Grace Hopper：the queen of code 编码皇后 发现第一个bug

PIE模型
【document】ieee std 1044文档
【book】introduction to software testing

Fault, Error & Failure

- Software Fault : A **static** defect in the software (i.e., defect)
- Software Error : An incorrect **internal** state that is the manifestation of some faults
- Software Failure : **External**, incorrect behavior with respect to the requirements or other description of the expected behavior

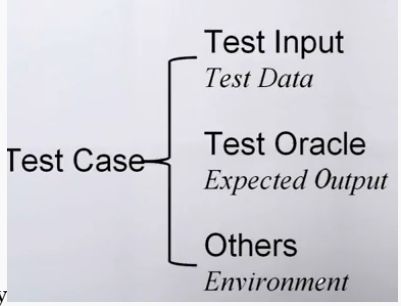
PIE Model

- Execution/Reachability : The location or locations in the program that contain the fault must be reached
- Infection : The state of the program must be incorrect
- Propagation : The infected state must propagate to cause some output of the program to be incorrect

可能会存在一个没有任何测试能够发现的fault，但这种fault应该不被称之为fault
产生error但不一定会失效

PIE Model

- Execution
- Infection
- Propagation
- Fault
- Error
- Failure



软件测试术语terminology
测试：发现bug
调试：修复bug 找到fault并修正
静态测试：无需运行程序

动态测试：运行程序
【book】google软件测试之道

图结构测试方法、

图：
多初始节点时，构造亚节点，指向所有初始节点；同理可以构造终结节点
单点路径为o
测试路径：初始节点到终结点的路径；
但有些测试路径无法覆盖，这是不可判定问题

图覆盖准则：
结构覆盖
数据流覆盖

顶点覆盖VC
边覆盖EC
边对覆盖
n路径覆盖 $VC(n=0), EC(n=1), EPC(n=2), CPC(n=\infty)$

蕴含（subsume）

Subsume

- C1 subsumes C2, denoted by C1 $\geqq$ C2 :
  For any T, if T satisfies C1 implies T satisfies C2.
- n_1PC $\geqq$ n_2PC if $n_1 \geqq n_2$
- C1 $\geqq$ C2 does not imply that T_1 satisfying C1 can detect any fault detected by T_2 which satisfies C2.

主路径：不是任何简单路径的子路径， 长度极大化的简单路径

Prime Path Coverage

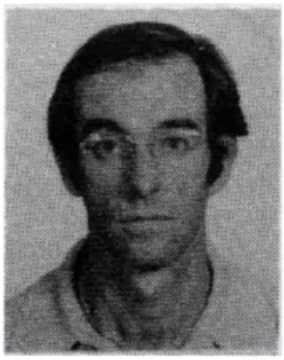
- A simple, elegant and finite criterion that requires loops to be executed as well as skipped

Prime Path Coverage (PPC) : TR contains each prime path in G.

基本路径测试（Thomas J McCabe）
独立路径
线性独立路径

The Number of Linearly Independent Paths

- The number of linearly independent paths is the rank of this matrix.
- The rank of this matrix is exactly the cyclomatic complexity of the graph.



Thomas J. McCabe: A Complexity Measure. IEEE Trans. Software Eng. 2(4): 308-320 (1976)

圈复杂度CC=E-V+2

Junit：erich gamma（设计模式）与kent beck（极限编程）

控制流图生成（CFG generation） soot自动为java产生控制流图