Model Checking Contest

Report for 2013

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MCC
2013

Model Checking Contest @

Contents

Special thanks for those who helped to organize this MCC, in particular Fabrice Legond-Aubry + Harro Wimmel (multi-core machines), Lom Hillah (PNML)

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Objectives

When it Comes to Deal with Large and Complex Systems...

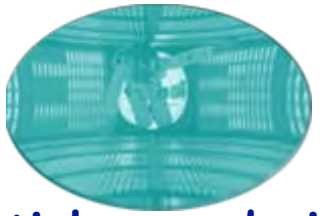
- Lots of questions are raised...
  - To verify highly concurrent systems, should we use a symmetry-based or a partial order-based model checker?
  - For models with large variable domains, should we use decision diagram-based, or a symmetry-based model checker?
  - Can we combine structural reductions techniques with partial-order ones or symmetry-based ones?
  - How do tools evolve in the community?
  - ...

- A large variety of model checking techniques
  - and their potential combination
- A large variety of model categories
- A challenge with large scale specifications

- A need to evaluate in the fairest way current MC implementations

The Objectives...

- MCC is intended to:
  - Exchange experience between tool programmers,
  - Imagine some association of techniques, and thus better tools
  - Stimulate development of tools
  - Provide visibility to these tools
- MCC can also be of great help for the PN community (and users):
  - Define a common set of models for benchmarks
  - Identify experimentally classes of problems (in models)
    - identify the techniques able to cope with a given class of problems...
  - Improve communication between tools (and PNML ;-))
  - Provides raw data for comparison



- This is the third edition
  - Stabilized evaluation procedure (BenchKit) + potential reproducibility
  - Enriched Benchmark...
  - ...still elements to be improved

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Evaluation Procedure

What to be measured?

- The «enemies» of model checking
  - Memory consumption
  - CPU consumption

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- The «enemies» of model checking
  - Memory consumption
  - CPU consumption
- 17 classes of «Examinations» to be processed
  - State space generation
  - Formula evaluation
    - Reachability Formulas
    - CTL formulas
    - LTL formulas

    }  still difficult
  - Also a classification of atomic propositions in formulas
    - Cardinality or Place Comparison, Fireability, MarkingComparison, Deadlock, Mix

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- 24 «known» models (7 from 2011 + 12 from 2012 + 5 from 2013)
  - Kripke-equivalent encoding allowed

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- 24 «known» models (7 from 2011 + 12 from 2012 + 5 from 2013)
  - Kripke-equivalent encoding allowed
- 4+1 «Surprise models»
  - Origins: LIG, Univ. P. & M. Curie, Petriweb.org, Univ. Rostock

Facts about the MCC

cluster1 (Univ P. & M. Curie)	ebro (Univ. Rostock)	quadhexa-2 (Univ. Nanterre)
		
CPU		
total of 46 CPU	**total of 64 CPU**	**total of 24 CPU**
23 x Intel Xeon E5645 2.4 GHz, 6-Core, 6x 1536KB/12288KB L2/L3	4 x AMD Opteron™ 6200 Series (Interlagos) 2.7 GHz, 16-Core, 16x 1024KB/16MB L2/L3	4 x Intel Xeon X7460 2.66 GHz, 6-Core, 3 x 3MB/16NB L2/L3
Memory		
23 x 8GB (2x4GB) DDR3 / PC1333	512GB (32x 16GB) DDR3 / PC1600	128BG (8x 16BG) DDR3 / PC1333
Disks		
23 x 500GB SATA 7200 + 1TB SATA 7200	2 x 1TB SAS2-Server-RAID + 2 x 128GB SSD Samsung 830 SERIES SATA III MLC	4 x 400GB RAID 1 (mirror) Seagate SAS Cheetah
Linux Kernel		
2.6.38.8-server-10.mga	2.6.32-358.11.1.el6.x86_64	3.8.1-server-1.mga3

