Python过程间调用分析

马洪跃

2018-12-29

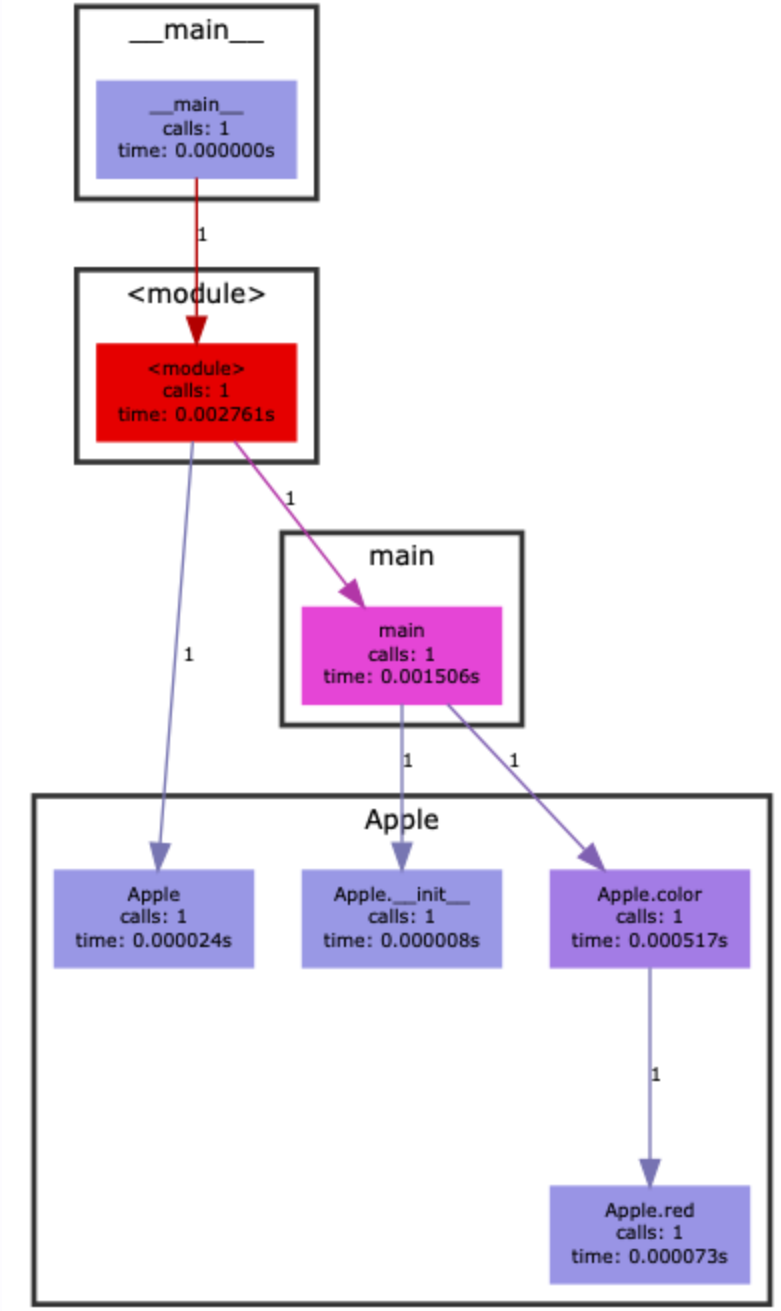
Github项目地址 InterPy

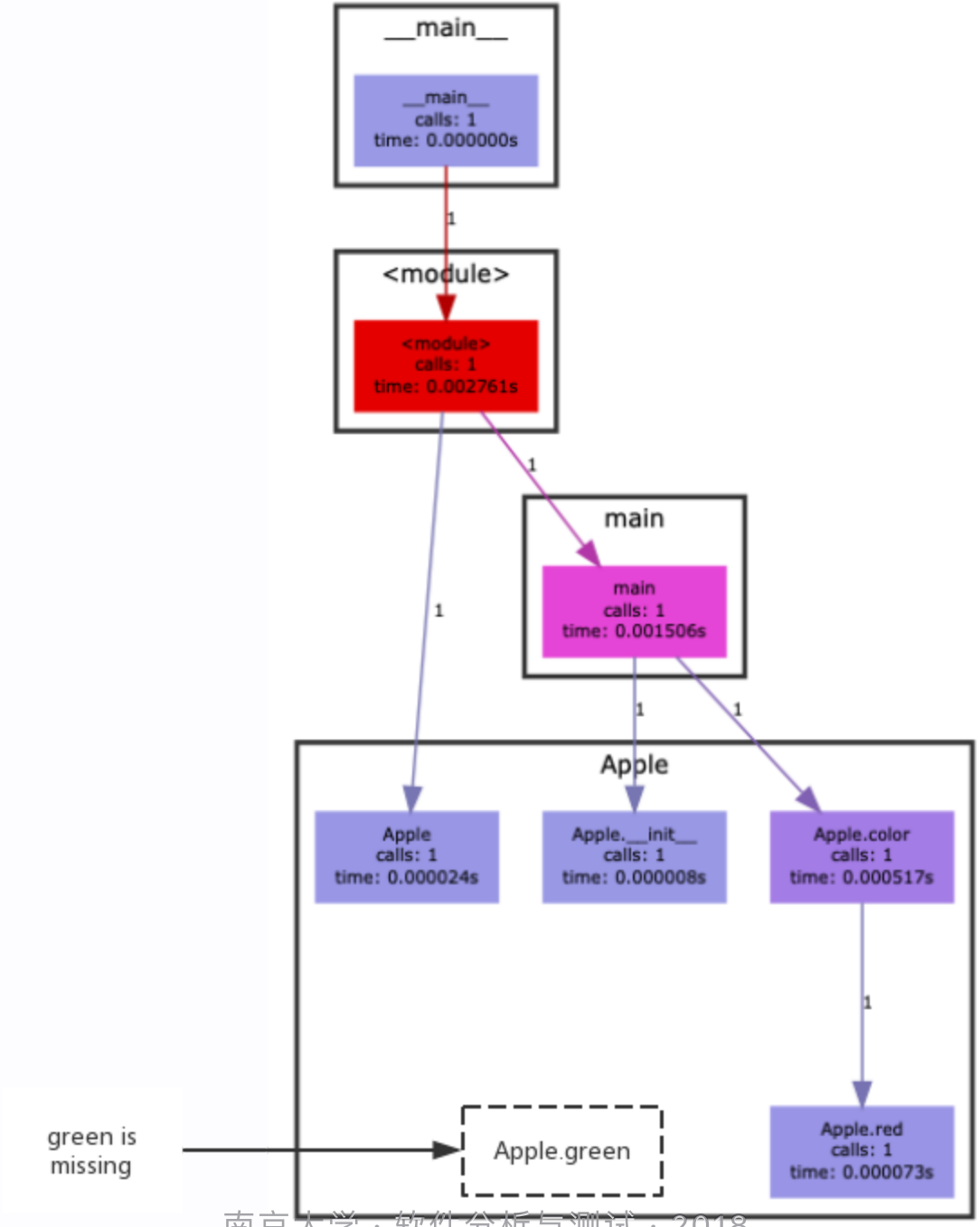
PyCallGraph

项目地址

```
class Apple:
    def __init__(self, name):
        self.name = name
    def color(self):
        lname = self.name.lower()
        if lname == 'gala' or lname == 'fuji':
            self.red(self.name)
            return 'red'
        else:
            self.green(self.name)
            return 'green'
    def red(self, rname):
        print('R u want to eat red apples? '+ rname + ' is red. Plz')
    def green(self, gname):
        print('R u want to eat green apples? '+ gname + ' is red. Plz')

def main():
    apple = Apple('fuji')
    color = apple.color()
    print('The color of this apple is: '+ color)
```


__main__
__main__
calls: 1
time: 0.000000s
1
<module>
<module>
calls: 1
time: 0.002761s
1
1
main
main
calls: 1
time: 0.001506s
1
1
Apple
Apple
calls: 1
time: 0.000024s
Apple.__init__
calls: 1
time: 0.000008s
Apple.color
calls: 1
time: 0.000517s
1
Apple.red
calls: 1
time: 0.000073s


__main__
__main__
calls: 1
time: 0.000000s
1
<module>
<module>
calls: 1
time: 0.002761s
1
1
main
main
calls: 1
time: 0.001506s
1
1
Apple
Apple
calls: 1
time: 0.000024s
Apple.__init__
calls: 1
time: 0.000008s
Apple.color
calls: 1
time: 0.000517s
1
green is
missing
Apple.green
Apple.red
calls: 1
time: 0.000073s
Generated by Python Call Graph v1.0.1
http://pycallgraph.slowchop.com

