

软件测试上机报告



第四次作业

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一、实验要求

Tasks:

1. Install MuJava. The instruction of how to install and use MuJava can be seen in <https://cs.gmu.edu/~offutt/mujava/> .
2. Two small programs are given for your task. BubbleSort.java is an implementation of bubble sort algorithm and Backpack.java is a solution of 01 backpack problem. Try to generate Mutants of 2 given programs with MuJava.
3. Write testing sets for 2 programs with Junit, and run mutants on the test sets with MuJava.

Requirements for the experiment:

1. Finish the tasks above individually.
2. Check in your java code to github and send the URL to tjuscst@qq.com
3. Post your experiment report to your blog and send the URL to tjuscst@qq.com , the following information should be included in your report:
 - a) The brief description that you install MuJava
 - b) Steps for generating Mutants
 - c) Steps for making test sets and running mutants.
 - d) Your mutants result (The number of live mutants, killed mutants, etc.)

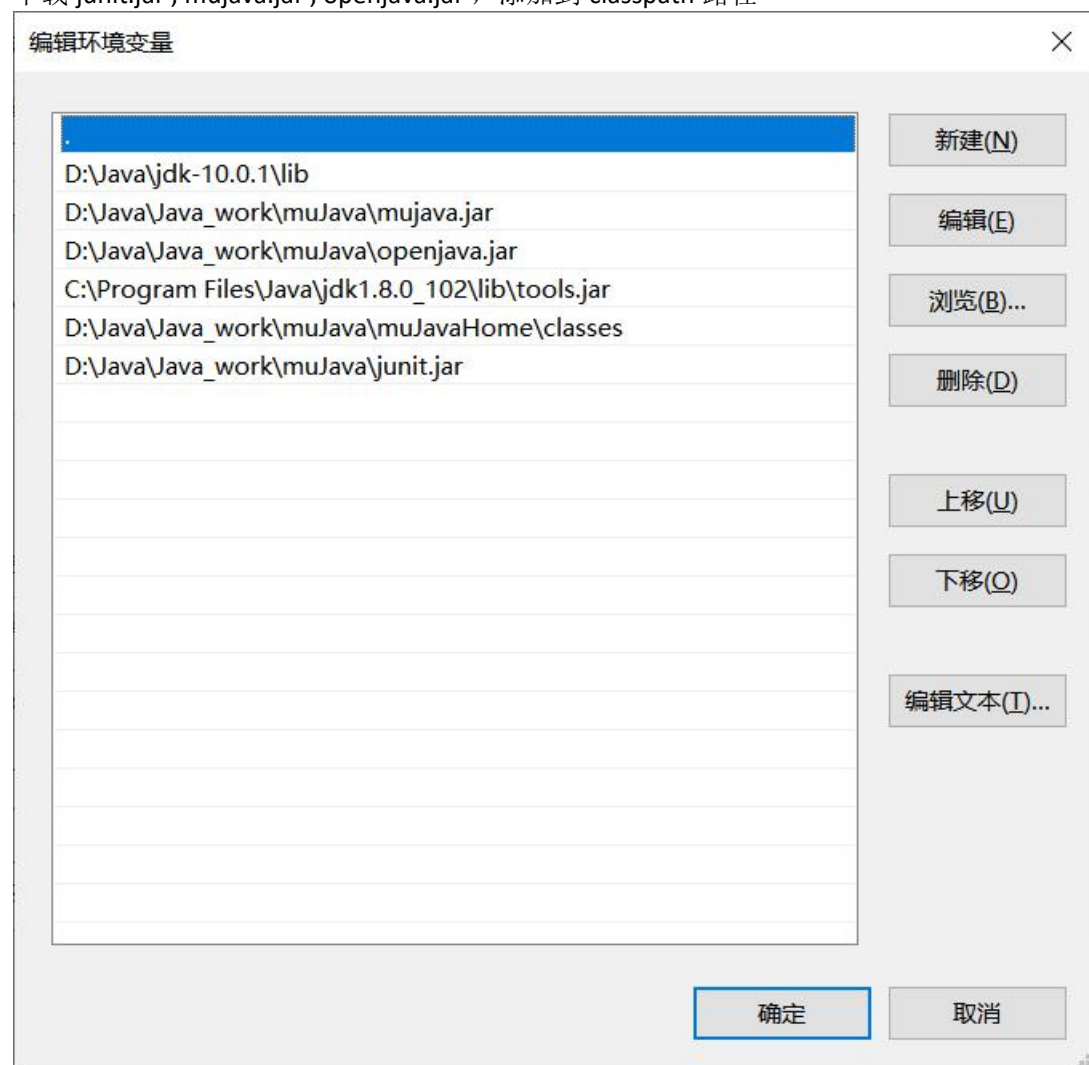
二、实验过程

1. 安装 mujava

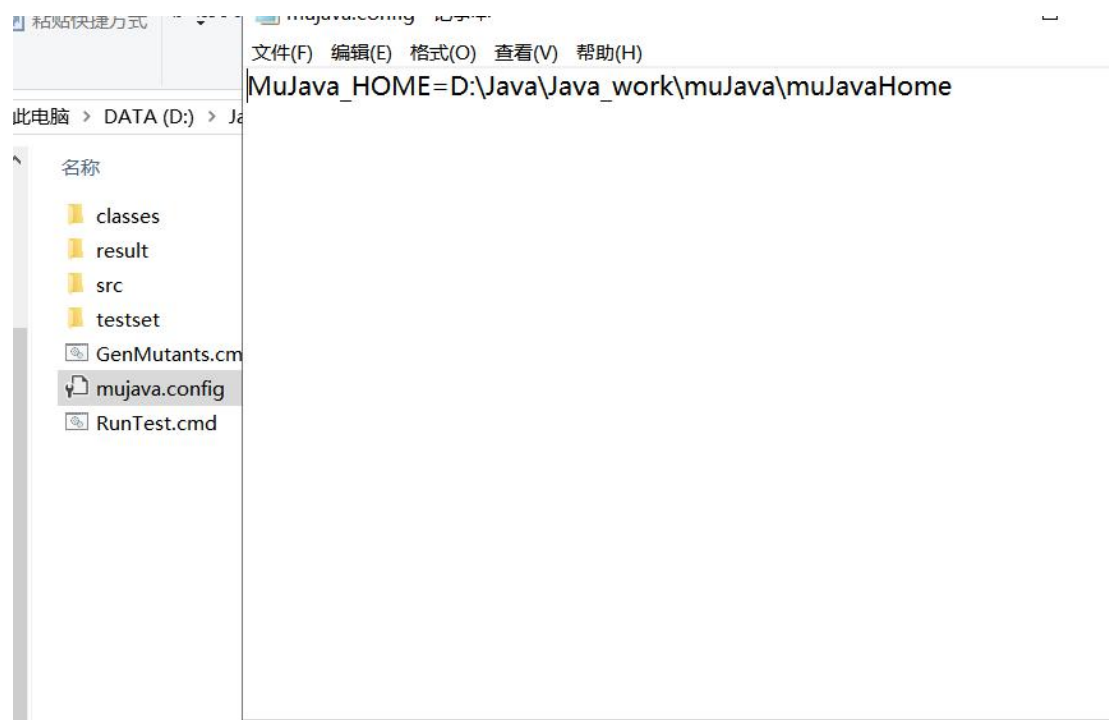
此电脑 > DATA (D:) > Java > Java_work > muJava

名称	修改日期	类型	大小
muJavaHome	2020/4/8 19:30	文件夹	
junit.jar	2016/7/19 21:40	Executable Jar File	248 KB