Facts about the MCC

"Known" Models	"Surprise" Models
Confinement of the Execution	
Memory : 4GB CPU : 2700s	Memory : 4GB CPU : 2700s
Total Number of tool executions (one examination on one model instance)	
49380	4913
Execution per Machine	
cluster1 (Univ P. & M. Curie) : 24937 quadhexa-2 (Univ. Nanterre) : 24443	ebro (Univ. Rostock) : 1640 quadhexa-2 (@niv. Nanterre) : 3273
Total CPU Time required	
80 days, 18 hours, 17 minutes, 11 seconds	3 days, 11 hours, 45 minutes, 12 seconds
Size of collected raw data (CSV, outputs, etc. excluding charts)	
1,77GB	122,3MB
Produced Performance Charts (for models)	
1182	177
Produced Execution Charts (for relevant executions)	
13763	1541

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A Big Benchmark

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The Models

Presentation of the Models

	Model Name	model type	safe	dead-lock	free choice	state machine	event graph	rever-sible
New in 2013 (incl. Surprise)	Dekker	P/T	✓	×	×	×	×	✓
	DotAndBoxes	colored	✓	✓	×	×	×	×
	DrinkVendingMachine	colored	✓	×	×	×	×	✓
	HouseConstruction	P/T	×	✓	✓	×	✓	×
	IBMB2S565S3960	P/T	?	?	?	?	?	?
	PermAdmissibility	colored	×	✓	×	×	×	×
	QuasiCertifProtocol	colored	×	✓	?	?	?	×
	RessAllocation	P/T	×	✓	×	×	×	×
	Vasy2003	P/T	✓	×	×	×	×	×

Presentation of the Models

	Model Name	model type	safe	dead-lock	free choice	state machine	event graph	rever-sible
Models from 2012	cs_repetitions	colored + P/T	✗	✗	?	?	?	?
	rwmutex	colored + P/T	✓	✗	✗	✗	✗	✓
	echo	colored + P/T	✓	✓	✗	✗	✗	✗
	eratosthenes	colored + P/T	✓	✓	?	?	?	?
	galloc_res	colored + P/T	✗	✗	?	?	?	?
	lamport_fmea	colored + P/T	✓	✗	✗	✗	✗	✗
	neoelection	colored + P/T	✓	✓	✗	✗	✗	✓
	philo_dyn	colored + P/T	✓	✓	?	?	?	?
	planning	colored + P/T	✗	?	✗	✗	?	?
	railroad	colored + P/T	✗	✗	?	?	?	?
	ring	colored + P/T	✓	?	✗	✗	?	?
	simple_lbs	colored + P/T	✓	✗	✗	✗	✗	✗

Presentation of the Models

	Model Name	model type	safe	dead-lock	free choice	state machine	event graph	rever-sible
Models from 2011	FMS	P/T	×	?	?	?	?	?
	Kanban	P/T	×	?	?	?	?	?
	MAPK	P/T	×	?	?	?	?	?
	Peterson	colored	✓	?	?	?	?	?
	Philosophers	colored	✓	?	?	?	?	?
	SharedMemory	colored	✓	×	?	?	?	?
	TokenRing	colored	✓	?	?	?	?	?

Presentation of the Models

Model Name	model type	safe	dead-lock	free choice	state machine	event graph	rever-sible
Models from 2011			?	?	?	?	?
							?
							?
							?
Ph							?
Shar							?
							?

