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
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- 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
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Using Mind Mapping to Design Test Cases (© 2013-2015 Professor W. Eric Wong, The University of Texas at Dallas)
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
• Suppose we have a computer program to compute the cost of each phone call, using the following scheme

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Evening/Weekend</th>
<th>Time unit (second)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>$0.05</td>
<td>$0.01</td>
<td>1</td>
</tr>
<tr>
<td>International</td>
<td>$1.00</td>
<td>$0.30</td>
<td>20</td>
</tr>
</tbody>
</table>

- 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

- 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

```
[invalid phone number] -> Bad Calls
[bad country code]   
[invalid country code]
[country code (not supported)]

[price] 
[good calls] 
[destination] 
[rate]
[weekday] 
[weekend]
[standard] 
[evening]
```

**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](http://www.cameditor.org))
  - Docear ([http://www.docear.org/](http://www.docear.org/))