

Compiler Lab Report:

HW4



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Q1

Q1.1

- `Program`: 整个程序
- `FuncDecl`: 函数定义
- `Block`: 基本块
- `Stm`: 语句的抽象基类
- `Jump`: 无条件跳转语句
- `Cjump`: 条件跳转语句

- `Move`：赋值语句
- `Seq`：语句序列，即按顺序执行的一组语句
- `LabelStm`：程序跳转目标，类似 `asm` 中的标签
- `Return`：函数返回语句
- `Phi`：用于 `SSA` 形式（目前不知道是什么）
- `ExpStm`：将一个有副作用的表达式当作语句使用，忽略其返回值
- `Exp`：表达式的抽象基类
- `Binop`：二元运算表达式
- `Mem`：访问内存地址
- `TempExp`：临时变量访问，通过 `Temp` 引用 IR 中的寄存器
- `Eseq`：先执行语句再计算表达式，用于表达式含副作用的情况
- `Name`：将 `Label` 转换为指针值，用于跳转表
- `Const`：常量
- `Call`：函数调用
- `ExtCall`：语言自带函数

Q1.2

- `Program`：整个程序，`Tiger IR` 把表达式作为独立体，我们的 `Tiger IR+` 需要对整个程序进行分析。
- `FuncDecl`：函数定义，理由同上。
- `Block`：基本块，有单一入口和多个出口，理由同上，后续可以构建 CFG。
- `Return`：显式返回，理由同上，`Tiger IR` 等价于单一函数，不存在返回。
- `Phi`：用于 SSA 形式，合并来自不同控制路径的变量值。（目前不太清楚是做什么的）
- `ExtCall`：对语言自带函数的调用，与普通 `Call` 区分，`Tiger IR` 没有语言自带调用函数。

Q2

- `If` :
 - 分别考虑stm1和stm2的非空情况，然后设置对应跳转（没有某个分支，就直接跳到end），跳转后执行对应代码即可
 - 使用 `unCx` 获取 `cjump` 语句
 - 使用 `patch`，将跳转指针绑定label
 - 在节点出入口，放入对应label
- `While` :
 - 实现和 `If` 类似，额外需要一个无条件跳转
 - `break` 只要无条件跳转至 `while_end` 即可
 - `continue` 只要无条件跳转至 `while_test` 即可
- `Assign` :
 - 将 `left` 处理成temp
 - 然后将处理好的 `exp` 作为右值即可
- `Return` :
 - 处理返回值，然后直接设定 `visit_tree_result` 为 `Return` 节点即可
- `BinaryOp` :
 - 分为3类运算处理：逻辑运算、算术运算、比较运算
 - 首先处理逻辑运算：
 - 左右子树分别用 `unCx()` 转换为 `Tr_cx`
 - 中间插入 `mid_label` 实现短路连接，对条件依次分析
 - 然后处理算术运算：
 - 直接生成 `Binop` 即可
 - 最后处理比较运算：
 - 左右子树处理为 `Tr_ex`
 - 构造 `cjump`，放入label并patch即可
- `UnaryOp` :

- 套用 `Binop` (第二个操作数为0) 即可
- `Esc` :
 - 依次访问 `s1`, 然后处理 `exp` 即可, 最后合成 `Eseq`
- `IdExp` :
 - 通过 `method_var_table_map` 找到 `method` 的 `map`
 - 如果没找到变量, 那么添加; 如果找到了, 那么提取
 - 表达式转换成 `TempExp`

