

Using Mind Mapping to Design Test Cases

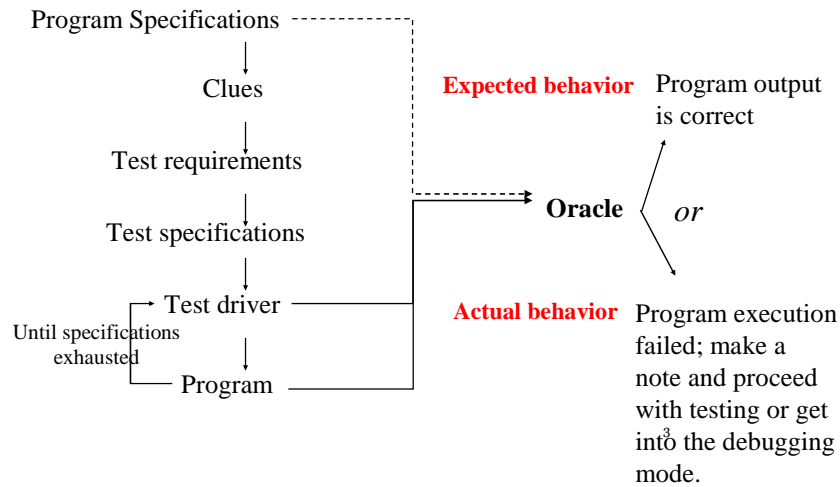
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Speaker Biographical Sketch

- Senior Research Scientist & Project Manager
Bellcore (Bell Communications Research)
 - Formerly part of AT&T Bell Labs
 - Now Telcordia Technologies
- Professor & Director of International Outreach
Department of Computer Science
University of Texas at Dallas
- Guest Researcher
Computer Security Division
National Institute of Standards and Technology (NIST)
- Vice President, IEEE Reliability Society
- Secretary, ACM SIGAPP (Special Interest Group on Applied Computing)
- Founder & Steering Committee Chair for the SERE conference
(*IEEE International Conference on Software Security and Reliability*)
(<http://paris.utdallas.edu/sere13>)



Test Generation

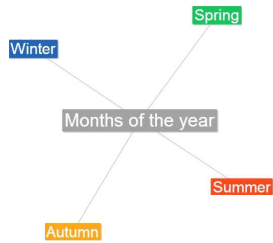


Mind Map: Overview

- A *mind map* is a diagram used to visually outline information.
 - It is often created around a **single word or text**, placed in the center, to which associated ideas, words, and concepts are added.
- Elements of a *mind map*
 - arranged *intuitively* according to the importance of the concepts
 - classified into groups, branches, or areas
 - aimed at representing semantic or other connections between portions of information
- *Mind maps* can be used to generate, visualize, structure, and classify ideas.

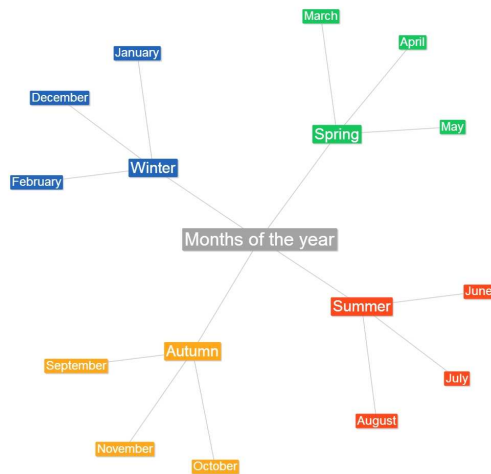
Mind Map: An Example (1)

- Using a mind map to classify the months of a year



Mind Map: An Example (2)

- Using a mind map to classify the months of a year



Test Generation using Mind Map (1)

- Suppose we have a computer program to compute the cost of each phone call, using the following scheme

	Standard	Evening/Weekend	Time unit (second)
Domestic	\$0.05	\$0.01	1
International	\$1.00	\$0.30	20

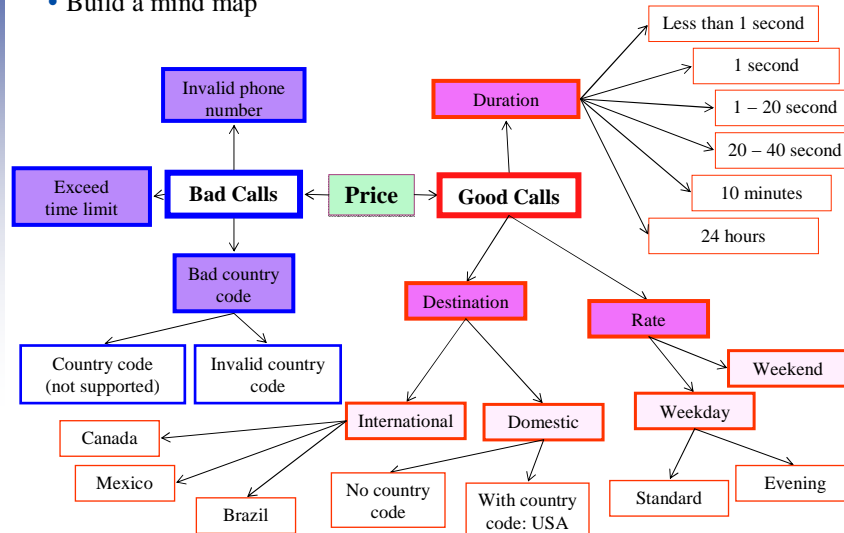
- If an invalid country code or an invalid phone number is used, there will be no charge
- If no country code is given or it equals “USA”, then the charge is based on a *domestic* call
- If the country code equals “Canada,” “Mexico,” or “Brazil,” then the charge is based on an *international* call.
- If the country code equals any other valid country names, the call cannot go through and there will be no charge
- The duration of each call is rounded up to the next highest time unit

Test Generation using Mind Map (2)

- The maximal duration of each call is 24 hours
 - 86,400 units for a domestic call
 - 4,320 units for an international call
- The “evening” rate applies between 8 pm and 6 am
- The “weekend” rate applies on Saturday and Sunday
-

Test Generation using Mind Map (3)

- Build a mind map



Test Generation using Mind Map (4)

- Create equivalence classes based on a mind map
 - Phone number:
 - { valid phone number }, { invalid phone number }
 - Country code:
 - { invalid country code }, { valid country code (supported) }, { valid country code (not supported) }, { no country code }, { USA }
 - Rate
 - { Weekday, Standard }, { Weekday, Evening }, { Weekend }
 - Duration
 - { less than 1 second }, { 1 second }, { 1 - 20 seconds }, { 20 - 40 seconds }, { 40 seconds - 10 minutes }, { 10 minutes to 24 hours }, { 24 hours }
- Apply unidimensional or multidimensional partitioning for test generation

Test Generation using Mind Map (5)

- Mind maps provide a visualization approach to classify the input domain.
- It can be easily combined with
 - ECP (Equivalence Class Partitioning)
 - BVA (Boundary Value Analysis)
 - etc.

Tool Support

- There are tools to help users generate mind maps
 - CAM editor (<http://www.cameditor.org>)
 - FreeMind (http://freemind.sourceforge.net/wiki/index.php/Main_Page)
 - Docear (<http://www.docear.org/>)