MuJava.docx	2019/4/17 14:48	DOCX 文档	17 KB
mujava.jar	2016/7/19 21:41	Executable Jar File	2,131 KB
openjava.jar	2016/7/19 21:40	Executable Jar File	275 KB
~\$MuJava.docx	2020/4/9 10:46	DOCX 文档	1 KB

下载 junit.jar , mujava.jar , openjava.jar , 添加到 classpath 路径



修改 mujava.config



建立四个文件夹，src 下放原始代码

脑 > DATA (D:) > Java > Java_work > muJava > muJavaHome > src			
名称	修改日期	类型	大小
Backpack.java	2019/4/15 16:52	JAVA 文件	3 1
BubbleSort.java	2019/4/17 16:43	JAVA 文件	1 1

classes 下面放编译过的 class 文件

包脑 > DATA (D:) > Java > Java_work > muJava > muJavaHome > classes			
名称	修改日期	类型	大小
Backpack.class	2020/4/9 10:00	CLASS 文件	2
BubbleSort.class	2020/4/9 9:52	CLASS 文件	1

启动

```
命令提示符 - java mujava.gui.GenMutantsMain
Microsoft Windows [版本 10.0.18362.657]
(c) 2019 Microsoft Corporation. 保留所有权利。

C:\Users\崔东浩>d:

D:\>cd D:\Java\Java_work\muJava\muJavaHome

D:\Java\Java_work\muJava\muJavaHome>java mujava.gui.GenMutantsMain
The main method starts
```

Mutants GeneratorTraditional Mutants ViewerClass Mutants Viewer

Usage:

- [1] Select files to test
- [2] Select mutation operators to apply
- [3] Push "RUN" button
- [4] Wait with endurance. ^^;

	File
<input checked="" type="checkbox"/>	BackPack.java
<input type="checkbox"/>	BubbleSort.java