Total, 255 models/instances

"Known" Models

231 models

CSRepetitions (Colored, 6 instances)
CSRepetitions (P/T, 6 instances)
Dekker (P/T, 6 instances)
DotAndBoxes (Colored, 4 instances)
DrinkVendingMachine (Colored, 2 instances)
DrinkVendingMachine (P/T, 2 instances)
Echo (P/T, 9 instances)
Eratosthenes (P/T, 8 instances)
GlobalRessAlloc (Colored, 7 instances)
GlobalRessAlloc (P/T, 2 instances)
Kanban (P/T, 8 instances)
LamportFastMutEx (Colored, 7 instances)
LamportFastMutEx (P/T, 7 instances)
MAPK (P/T, 6 instances)
NeoElection (Colored, 7 instances)
NeoElection (P/T, 7 instances)
PermAdmissibility (Colored, 6 instances)
PermAdmissibility (P/T, 6 instances)
Peterson (Colored, 6 instances)
Peterson (P/T, 6 instances)
Philosophers (colored, 13 instances)
Philosophers (P/T, 11 instances)
PhilosophersDyn (colored, 5 instances)
PhilosophersDyn (P/T, 3 instances)
RessAllocation (P/T, 15 instances)
Ring (P/T, 1 instance)
RwMutex (P/T, 12 instances)
SharedMemory (colored, 14 instances)
SharedMemory (P/T, 6 instances)
SimpleLoadBal (colored, 5 instances)
SimpleLoadBal (P/T, 5 instances)
TokenRing (colored, 7 instances)
TokenRing (P/T, 4 instances)

"Surprise" Models

24 models

HouseConstruction (P/T, 8 instances)
IBMB2S565S3960 (P/T, 1 instance)
QuasiCertifProtocol (Colored, 6 instances)
QuasiCertifProtocol (P/T, 6 instances)
Vasy2003 (P/T, 1 instance)

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Participating Tools

The Submissions

#	Tool	from
1	alpina	Univ. Geneva, Switzerland
2	cunf	ENS de Cachan France
3	greatSPN	Univ. Torino, Italy
4	ITS-Tools	Univ. P. & M. Curie, France
5	lola	Univ. Rostock, Germany
6	lola_optimistic	Univ. Rostock, Germany
7	lola_optimistic_incomplete	Univ. Rostock, Germany
8	lola_pessimistic	Univ. Rostock, Germany
9	marcie	Univ. Cottbus, Germany
10	neco	Univ. Evry Val d'Essone, France
11	pnxdd	Univ. P. & M. Curie, France
12	sara	Univ. Rostock, Germany

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9	marcie	Univ. Cottbus, Germany
10	neco	Univ. Evry Val d'Essone, France
11	pn[illegible]	Univ. P. & M. Curie, France
12	[illegible]	Univ. Ros[illegible]

Provided in their VM

Nice hotline too ;-)

Participating tools: Supported techniques

Techniques reported by tools

Tool Name	Reported Techniques
Apina	Decision Diagrams
Cunf	Net Unfolding, SAT/SMT
greatSPN	Decision Diagrams
ITS-Tools	Decision Diagrams Structural Reductions
LoLA (all variants)	Explicit model checking State compression Stubborn sets
Marcie	Decision Diagrams
Neco	Explicit model checking
PNXDD	Decision Diagrams Topological
Sara	SAT/SMT Stubborn Sets Topological

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Analysis of the Results

considerations About The Outputs from the Executions

- Outputs are HUGE
  - Almost 2Gbyte of csv + text
  - Need for automated analysis
    - challenge for this year

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- They may be difficult to compare
  - State space generation, almost a consensus
    - The few differences are explained
    - Encoding errors (from Tools), Mistake from us (unfolding into P/T)
  - For formulas, it is much more difficult
    - Predictability of formula satisfiability (random formulas),
    - Some mistakes in Formula generation,
    - Stability of formula transformations into a given Tool's language...
- What we did
  - State Space Generation, check that all differences could be explained
  - For formulas
    - Existence of some output (at least one formula computed)

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Better for deadlock analysis

- What we did
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  - For formulas
    - Existence of some output (at least one formula computed)

Known Models, how difficult are they?