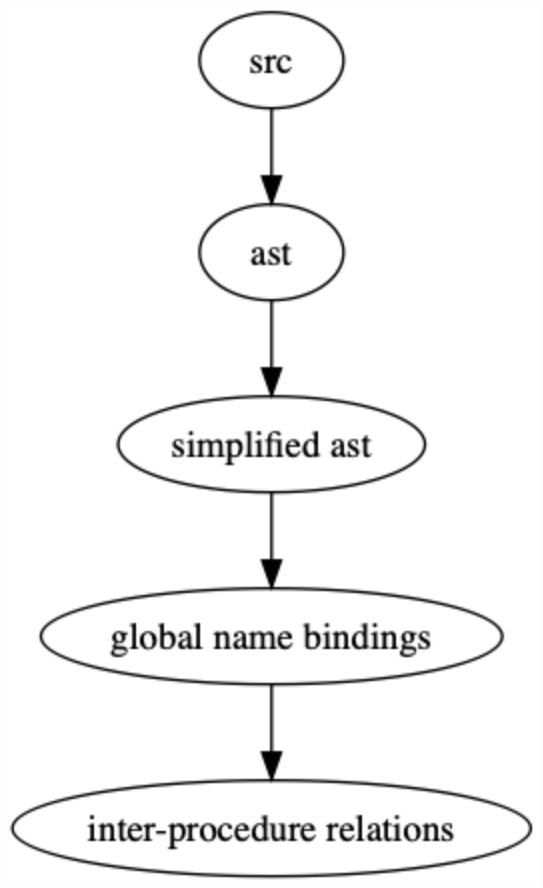
PyCallGraph

- 动态分析
- 需要运行待分析源代码
- 代码覆盖不全
- 考虑通过求解器生成输入数据

InterPy

- 静态分析
- 无须运行源代码
- 代码覆盖100%
- 时间复杂度低
- 现版本支持单个Python源文件

Four Passes


src
ast
simplified ast
global name bindings
inter-procedure relations

First pass

- trivial
- python api: ast.parse()

