

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

Yves Ledru

LSR/IMAG (Grenoble, France)

ASE Retrospective pannel at ASE'06, Tokyo, sep. 2006

# Specification in ASE

LSR

- 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



# TestEra [ASE 2001]

LSR

[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

LSR

- 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

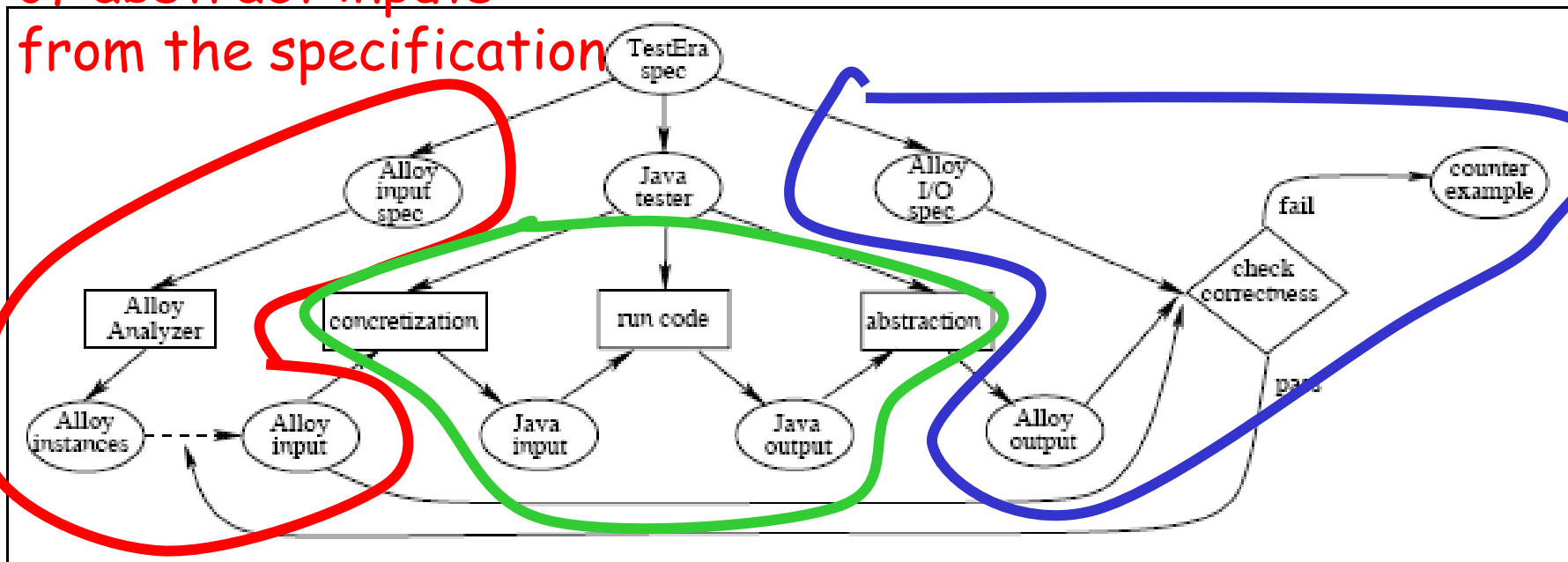


Figure 1. Basic TestEra framework

Fig. from [MK01]

connection between abstract (Alloy) and concrete (java) levels

# Structure of [MK01]

LSR

- 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

LSR

- 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!



# Experiments in Test Suite Reduction [2004]

LSR

[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

LSR

- **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]

LSR

- 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

LSR

- 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

Criteria	Full Set	Run 1	Run 2	Run 3	Run 4	Run 5	Average	Reduction
Variable Domain	32	28	29	25	28	25	27.0	15.6%
Transition	64	58	58	58	59	57	58.0	9.38%
Decision	67	62	61	62	62	61	61.6	8.06%
Decision Usage	69	62	63	63	62	63	62.6	9.28%
MCDC	70	64	63	63	63	63	63.2	9.71%
MCDC Usage	72	67	66	67	67	67	66.8	7.22%

Table 3. Fault finding capability of the reduced test-sets [HD04]

- Reduced test suites always have lower fault detection capabilities
- 7,22% is small, but unacceptable for air and space applications

[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?

LSR

- 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

LSR

- 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 »?

LSR

- 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...**