	CTL					LTL					Reachability						
model	Card. Comp.	Fire-ability	Marking Comp.	Mix	Place Comp.	Card. Comp.	Fire-ability	Mark. Comp.	Mix	Place Comp.	Card. Comp.	Deadlock	Fire-ability	Marking Comp.	Mix	Place Comp.	State Space
CSRepetitions (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😄	😄	😄	😡	😄	😄	😄
CSRepetitions (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😆	😐	😐	😐	😐	😐
Dekker (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😐
DotAndBoxes (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😄	😄	😄	😡	😄	😄	😄
DrinkVendingMachine (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😄	😄	😄	😡	😄	😄	😄
DrinkVendingMachine (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐
Echo (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😡
Eratosthenes (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😐
FMS (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😆	😡	😐	😐	😐
GlobalRessAlloc (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😄	😄	😄	😡	😡	😄	😄
GlobalRessAlloc (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😆	😐	😐	😐	😐	😐
Kanban (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😐
LamportFastMutEx (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😄	😄	😄	😡	😄	😄	😄
LamportFastMutEx (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐
MAPK (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😐
NeoElection (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😄	😄	😄	😡	😄	😄	😄

Known Models, how difficult are they?

	CTL					LTL					Reachability						
model	Card. Comp.	Fire-ability	Marking Comp.	Mix	Place Comp.	Card. Comp.	Fire-ability	Mark. Comp.	Mix	Place Comp.	Card. Comp.	Deadlock	Fire-ability	Marking Comp.	Mix	Place Comp.	State Space
CSRepetitions (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😄	😄	😄	😡	😄	😄	😄
CSRepetitions (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😆	😐	😐	😐	😐	😐
Dekker (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😐
DotAndBoxes (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😄	😄	😄	😡	😄	😄	😄
DrinkVendingMachine (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😄	😄	😄	😡	😄	😄	😄
DrinkVendingMachine (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐
Echo (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😡
Eratosthenes (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😐
FMS (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😆	😡	😐	😐	😐
GlobalRessAlloc (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😄	😄	😄	😡	😡	😄	😄
GlobalRessAlloc (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😆	😐	😐	😐	😐	😐
Kanban (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😐
LamportFastMutEx (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😄	😄	😄	😡	😄	😄	😄
LamportFastMutEx (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐
MAPK (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😐
NeoElection (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😄	😄	😄	😡	😄	😄	😄

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NeoElection (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐
PermAdmissibility (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😬	😬	😬	😡	😬	😬	😬
PermAdmissibility (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😆	😐	😐	😐	😐	😐
Peterson (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😬	😬	😬	😡	😬	😬	😬
Peterson (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐
Philosophers (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😬
Philosophers (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😆	😐	😐	😐	😐	😐
PhilosophersDyn (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😬
PhilosophersDyn (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐
Planning (P/T)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡

Known Models, how difficult are they?

	CTL					LTL					Reachability						
model	Card. Comp.	Fire-ability	Marking Comp.	Mix	Place Comp.	Card. Comp.	Fire-ability	Mark. Comp.	Mix	Place Comp.	Card. Comp.	Deadlock	Fire-ability	Marking Comp.	Mix	Place Comp.	State Space
Railroad (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😐
RessAllocation (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😐
Ring (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😆	😐	😐	😐	😐	😐
RwMutex (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😐
SharedMemory (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😬
SharedMemory (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😆	😐	😐	😐	😐	😐
SimpleLoadBal (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😬	😬	😬	😡	😬	😬	😬
SimpleLoadBal (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐
TokenRing (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😬
TokenRing (P/T)	😡	😐	😐	😐	😡	😡	😐	😐	😐	😡	😡	😆	😐	😐	😐	😡	😐

Known Models, how difficult are they?

