ASE Papers on specification...
...that influenced me

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ASE Retrospective pannel at ASE’06, Tokyo, sep. 2006
Specification in ASE

- Specification is rarely the goal of ASE research, but it is often combined with
  - Program Synthesis
  - Verification or Validation
  - ...

- Two papers on Specification and Testing
[MK01] Darko Marinov, Sarfraz Khurshid

TestEra: A Novel Framework for Automated Testing of Java Programs

Int Conf Automated Software Engineering
San Diego, IEEE CS Press 2001
The Testera tool

- Other researches addressed these topics, but here the integration was original and unique!

Automatic generation of abstract inputs from the specification

Use the specification as test oracle

Connection between abstract (Alloy) and concrete (Java) levels

Figure 1. Basic TestEra framework

Fig. from [MK01]
Structure of [MK01]

- Underlying principles nicely explained in 4 pages!
- Rest of the paper dedicated to 3 convincing case studies:
  - Real data structure from Java library demonstrates the applicability to real software
  - Service identification algorithm (real bugs from outside the group)
  - Code from the Alloy Analyser (use your own medicine)

[MK01] Darko Marinov, Sarfraz Khurshid

*TestEra: A Novel Framework for Automated Testing of Java Programs*
Historical perspective

- One paper from a stream of research
  - Starting with the Alloy papers (including an invited talk at ASE’99)
  - Continuing with the Korat tool (ISSTA 2002)
  - A single paper is not necessarily influential, it is a member of a set of influential research!
[HG04] Mats Heimdahl, Devaraj George

*Test-Suite Reduction for Model Based Tests: Effects on Test Quality and Implications for Testing*

Int. Conf. Automated Software Engineering
Linz, IEEE CS Press 2004
Test Suite Reduction

• The problem
  – Given a test suite T,
    Find a subset S included in T
    Such that
    S has the same « coverage » than T

• Greedy algorithm:
  – Start with an empty S
  – Repeat
    • Choose a test randomly in T
    • If it increases the coverage
      Then add it to S
  – Until you reach the coverage of T
Experimental study in [HD04]

- Taken from an industrial project in air and space (flight guidance system from Rockwell Collins)
- Project led at the specification level:
  - Used the specification to measure coverage
  - Generated 100 faulty specifications
  - Compare the number of faults detected by T and S

[HG04] Mats Heimdahl, Devaraj George

*Test-Suite Reduction for Model Based Tests: Effects on Test Quality and Implications for Testing*
A stream of research

• Early and seminal papers in that domain by M.J. Harrold and G. Rothermel in the beginning of the 90’s
• Several studies tried to answer the question: Does S has the same fault detection capabilities as T?
• Previous empirical studies did bring totally different results.
## Results

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Full Set</th>
<th>Run 1</th>
<th>Run 2</th>
<th>Run 3</th>
<th>Run 4</th>
<th>Run 5</th>
<th>Average</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable Domain</td>
<td>32</td>
<td>28</td>
<td>29</td>
<td>25</td>
<td>28</td>
<td>25</td>
<td>27.0</td>
<td>15.6%</td>
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<tr>
<td>Transition</td>
<td>64</td>
<td>58</td>
<td>58</td>
<td>58</td>
<td>59</td>
<td>57</td>
<td>58.0</td>
<td>9.38%</td>
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<tr>
<td>Decision</td>
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<td>62</td>
<td>61</td>
<td>62</td>
<td>61</td>
<td>61</td>
<td>61.6</td>
<td>8.06%</td>
</tr>
<tr>
<td>Decision Usage</td>
<td>69</td>
<td>62</td>
<td>63</td>
<td>63</td>
<td>63</td>
<td>63</td>
<td>62.6</td>
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<tr>
<td>MCDC</td>
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<td>64</td>
<td>63</td>
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<td>63</td>
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<td>9.71%</td>
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<tr>
<td>MCDC Usage</td>
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<td>67</td>
<td>66</td>
<td>67</td>
<td>67</td>
<td>67</td>
<td>66.8</td>
<td>7.22%</td>
</tr>
</tbody>
</table>

Table 3. Fault finding capability of the reduced test-sets \[\text{HD04}\]

- Reduced test suites always have lower fault detection capabilities
- 7.22% is small, but unacceptable for air and space applications

\[\text{HG04}\] Mats Heimdahl, Devaraj George

_**Test-Suite Reduction for Model Based Tests: Effects on Test Quality and Implications for Testing**_
Why is it a good paper?

- Very well written! (I give it to read to my students)
- Excellent survey of the foundations and related work
- Picks up an open question…
- Answers it by a solid experimental evaluation.
Conclusion

• The quality of writing is a significant element for influential papers…
• …But it must rely on strong and mature research work!
• None of these papers is the « seminal » paper…
• But these are within a stream of research
Question: can ASE papers be « influential »?

• The ASE PC requires papers with extensive evaluation
  – Most of the paper dedicated to experimental evaluation
  – Remaining space only sufficient to provide a synthetic view of the underlying ideas

• Yes, ASE papers can demonstrate the effectiveness of some technique/tool

• But seminal papers might end up as short papers...