Tribhuvan University
Institute of Science and Technology

Central Department of Computer Science and Information Technology (CDCSIT)

Kirtipur, Kathmandu

Complexity and Algorithms - Assignment

On

"Test case strategy for reduction of test paths such that test time and cost is reduced with minimal impact with respect to disaster."

Submitted by

Akkal Bahadur Bist

Section-A (Roll No-19/2079)

Submitted To

Mr. Sarbin Sayami

Head of Department,

Central Department of Computer Science and Information Technology

22 April, 2023

1. Develop a test case strategy for reduction of test paths (sampling) such that test time and cost is reduced with minimal impact with respect to disaster.

Definition:

A test case strategy is a plan or strategy that outlines how a software product, an algorithm or system will be tested. It covers aspects such as the areas of the software that need to be tested, the types of testing to be performed, the test environment, test data, automation, and the roles and responsibilities of the testing team. The strategy ensures that testing is effective, efficient, and meets the required quality standards.

Example: Flight safety system

We follow different stages like:

1. Take an Algorithm
2. Draw Flowchart
3. Draw Graph
4. Calculate Cyclomatic complexity and
5. Test Paths

1. Algorithm:

An algorithm is a step-by-step procedure or set of instructions for solving a problem or achieving a specific goal.

This algorithm is a flight safety system that checks the altitude and speed of a plane and alerts the pilot if either value is approaching a dangerous level.

Step 1: Start

Step 2: Input altitude in feet and speed in mph

Step 3: If

altitude is less than 1000 feet AND speed is greater than 200 mph

then

alert to pilot

Step 4: If

altitude is less than 500 feet OR speed is greater than 300 mph

then

alert to pilot

Step 5: End

2. Flowchart:

Flowchart is a graphical representation of a process or algorithm that uses symbols to depict the steps and flow of information.

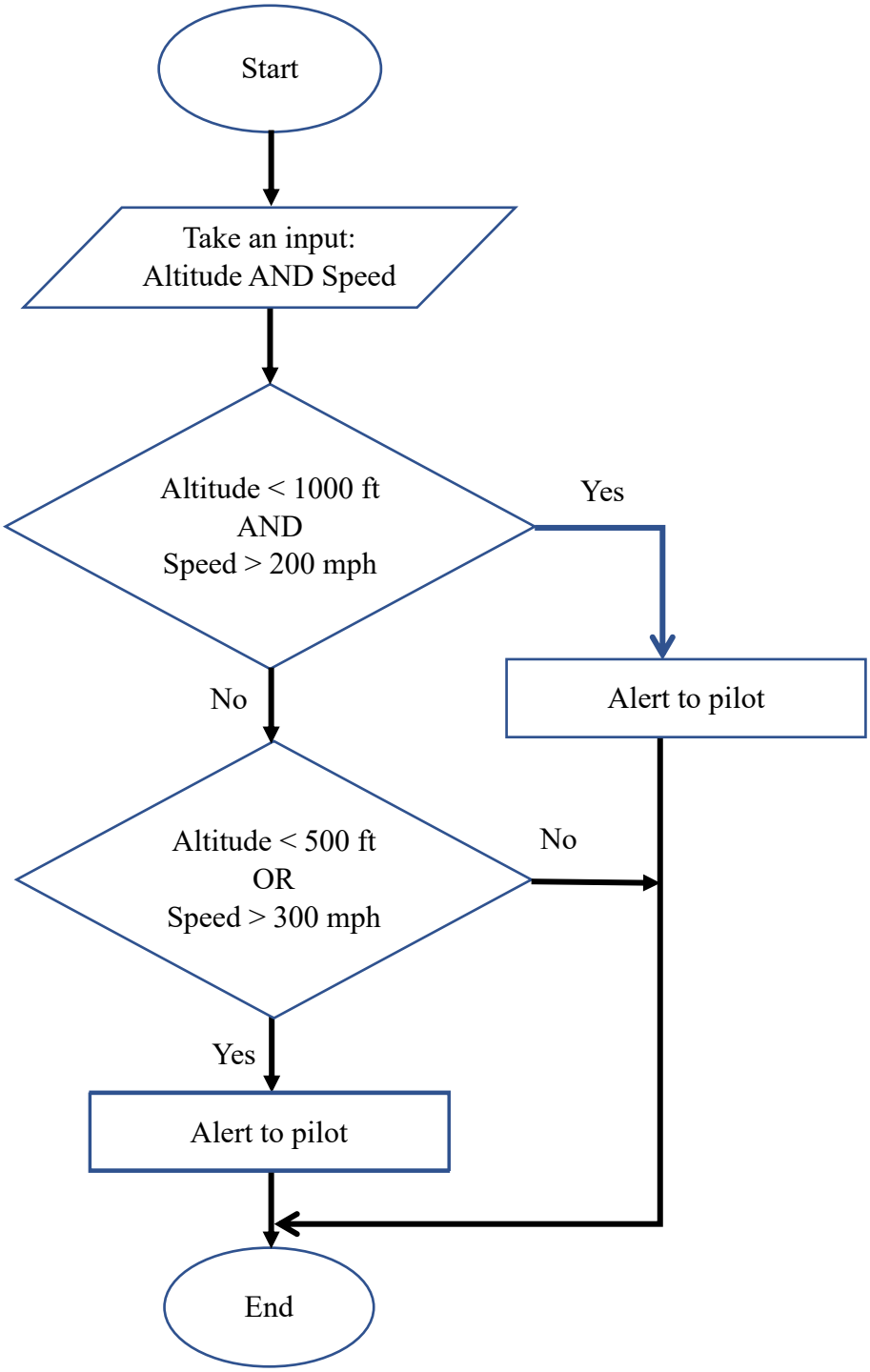

Figure-1: Flowchart of Flight safety system.