Second pass

- 简化抽象语法树
- 去除控制流信息
- for loop, while loop, if, etc.
- ast.NodeTransformer

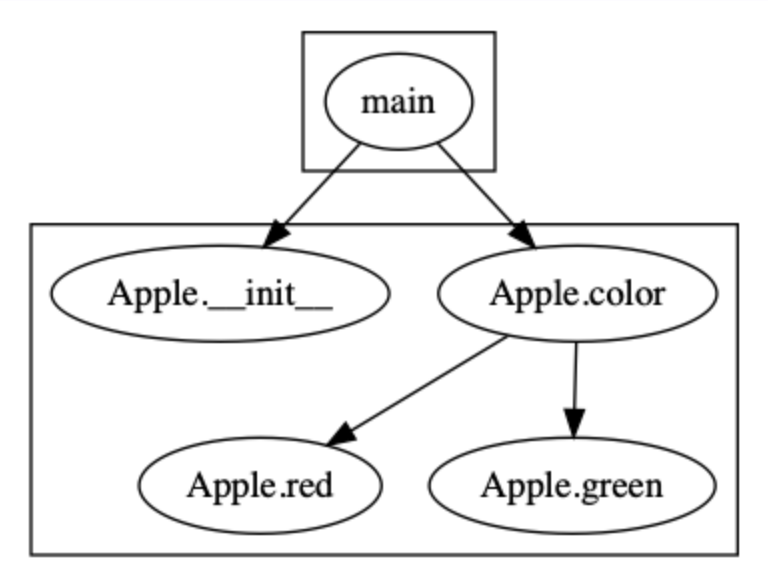
Third pass

- 从AST中解析过程信息
- 类似于Python的import过程

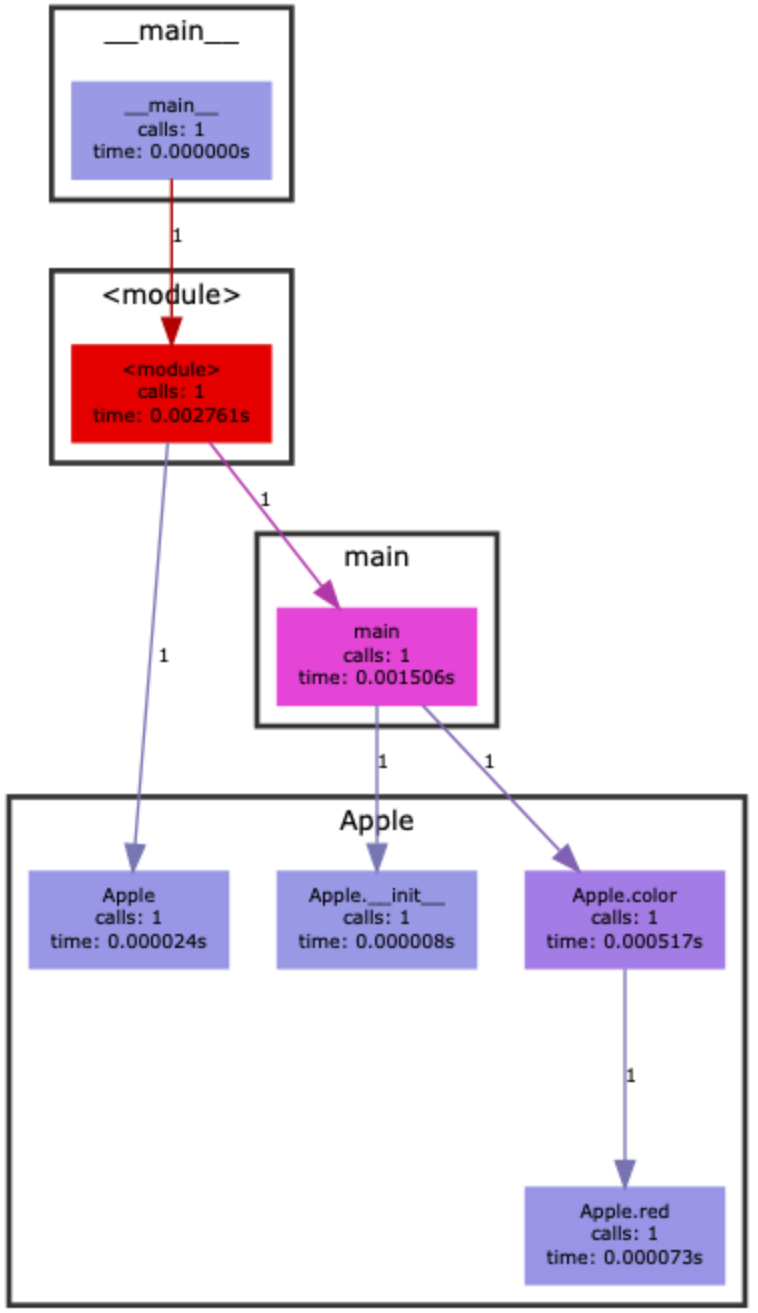
Fourth pass

- 获取过程间调用信息
- 类似于Python的解释执行过程
- 了解更多（抽象解释）

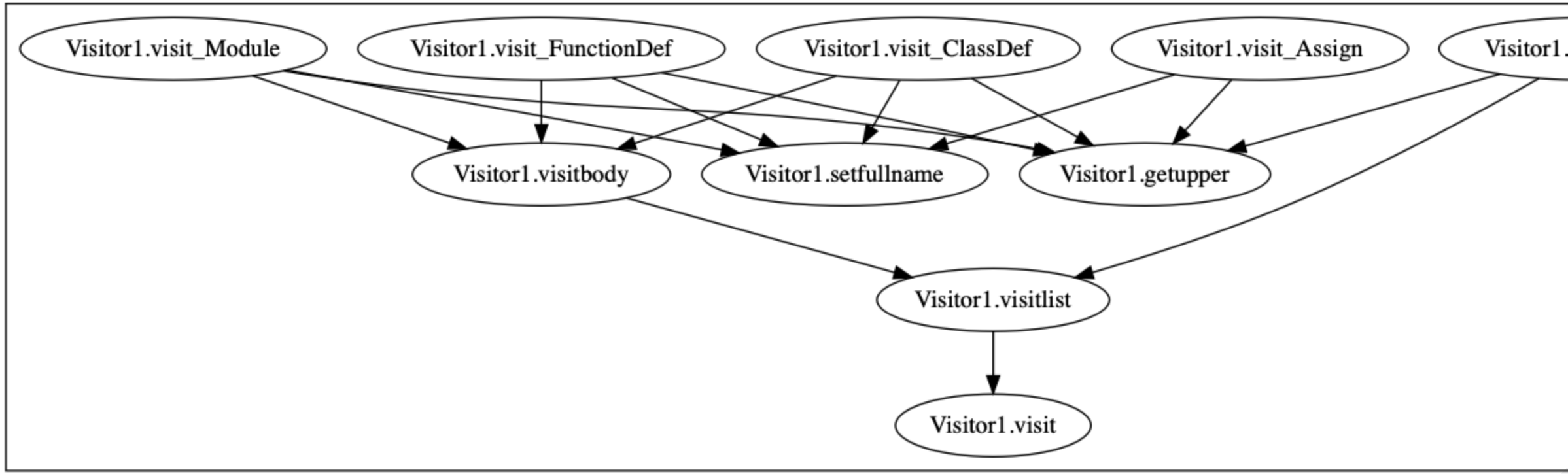
Demo time


main
Apple.__init__
Apple.color
Apple.red
Apple.green

VS


__main__
__main__
calls: 1
time: 0.000000s
1
<module>
<module>
calls: 1
time: 0.002761s
1
1
main
main
calls: 1
time: 0.001506s
1
1
Apple
Apple
calls: 1
time: 0.000024s
Apple.__init__
calls: 1
time: 0.000008s
Apple.color
calls: 1
time: 0.000517s
1
Apple.red
calls: 1
time: 0.000073s
Generated by Python Call Graph v1.0.1
http://pycallgraph.slowchop.com

interpy/visitor1.py



TODOs

- 多文件解析
- Python动态性处理

Q&A