Compiler Project Phase3

Workload Division:

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Function Invocation, Array Initialization and accessing

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Translation of the conditional Expression.

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Translation of the basic Expressions.

Design:

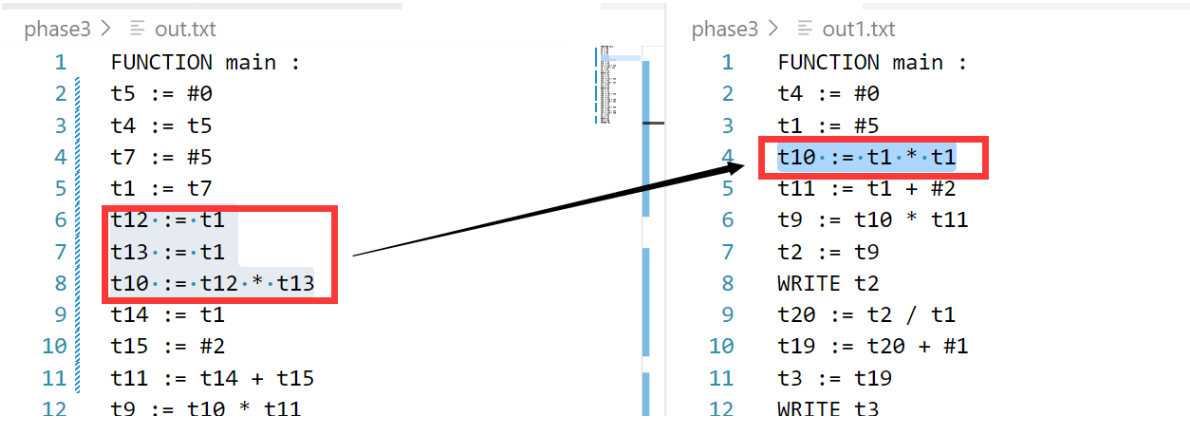
```
we implement several translation functions.
- char* new_place();
- char* new_label();
- char* translate_cond_Exp(node* Exp, char* lb1, char* lb2);
- char* translate_stmt(node* stmt);
- char* translate_Exp(node* Exp, char* place);
- char* translate_Args(node* Args, int* arglist);
- char* translate_def(node* def);
By invoking this function recursively, we can translate the code into TAC.
```

Optimization:

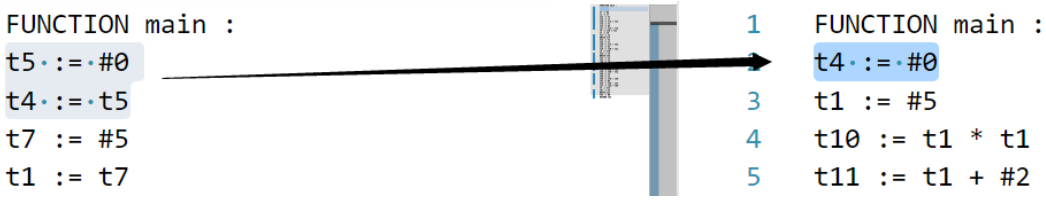
We adopt 2 strategies to decrease the number of instructions.

#1 cut one register when using ID

```
int main()
{
    int a, b, c;
    int final = 0;
    a = 5;
    b = a * a * (a + 2);
    write(b);
    c = b / a + 1;
    write(c);
    final = a + b - c * 3 + (b / a - 4);
    write(final);
    return 0;
}
```



#2 cut one register when using INT



Total # of Instructions before and after optimization

	Before	After
test_3_r01.spl	41	21
test_3_r02.spl	147	98
test_3_r03.spl	61	37
test_3_r04.spl	33	22
test_3_r05.spl	70	44
test_3_r06.spl	63	41
test_3_r07.spl	115	75
test_3_r08.spl	53	38
test_3_r09.spl	188	117
test_3_r10.spl	28	20

For executed # instruction

test_3_r09.spl

before:

```
[program output] 370
[program output] 371
[program output] 407
[program output] 3
[INFO] Total instructions = 114229
```

after:

```
[program output] 370
[program output] 371
[program output] 407
[program output] 3
[INFO] Total instructions = 61214
```

Bonus:

1.**We implement initializing and accessing 1-dim and 2-dim arrays.**

phase3 > out.txt

```
1   FUNCTION main :
2   DEC t1 16
3   t5 := #1 * #4
4   t3 := &t1 + t5
5   *t3 := #6
6   t10 := #1 * #4
7   t11 := &t1 + t10
8   t8 := *t11
9   WRITE t8
10  RETURN #0
11
```

phase3 > sample > test.spl

```
1   int main()
2   {
3       int b[4];
4       b[1]= 6;
5       write(b[1]);
6       return 0;
7   }
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

```
File "urwid/wimp.py", line 540, in keypress

  SUSTech-CS323 IR-Simulator [out.txt]

