Heuristic Approach to TCG

- Heuristic
  - Webster dictionary
    - involving or serving as an aid to learning, discovery, or problem-solving by experimental and especially trial-and-error methods
- Examples
  - Discussion

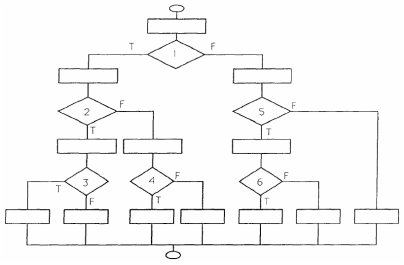
Search Examples

- Looking for a solution in a search space
- Known techniques
  - Depth-first
  - Breadth-first
  - Binary search for certain structures
- Others?
  - Large branching factor
  - Very deep

Do we need a Heuristic?

- To generate test cases that achieve maximal branch coverage

Example Flow-chart



	Branch	
Condition	T	F
1	X	X
2	X	X
3	X	
4	X	
5		X
6		

Observations

- 1T, 1F, 2T, 2F have been covered
- 3T has been covered
- To cover 3F, can we tweak the test case for 3T?
- Also, what do we do when multiple test cases are available for tweaking?
  - Need a way to compare

"Best Test Case"

- If (Exp) THEN __ ELSE __;
- Exp can be (LHS <op> RHS)
- The "goodness" of a test case t1

$$\frac{|LHS(t1) - RHS(t1)|}{(2*MAX(|LHS(t1)|, |RHS(t1)|))}$$

- Should we rely on only local information?
  - What are the risks?

Better "Best Test Case"

$$G(t,D) = w * L(t,D) + (1-w) * P(t,D) \quad (2)$$

where:

- G(t,D) : Goodness of test case t at condition D.
- L(t,D) : Freedom space of t at D.
- P(t,D) : Sum of freedom space reciprocals of t along the path toward D.
- w : Weighting factor between L(t,D) and P(t,D), $0 < w < 1$.

L(t,D) is defined as in formula (1), and P(t,D) is defined as:

$$P(t,D) = \sum_{\text{all } D_i} 1 / (n * L(t,D_i)) \quad (3)$$

- Smallest value indicates the best test case