≥ 66%

≥33% and < 66%

<33% of the tools

no tool

	CTL					LTL					Reachability						
model	Card. Comp.	Fire-ability	Marking Comp.	Mix	Place Comp.	Card. Comp.	Fire-ability	Mark. Comp.	Mix	Place Comp.	Card. Comp.	Deadlock	Fire-ability	Marking Comp.	Mix	Place Comp.	State Space
Railroad (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😐
RessAllocation (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😐
Ring (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😆	😐	😐	😐	😐	😐
RwMutex (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😐
SharedMemory (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😬
SharedMemory (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😆	😐	😐	😐	😐	😐
SimpleLoadBal (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😬	😬	😬	😡	😬	😬	😬
SimpleLoadBal (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐
TokenRing (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😬
TokenRing (P/T)	😡	😐	😐	😐	😡	😡	😐	😐	😐	😡	😡	😆	😐	😐	😐	😡	😐

Harder for colored

And Surprise Models, how difficult are they?

	CTL					LTL					Reachability						
model	Card. Comp.	Fire-ability	Marking Comp.	Mix	Place Comp.	Card. Comp.	Fire-ability	Mark. Comp.	Mix	Place Comp.	Card. Comp.	Deadlock	Fire-ability	Marking Comp.	Mix	Place Comp.	State Space
HouseConstruction (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😐
IBMB2S565S3960 (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😬
QuasiCertifProtocol (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡
QuasiCertifProtocol (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐
Vasy2003 (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😬

😆 ≥ 66%

😐 ≥33% and < 66%

😬 <33% of the tools

😡 no tool

And Surprise Models, how difficult are they?

	CTL					LTL					Reachability						
model	Card. Comp.	Fire-ability	Marking Comp.	Mix	Place Comp.	Card. Comp.	Fire-ability	Mark. Comp.	Mix	Place Comp.	Card. Comp.	Deadlock	Fire-ability	Marking Comp.	Mix	Place Comp.	State Space
HouseConstruction (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😐
IBMB2S565S3960 (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😬
QuasiCertifProtocol (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡
QuasiCertifProtocol (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐
Vasy2003 (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😬

Harder than for «known models»

😆 ≥ 66%

😐 ≥33% and < 66%

😬 <33% of the tools

😡 no tool

And Surprise Models, how difficult are they?

	CTL					LTL					Reachability						
model	Card. Comp.	Fire-ability	Marking Comp.	Mix	Place Comp.	Card. Comp.	Fire-ability	Mark. Comp.	Mix	Place Comp.	Card. Comp.	Deadlock	Fire-ability	Marking Comp.	Mix	Place Comp.	State Space
HouseConstruction (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😐
IBMB2S565S3960 (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😬
QuasiCertifProtocol (colored)	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡	😡
QuasiCertifProtocol (P/T)	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐	😐
Vasy2003 (P/T)	😐	😐	😡	😐	😐	😐	😐	😡	😐	😐	😐	😐	😐	😡	😐	😐	😬

Harder than for «known models»

Some tools perform better with their «default settings» (wait for trophies)

😆 ≥ 66%

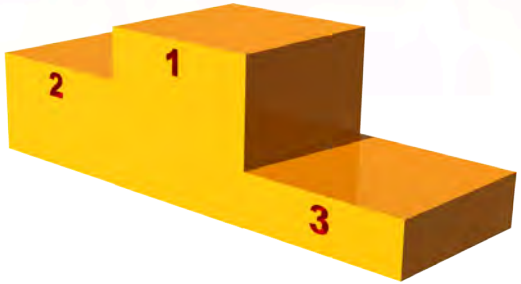
😐 ≥33% and < 66%

😬 <33% of the tools

😡 no tool

New in 2013, computation of scores

- Too early for a «Global Race»
  - Is it interesting?
  - Depends on the strength and weakness of tools...