CODE                                    SYMBOLS

< step > < exec > < stop >

  FUNCTION main :                         t1 | [0, 6, 0, 0]
  DEC t1 16                              t10 | 4
  t5 := #1 * #4                          t11 | 4
  t3 := &t1 + t5                          t3 | 4
  *t3 := #6                               t5 | 4
  t10 := #1 * #4                          t8 | 6
  t11 := &t1 + t10
  t8 := *t11                          [program output] 6
  WRITE t8                            [INFO] Total instructions = 10
@ RETURN #0
```

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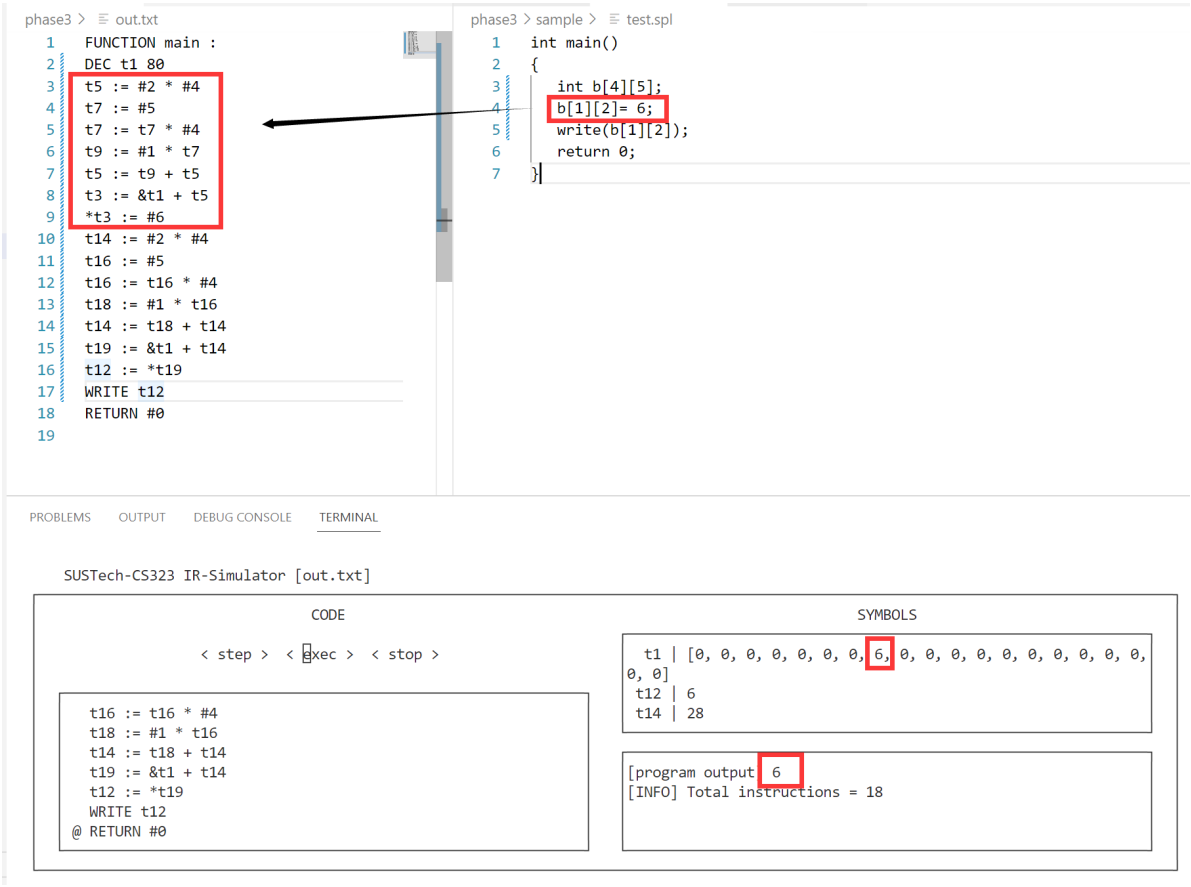
phase3 > out.txt
FUNCTION main :
DEC t1 80
t5 := #2 * #4
t7 := #5
t7 := t7 * #4
t9 := #1 * t7
t5 := t9 + t5
t3 := &t1 + t5
*t3 := #6
t14 := #2 * #4
t16 := #5
t16 := t16 * #4
t18 := #1 * t16
t14 := t18 + t14
t19 := &t1 + t14
t12 := *t19
WRITE t12
RETURN #0
phase3 > sample > test.spl
int main()
{
int b[4][5];
b[1][2]= 6;
write(b[1][2]);
return 0;
}
PROBLEMS
OUTPUT
DEBUG CONSOLE
TERMINAL
SUSTech-CS323 IR-Simulator [out.txt]
CODE
< step > < exec > < stop >
t16 := t16 * #4
t18 := #1 * t16
t14 := t18 + t14
t19 := &t1 + t14
t12 := *t19
WRITE t12
@ RETURN #0
SYMBOLS
t1 | [0, 0, 0, 0, 0, 0, 0, 6, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
t12 | 6
t14 | 28
[program output] 6
[INFO] Total instructions = 18