

CS323 Project phase3

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In this project phase, we implement the intermediate-code generation of spl language.

To generate the executable program, just run `make splc` command, you need the following dependencies

```
g++
flex
bison
```

The following are some key features of our implementation.

Type handling

We create a class **v_type** to record variables' essential type information. And hash map is used to record the symbol table.

```
enum TYPE_T {TYPE_INT, TYPE_FLOAT, TYPE_CHAR, TYPE_UNKNOW, TYPE_STRUCT, TYPE_ERROR};
class v_type
{
public:
    TYPE_T type;
    string struct_name;
    int array_dim;
}
```

Intermediate Representation

In our project, the TAC instructions is often stored in a set of quadruples, and double-linked list is used as the data structure to store, each instruction has is pre instruction and next instruction, except the head and tail. The IR class is defined as below, the Operation enum is used to record different operation.

```
enum Operation {START, OP_ADD, OP_SUB, OP_MUL, OP_DIV, OP_ASSIGN,
OP_LT, OP_LE, OP_GT, OP_GE, OP_NE, OP_EQ, OP_FUN, OP_PARAM, GOTO,
LABEL, OP_RETURN, READ, WRITE, CALL, ARG, PARA, DEC, ADDR, ADDR_A, STAR};

class IR {
public:
    string target;
    Operation op;
    string arg1;
    string arg2;
    IR *next;
    IR *pre;
};
```

Optimize the code

The generated intermediate code will include a lot of repeatable or useless items, we focus on optimizing the useless assignment statements, which means, if a temporary variable is created and it is only used for a single assignment, then this assignment will be removed, the following is a concrete example:

```
//before optimize
t1 := #5
t2 := #6
t3 := t1 + t2
//after optimize
t3 := #5 + #6
```

Bonus

We modify **Assumption 6** and **Assumption 7**, structure variables can appear in the program, and they can be declared as function parameters, arrays can be declared as function parameters, and multi-dimensional arrays can be defined as local variables. We can successfully generate the intermediate codes on the given **extra** test cases.