

hw5实验过程记录

参考资料

基本参考 `docs/lab5.md`。

实验过程

- 本次实验只需要对 `main` 方法作类型检查
- 整体的代码设计
 - 维护类型 `Ty_ty`：可确定以下4种类型
 - `Ty_int`
 - `Ty_float`
 - `Ty_array`：整型数组或浮点型数组，存储其元素类型 (`int` 或 `float`)
 - `Ty_name`：存储其类型名
 - 维护表达式类型 `expty`：除了 `Ty_ty`，还要维护是否为左值 (即 `bool location;`)

```
typedef struct expty_* expty;
struct expty_ {
    bool location;
    Ty_ty ty;
};
expty Expty(bool location, Ty_ty ty) {
    expty e = checked_malloc(sizeof(*e));
    e->location = location;
    e->ty = ty;
    return e;
}
```

- 维护一张变量表：记录所有声明过的变量
 - 借助 `symbol.h/c` 提供的字符串哈希表
 - 表项 `E_varEntry`：变量或常量声明
- 工作流程
 1. 初始化变量环境 `venv`
 2. 处理VarDecl：将变量和其类型信息存入 `venv` 中，同时检查是否有变量重定义
 3. 处理Stm和Exp
- 对Exp的处理：完全参照 lab5.md 的叙述，返回 `expty` (类型+是否是左值)
 - 要注意递归处理时返回 `NULL` 的情况：直接跳过，也返回 `NULL`
 - `OpExp` 的返回值：若为比较运算符或逻辑运算符，应返回 `int`；若为算术运算符，都为 `int` 才返回 `int`，否则返回 `float`

```

1  switch (e->u.op.oper) {
2      case A_and:
3      case A_or:
4      case A_less:
5      case A_le:
6      case A_greater:
7      case A_ge:
8      case A_eq:
9      case A_ne:
10         return Expty(FALSE, Ty_Int());
11     case A_plus:
12     case A_minus:
13     case A_times:
14     case A_div: {
15         if (left->ty->kind == Ty_int && right->ty->kind == Ty_int) {
16             return Expty(FALSE, Ty_Int());
17         } else {
18             return Expty(FALSE, Ty_Float());
19         }
20     }
21     default:
22         return NULL;
23 }

```

- 对Stm的处理：完全参照 lab5.md 的叙述
 - 递归检查Exp，并对返回的 `expty` 做检查
 - 注意返回的 `expty` 为 `NULL` 的情况
 - 对 `break` 或 `continue`：确保在 `while` 里，且 `while` 的表达式算作上一层循环
 - 维护一个计数器 `whileDepth`，记录循环层数
 - 确保出现以上语句时，深度大于0
 - 对 `ArrayInit`：
 - 检查左边的 `Exp`：左值、类型是 `array`
 - 检查右边的 `ExpList`：遍历，每个 `Exp` 都需要是 `int` 或 `float`，在类型不一致的 `Exp` 处报错

对 `Exp -> NUM`，无法确定是 `int` 还是 `float`，直接返回 `float`。

- 注意
 - 若Stm / Exp要若干次递归处理，则前面的递归报错处理完后再开始后面的递归，而非所有递归处理都完成后再报错

测试结果

运行 `make test` 和 `make astcheck` 指令，测试结果如下：(和 week6.pptx 结果相同)

```
● zqwh@LAPTOP-HDCBVNK7:~/compiler/2024/hw5$ make test
[hw5test01]
(line:5 col:5) error: right side of assignment must be of type array
[hw5test02]
(line:3 col:5) error: variable already declared
[hw5test03]
(line:3 col:5) error: right side of assignment must be of type int
[hw5test04]
(line:7 col:5) error: second argument of putarray() must be of type array
[hw5test05]
(line:11 col:7) error: right side of assignment must be of type array
[hw5test06]
[hw5test07]
[hw5test08]
(line:16 col:14) error: argument of putnum() must be of type int or float
[hw5test09]
(line:4 col:5) error: variable already declared
[hw5test10]
```

```
● zqwh@LAPTOP-HDCBVNK7:~/compiler/2024/hw5$ make astcheck
[hw5test01]
(line:5 col:5) Uncompatible type!
[hw5test02]
(line:3 col:5) Redeclared variable!
[hw5test03]
(line:3 col:5) Uncompatible type!
[hw5test04]
(line:7 col:5) Putarray should end with an array!
[hw5test05]
(line:11 col:7) Uncompatible type!
[hw5test06]
[hw5test07]
[hw5test08]
(line:16 col:14) Putnum an integer or float!
[hw5test09]
(line:4 col:5) Redeclared variable!
[hw5test10]
```

开发过程

开发过程基本按实验过程进行：(只是一部分)

hw5: add random code gen	6 Apr 2024 22:02	Jopqior	ea25f6a9
hw5: change output pos in OpExp	6 Apr 2024 20:42	Jopqior	7303a7d6
hw5: fix bug in error handling sequence in assign stm	6 Apr 2024 19:19	Jopqior	eb148c63
hw5: fix bug in error handling sequence	6 Apr 2024 19:13	Jopqior	64be0f23
hw5: fix bug in getarray exp	6 Apr 2024 18:56	Jopqior	dfaa22f9
hw5: change output style	6 Apr 2024 18:45	Jopqior	88ab13bd
hw5: add external test	6 Apr 2024 16:32	Jopqior	4fdac058
hw5: update report	6 Apr 2024 15:49	Jopqior	a456eae8
hw5: change output style and remove duplicate break	6 Apr 2024 15:21	Jopqior	5efd876
hw5: chmod	6 Apr 2024 15:20	Jopqior	bb6f0fdf
hw5: merge master	6 Apr 2024 15:02	Jopqior	9c1081f4
hw5: fix bug in transA_exp (no return)	5 Apr 2024 12:42	Jopqior	81d7a696
hw5: change report	4 Apr 2024 23:54	Jopqior	29d42926
hw5: fix assign stm's type checking	4 Apr 2024 23:52	Jopqior	a2e3b06e
hw5: add report	4 Apr 2024 23:22	Jopqior	fa205fcc
hw5: change Makefile and .gitignore for redirecting stderr to *.debug	3 Apr 2024 21:51	Jopqior	ad455bb6
hw5: add debug output and fix some bug	3 Apr 2024 21:41	Jopqior	54e7581f
hw5: add test file lvalue.fmj	3 Apr 2024 15:21	Jopqior	bd1273cd
hw5: fix output of return type checking	1 Apr 2024 23:59	Jopqior	ab83b275
hw5: fix an output style	1 Apr 2024 09:39	Jopqior	4213c0b5
hw5: add exp result null judgement	1 Apr 2024 09:37	Jopqior	678603cf
hw5: fix xml2ast.c	31 Mar 2024 21:57	Jopqior	3aa5f404
hw5: complete type checking without class	31 Mar 2024 21:37	Jopqior	aad21128
hw5: chmod fmj2ast	31 Mar 2024 15:22	Jopqior	c71cc7af
hw5: fix clean in Makefile	31 Mar 2024 15:22	Jopqior	1f897c75
hw5: initial commit	30 Mar 2024 00:42	Jopqior	dc8ed3a4