5)
      (set t9 7)
      (set t10 (add t8 t9))
      (set t11 3)
      (set t12 4)
      (set t13 (mul t11 t12))
      (set t14 0)
```

```
      (set t15 (add t14 t13))
      (set t16 (add t15 t1))
      (store_l t16 t10)
)

(data Va 40)

(procedure Pmain
      (formals)
      (locals)
      (frameSize 0)
      (set t17 (call f))
)
```