|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Program | LOC | STATE | BLOCK | BRANCH | Test pool size | Test suite size |
| Print\_tokens | 726 | 185 | 144 | 102 | 4130 | 16 |
| Print\_tokens2 | 570 | 200 | 197 | 159 | 4115 | 15 |
| Schedule | 412 | 150 | 93 | 63 | 2650 | 10 |
| Schedule2 | 374 | 128 | 118 | 83 | 2710 | 11 |
| Space | 9564 | 9126 | 1571 | 1016 | 13585 | 20 |

以上表格里的覆盖率信息为执行到的数据。

GSO萤火虫群优化算法与其他算法比较(平均APFD值)

GSO（普通）

CovFilter

|  |  |  |  |
| --- | --- | --- | --- |
| Program | state | block | branch |
| Print\_tokens | 0.950262536 | 0.948449308 | 0.934513454 |
| Print\_tokens2 | 0.935697208 | 0.941682352 | 0.923154134 |
| Schedule | 0.945214052 | 0.943825326 | 0.904916504 |
| Schedule2 | 0.952617396 | 0.942173286 | 0.917811712 |

GA

CovFilter

|  |  |  |  |
| --- | --- | --- | --- |
| Program | state | block | branch |
| Print\_tokens | 0.936713398 | 0.934601134 | 0.915510412 |
| Print\_tokens2 | 0.922963996 | 0.931423282 | 0.910552396 |
| Schedule | 0.942013272 | 0.94028405 | 0.89483321 |
| Schedule2 | 0.951734852 | 0.936764816 | 0.907936604 |

额外贪心算法

CovFilter

|  |  |  |  |
| --- | --- | --- | --- |
| Program | state | block | branch |
| Print\_tokens | 0.945671386 | 0.943931246 | 0.927734458 |
| Print\_tokens2 | 0.931494386 | 0.938861080 | 0.921191610 |
| Schedule | 0.943320486 | 0.942065950 | 0.898645816 |
| Schedule2 | 0.952561296 | 0.937717366 | 0.911915664 |

改进萤火虫算法（加入局部优化算子，使用3-opt算子）

CovFilter

|  |  |  |  |
| --- | --- | --- | --- |
| Program | state | block | branch |
| Print\_tokens | 0.953178622 | 0.951794512 | 0.939490864 |
| Print\_tokens2 | 0.940883982 | 0.945638138 | 0.929299506 |
| Schedule | 0.945760156 | 0.944303098 | 0.907138572 |
| Schedule2 | 0.952706204 | 0.943220736 | 0.920009722 |

本文的3-opt算法步骤如下：

1. t=1，当前测试用例序列为S。
2. 针对当前S随机选取三个点（测试用例），利用3-opt算子产生（最多）4个新测试用例序列S1，S2，S3，S4。选取评价值最优的测试用例序列S’。
3. 如果F(S’)>F(S)，S=S’，t=1；否则，t=t+1。
4. 如果t==Nmax，结束；否则，跳转到2。