Log level 1

NoneAllGenerate

Java Mutation Operator

Method-level

	Operator
<input checked="" type="checkbox"/>	AORB
<input checked="" type="checkbox"/>	AORS
<input checked="" type="checkbox"/>	AOIU
<input checked="" type="checkbox"/>	AOIS
<input checked="" type="checkbox"/>	AODU
<input checked="" type="checkbox"/>	AODS
<input checked="" type="checkbox"/>	ROR
<input checked="" type="checkbox"/>	COR
<input checked="" type="checkbox"/>	COD
<input checked="" type="checkbox"/>	COI
<input checked="" type="checkbox"/>	SOR
<input checked="" type="checkbox"/>	LOR
<input checked="" type="checkbox"/>	LOI
<input checked="" type="checkbox"/>	LOD
<input checked="" type="checkbox"/>	ASRS
<input checked="" type="checkbox"/>	SDL
<input checked="" type="checkbox"/>	VDL
<input checked="" type="checkbox"/>	CDL
<input checked="" type="checkbox"/>	ODL

NoneAll

Class-level

	Operator
<input checked="" type="checkbox"/>	IHI
<input checked="" type="checkbox"/>	IHD
<input checked="" type="checkbox"/>	IOD
<input checked="" type="checkbox"/>	IOP
<input checked="" type="checkbox"/>	IOR
<input checked="" type="checkbox"/>	ISI
<input checked="" type="checkbox"/>	ISD
<input checked="" type="checkbox"/>	IPC
<input checked="" type="checkbox"/>	PNC
<input checked="" type="checkbox"/>	PMD
<input checked="" type="checkbox"/>	PPD
<input checked="" type="checkbox"/>	PCI
<input checked="" type="checkbox"/>	PCC
<input checked="" type="checkbox"/>	PCD
<input checked="" type="checkbox"/>	PRV
<input checked="" type="checkbox"/>	OMR
<input checked="" type="checkbox"/>	OMD
<input checked="" type="checkbox"/>	OAN
<input checked="" type="checkbox"/>	JTI
<input checked="" type="checkbox"/>	JTD
<input checked="" type="checkbox"/>	JSI
<input checked="" type="checkbox"/>	JSD
<input checked="" type="checkbox"/>	JID
<input checked="" type="checkbox"/>	JDC
<input checked="" type="checkbox"/>	EOA
<input checked="" type="checkbox"/>	EOC
<input checked="" type="checkbox"/>	EAM
<input checked="" type="checkbox"/>	EMM

NoneAll

Mutants Generator Traditional Mutants Viewer Class Mutants Viewer

Select a class : Backpack
 Select a method : All method

*** Summary ***

Op	#
AO...	80
AO...	4
AOIU	8
AOIS	96
AO...	0
AO...	0
ROR	35
COR	0
COD	0
COI	6
SOR	0
LOR	0
LOI	34
LOD	0
ASRS	0
SDL	18
VDL	28
CDL	16
ODL	40

Total : 365

AOIS_29
 AOIS_3
AOIS_30
 AOIS_31
 AOIS_32
 AOIS_33
 AOIS_34
 AOIS_35
 AOIS_36
 AOIS_37
 AOIS_38
 AOIS_39
 AOIS_4
 AOIS_40
 AOIS_41
 AOIS_42
 AOIS_43
 AOIS_44
 AOIS_45
 AOIS_46
 AOIS_47
 AOIS_48
 AOIS_49
 AOIS_5
 AOIS_50
 AOIS_51
 AOIS_52
 AOIS_53
 AOIS_54

(line 33) int Backpack_Solution(int,int,int,int):n => -n

Original

```

33  for (int i = 1; i < n + 1; i++) {
34    for (int j = 1; j < m + 1; j++) {
35      if (w[i - 1] <= j) {
36        if (c[i - 1][j] < c[i - 1][j] - w[i - 1] + p[i - 1]) {
37          c[i][j] = c[i - 1][j] - w[i - 1] + p[i - 1];
38        } else {
39          c[i][j] = c[i - 1][j];
40        }
41      } else {
42        c[i][j] = c[i - 1][j];
43      }
44    }
45  }
46  return c[n][m];

```

Mutant

```

28  c[i][j] = 0;
29  }
30  for (int j = 0; j < m + 1; j++) {
31    c[0][j] = 0;
32  }
33  for (int i = 1; i < -n + 1; i++) {
34    for (int j = 1; j < m + 1; j++) {
35      if (w[i - 1] <= j) {
36        if (c[i - 1][j] < c[i - 1][j] - w[i - 1] + p[i - 1]) {
37          c[i][j] = c[i - 1][j] - w[i - 1] + p[i - 1];
38        } else {
39          c[i][j] = c[i - 1][j];
40        }
41      } else {