Graphs and Figures

Work in progress 1 + 11					
✓ HW4-d...	feat: completed	You	34	1分...	de...
master	HW5/test/test0.3.irp updated	xywang2772	1	6小...	0a...
	HW5: added test0 with getarray and putarray exam	xywang2772	4	13小...	82...
	HW5/test/test3, test8 updated	xywang2772	2	前天	c2...
	HW4: update gentests-ubuntu-amd64	Lin-YanJun	1	3天前	32...
	Corrected gentests-ubuntu-arm64 version	xywang2772	1	3天前	f9...
	Updated irp output files	xywang2772	8	3天前	05...
	update HW5/README.md.	王晓阳	1	4天前	9c...
	add HW5.	王晓阳	1	4天前	26...
	HW5 added	xywang2772	23	4天前	49...
	xml2ast.cc debugged (classvar)	xywang2772	1	上周	42...
	HW4: upload gentests-ubuntu-amd64	Lin-YanJun	1	2周前	3f...
	Merge branch 'master' of https://gitee.com/fudanCt	Lin-YanJun		2周前	27...
	upload gentests-ubuntu-arm64 to generate .2-sem	xywang2772	1	2周前	ab...

```

Reading hw4test01
-----Reading AST from : hw4test01.2-semant.ast-----
Classes: _^main^_ ;
Class Hierarchy:
Methods: _^main^_>main ;
Class Variables:
Method Variables: _^main^_>main->x with type=INT ;
Method Formals: _^main^_>main->_return^_main with type=INT ;
-----Converting AST to IR-----
Compiler Configuration:: address_length: 4; memory_alignment: 4; int_length: 4; float_length: 4; double_length: 8
-----Saving IR (XML) to: hw4test01.4-myrip.irp-----
-----Done---
Standard irp not exists
Output match
Reading hw4test02
-----Reading AST from : hw4test02.2-semant.ast-----
Classes: _^main^_ ;
Class Hierarchy:
Methods: _^main^_>main ;
Class Variables:
Method Variables: _^main^_>main->x with type=INT ;
Method Formals: _^main^_>main->_return^_main with type=INT ;
-----Converting AST to IR-----
Compiler Configuration:: address_length: 4; memory_alignment: 4; int_length: 4; float_length: 4; double_length: 8
-----Saving IR (XML) to: hw4test02.4-myrip.irp-----
-----Done---
Standard irp not exists
Output match
Reading hw4test03
-----Reading AST from : hw4test03.2-semant.ast-----
Classes: _^main^_ ;
Class Hierarchy:
Methods: _^main^_>main ;
Class Variables:
Method Variables: _^main^_>main->x with type=INT ;
Method Formals: _^main^_>main->_return^_main with type=INT ;
-----Converting AST to IR-----
Compiler Configuration:: address_length: 4; memory_alignment: 4; int_length: 4; float_length: 4; double_length: 8
-----Saving IR (XML) to: hw4test03.4-myrip.irp-----
-----Done---
Standard irp not exists
Output match
Reading hw4test04
-----Reading AST from : hw4test04.2-semant.ast-----
Classes: _^main^_ ;
Class Hierarchy:
Methods: _^main^_>main ;
Class Variables:
Method Variables: _^main^_>main->x with type=INT ; _^main^_>main->y with type=INT ;
Method Formals: _^main^_>main->_return^_main with type=INT ;
-----Converting AST to IR-----
Compiler Configuration:: address_length: 4; memory_alignment: 4; int_length: 4; float_length: 4; double_length: 8
-----Saving IR (XML) to: hw4test04.4-myrip.irp-----
-----Done---
Standard irp not exists
Output match

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Reading hw4test05
-----Reading AST from : hw4test05.2-semant.ast-----
Classes: _^main^_ ;
Class Hierarchy:
Methods: _^main^_>main ;
Class Variables:
Method Variables: _^main^_>main->x with type=INT ; _^main^_>main->y with type=INT ;
Method Formals: _^main^_>main->_Areturn^_main with type=INT ;
-----Converting AST to IR-----
Compiler Configuration:: address_length: 4; memory_alignment: 4; int_length: 4; float_length: 4; double_length: 8
-----Saving IR (XML) to: hw4test05.4-myrip.irp-----
-----Done---
Standard irp not exists
Output match
Reading hw4test06
-----Reading AST from : hw4test06.2-semant.ast-----
Classes: _^main^_ ;
Class Hierarchy:
Methods: _^main^_>main ;
Class Variables:
Method Variables: _^main^_>main->x with type=INT ; _^main^_>main->y with type=INT ;
Method Formals: _^main^_>main->_Areturn^_main with type=INT ;
-----Converting AST to IR-----
Compiler Configuration:: address_length: 4; memory_alignment: 4; int_length: 4; float_length: 4; double_length: 8
-----Saving IR (XML) to: hw4test06.4-myrip.irp-----
-----Done---
Standard irp not exists
Output match
Reading hw4test07
-----Reading AST from : hw4test07.2-semant.ast-----
Classes: _^main^_ ;
Class Hierarchy:
Methods: _^main^_>main ;
Class Variables:
Method Variables: _^main^_>main->x with type=INT ; _^main^_>main->y with type=INT ;
Method Formals: _^main^_>main->_Areturn^_main with type=INT ;
-----Converting AST to IR-----
Compiler Configuration:: address_length: 4; memory_alignment: 4; int_length: 4; float_length: 4; double_length: 8
-----Saving IR (XML) to: hw4test07.4-myrip.irp-----
-----Done---
Standard irp not exists
Output match
Reading hw4test08
-----Reading AST from : hw4test08.2-semant.ast-----
Classes: _^main^_ ;
Class Hierarchy:
Methods: _^main^_>main ;
Class Variables:
Method Variables: _^main^_>main->x with type=INT ; _^main^_>main->y with type=INT ;
Method Formals: _^main^_>main->_Areturn^_main with type=INT ;
-----Converting AST to IR-----
Compiler Configuration:: address_length: 4; memory_alignment: 4; int_length: 4; float_length: 4; double_length: 8
-----Saving IR (XML) to: hw4test08.4-myrip.irp-----
-----Done---
Standard irp not exists
Output match
```

```
Reading hw4test09
-----Reading AST from : hw4test09.2-semant.ast-----
Classes: _^main^_ ;
Class Hierarchy:
Methods: _^main^_->main ;
Class Variables:
Method Variables: _^main^_->main->x with type=INT ; _^main^_->main->y with type=INT ;
Method Formals: _^main^_->main->_return^_main with type=INT ;
-----Converting AST to IR-----
Compiler Configuration:: address_length: 4; memory_alignment: 4; int_length: 4; float_length: 4; double_length: 8
-----Saving IR (XML) to: hw4test09.4-myrip.irp-----
-----Done---
Standard irp not exists
Output match
Reading hw4test10
-----Reading AST from : hw4test10.2-semant.ast-----
Classes: _^main^_ ;
Class Hierarchy:
Methods: _^main^_->main ;
Class Variables:
Method Variables: _^main^_->main->x with type=INT ; _^main^_->main->y with type=INT ;
Method Formals: _^main^_->main->_return^_main with type=INT ;
-----Converting AST to IR-----
Compiler Configuration:: address_length: 4; memory_alignment: 4; int_length: 4; float_length: 4; double_length: 8
-----Saving IR (XML) to: hw4test10.4-myrip.irp-----
-----Done---
Standard irp not exists
Output match
```