3. Graph:

A graph is a visual representation of a set of objects (nodes) or notational representation of flowchart in connected manner that are connected by links (edges) to form a network.

The above flowchart represent in graph as follows:

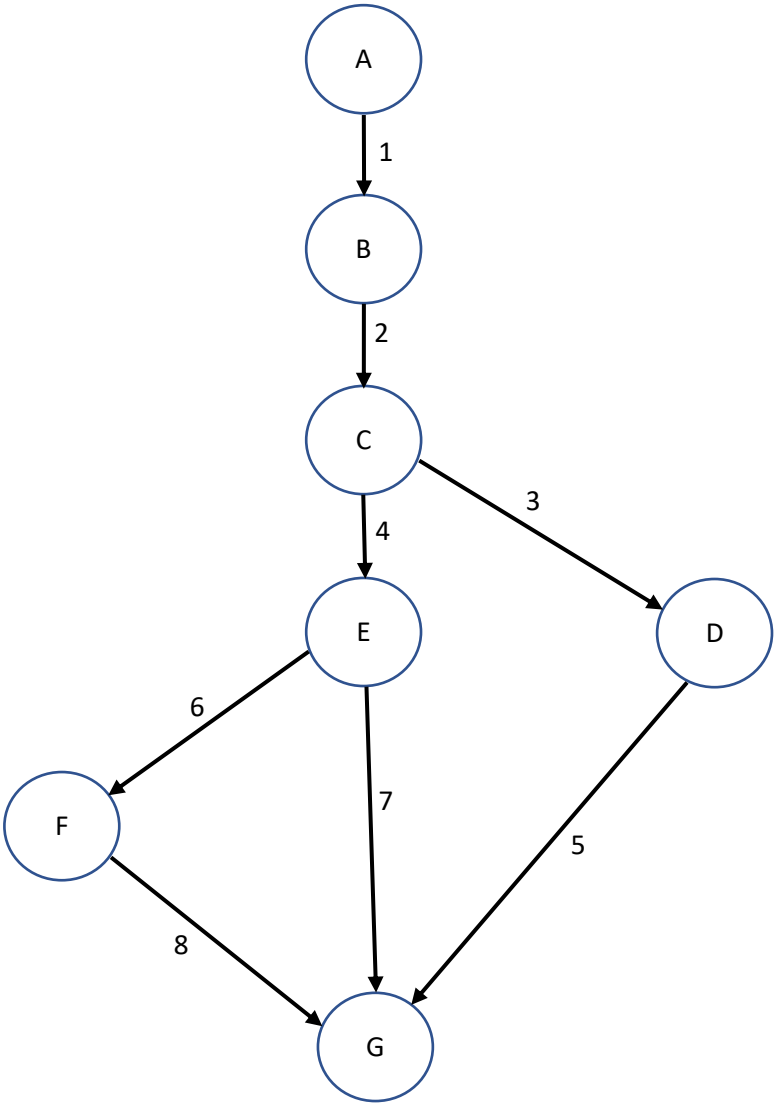

Figure-1: Graph of Flight safety system.

3. Cyclomatic Complexity:

Cyclomatic complexity is a measure of the number of independent paths in a algorithm or system. We calculate cyclomatic complexity: M = E – N + 2P

where,

M = Cyclomatic complexity

E = Number of edges in the control flow graph

N = Number of nodes in the control flow graph

P = Number of connected components in the control flow graph (exit points)

Calculate the Cyclomatic Complexity of the Flight safety system algorithm, we count the number of nodes, edges, and exit points in the control flow graph. In this case, we have 7 nodes, 8 edges, and 1 exit point.

Then the cyclomatic complexity of this algorithm is:

M = 8 - 7 + 2(1)

⇨ M = 3

Hence, the Cyclomatic Complexity of the Flight safety system algorithm is O(3).

4.Test Paths:

The possible no of path from this above graph are:

Path-1 = A→B→C→D→G

Path-2 = A→B→C→E→F→G

Path-3 = A→B→C→E→G

Using this graph, we can estimate the path cost for statement and branch coverage as follows:

$$Statement\ Coverge = \frac{Visited\ Nodes\ of\ the\ Path}{Total\ Nodes} \times 100\%$$

$$Branch\ Coverge = \frac{Visited\ Predicated\ Nodes}{Total\ Predicated\ Nodes} \times 100\%$$

Path	Statement Coverage Cost	Branch Coverage Cost
Path-1	5/7*100 = 71.43%	1/2*100 = 50%
Path-2	6/7*100 = 85.71%	2/2*100 = 100%
Path-3	5/7*100 = 71.43%	2/2*100 = 100%

Conclusion:

In conclusion, the above calculated path table provided helps to determine the statement and branch coverage cost for different paths in the algorithm. By comparing the calculated statement and branch coverage cost, the best paths for the test case strategy is Path-2 (Statement Coverage Cost = 85.71% and Branch Coverage Cost 2/2*100 = 100%) next is Path-3 and worst is Path-1.