```

编写 testset
运行结果

TestCase Runner Traditional Mutants Viewer Class Mutants Viewer

☐ Execute only class mutants
☐ Execute only traditional mutants
☒ Execute all mutants

Class : BubbleSort
 Method : All method
 TestCase: BubbleSortTest RUN
 Time-Out : 3 seconds

Op	#
AORB	24
AORS	2
AOIU	3
AOIS	30
AO...	0
AODS	0
ROR	18
COR	0
COD	0
COI	3
SOR	0
LOR	0
LOI	12
LOD	0
ASRS	0
SDL	9
VDL	6
CDL	5
ODL	12

Total : 124

Op	#
IHI	0
IHD	0
IOD	0
IOP	0
IOR	0
ISI	0
ISD	0
IPC	0
PNC	0
PMD	0
PPD	0
PCI	0
PCC	0
PCD	0
PRV	0
OMR	0
OMD	0
OAN	0
JTI	0
JTD	0
JSI	0
JSD	0
JID	0
JDC	0
EOA	0
EOC	0
EAM	0
EMM	0

Total : 0

Traditional Mutants Result

Live Mutants #	0
Killed Mutants #	124
Total Mutants #	124
Mutant Score	100.0...

Live

Killed

- AOIS_1
- AOIS_10
- AOIS_11
- AOIS_12
- AOIS_17
- AOIS_18
- AOIS_19
- AOIS_2
- AOIS_20
- AOIS_21
- AOIS_22
- AOIS_23
- AOIS_24
- AOIS_25
- AOIS_26
- AOIS_27
- AOIS_28
- AOIS_29
- AOIS_3

Class Mutants Result

Live Mutants #	0
Killed Mutants #	0
Total Mutants #	0
Mutant Score	- %

Live

Killed

全部 killed,

```

===== Executing Mutants =====
AOIS_1{testConstructor=testConstructor: 12; expected:<[I@7e98379b> but was:<[I@7aa7bc90>}
AOIS_10{testConstructor=testConstructor: 12; expected:<[I@5f1d8dc2> but was:<[I@5b2212f9>}
AOIS_11{testConstructor=testConstructor: 12; expected:<[I@2192cba2> but was:<[I@25ad4b48>}
AOIS_12{testConstructor=testConstructor: 12; expected:<[I@3c57c3dc> but was:<[I@3868408e>}
AOIS_17{testConstructor=testConstructor: 12; expected:<[I@7cddde54f> but was:<[I@78e26e0c>}
AOIS_18{testConstructor=testConstructor: 12; expected:<[I@239ce62a> but was:<[I@27a36681>}
AOIS_19{testConstructor=testConstructor: 12; expected:<[I@73978be6> but was:<[I@77a8114c>}
AOIS_2{testConstructor=testConstructor: 12; expected:<[I@1b8f0748> but was:<[I@1fb080e1>}
AOIS_20{testConstructor=testConstructor: 12; expected:<[I@3d271475> but was:<[I@39189709>}
AOIS_21{testConstructor=testConstructor: 12; expected:<[I@2ac4d8a> but was:<[I@693c907>}
AOIS_22{testConstructor=testConstructor: 12; expected:<[I@633fd4cf> but was:<[I@67005c70>}
AOIS_23{testConstructor=testConstructor: 12; expected:<[I@5f28e472> but was:<[I@5b176b4f>}
AOIS_24{testConstructor=testConstructor: 12; expected:<[I@7c3d4e9e> but was:<[I@7802d5c1>}
AOIS_25{testConstructor=testConstructor: 12; expected:<[I@4560a6da> but was:<[I@415f2aae>}
AOIS_26{testConstructor=testConstructor: 12; expected:<[I@59d32ceb> but was:<[I@5dec309>}
AOIS_27{testConstructor=testConstructor: 12; expected:<[I@2ac96d1a> but was:<[I@2ef6ec9b>}
AOIS_28{testConstructor=testConstructor: 12; expected:<[I@6c412df4> but was:<[I@687eb4a4>}
AOIS_29{testConstructor=testConstructor: 12; expected:<[I@62c27de7> but was:<[I@66fde567>}
AOIS_3{testConstructor=testConstructor: 12; expected:<[I@377769f3> but was:<[I@3348ebc5>}
AOIS_30{testConstructor=testConstructor: 12; expected:<[I@29e8bcee> but was:<[I@2dd72d0b>}
AOIS_31{testConstructor=testConstructor: 12; expected:<[I@32ddca94> but was:<[I@36e24817>}
AOIS_32{testConstructor=testConstructor: 12; expected:<[I@34637a86> but was:<[I@305ce8d2>}
AOIS_33{testConstructor=testConstructor: 12; expected:<[I@3d816bh2> but was:<[I@39bee8da>}
  
```