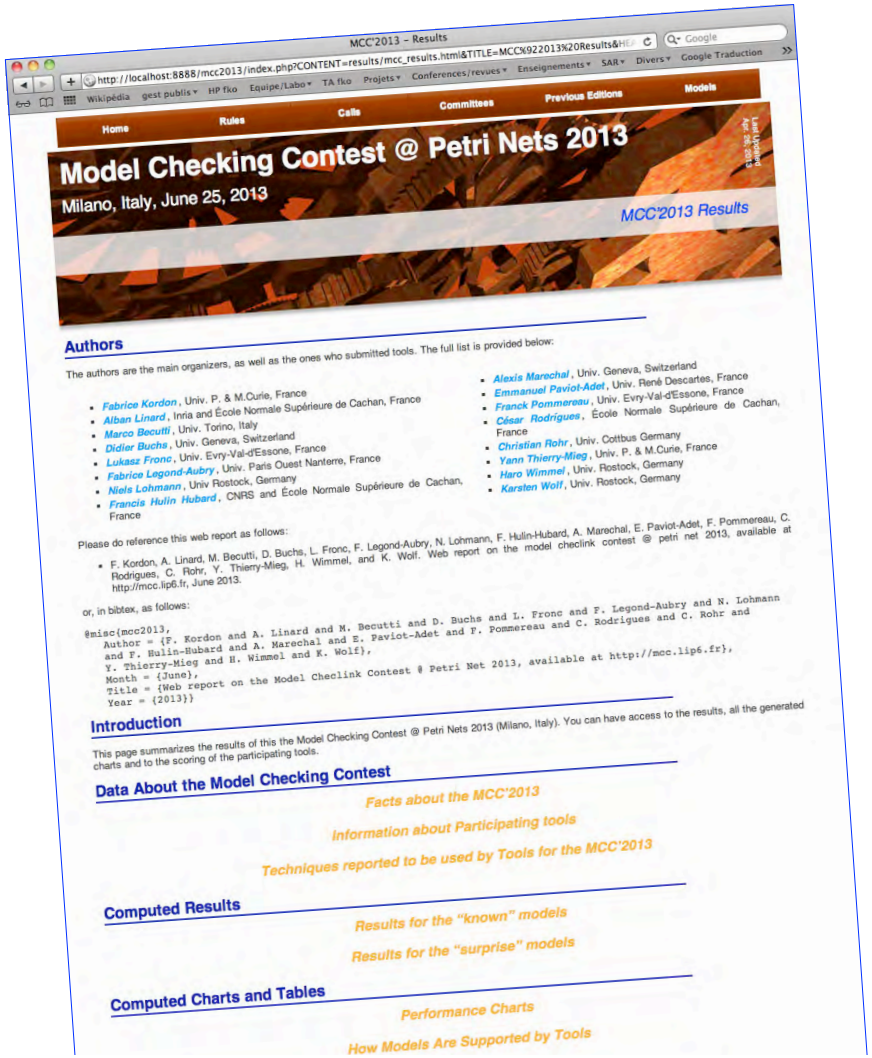
- For this year, how scoring was computed
  - +1 point for each instance where a tangible result is produced
  - +1 point bonus for the tool when it performs the first instance
  - +2 points for when a tool is best for a model (i.e. the farest in instances)
  - +2 points when a tool reaches the last proposed instance of a model
    - This has to be refined for models with only one instance ;-)

- Trophies are per examination only
  - For «known» models
  - For «surprise» models
  - Globally (global = known + 2 * surprise)
    - Consideration for the «default setting» mode + much less surprise models

- Available online: http://mcc.lip6.fr
  - Partial previews where checked with tool developers

Available online: http://mcc.lip6.fr

- Partial previews where checked with tool developers



MCC'2013 - Results

http://localhost:8888/mcc2013/index.php?CONTENT=results/mcc_results.html&TITLE=MCC%(922013%20Results&HE

Home | Rules | Calls | Committees | Previous Editions | Models

Model Checking Contest @ Petri Nets 2013

Milano, Italy, June 25, 2013

MCC'2013 Results

Authors

The authors are the main organizers, as well as the ones who submitted tools. The full list is provided below:

- Fabrice Kordon, Univ. P. & M.Curie, France
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- Haro Wimmel, Univ. Rostock, Germany
- Karsten Wolf, Univ. Rostock, Germany

Please do reference this web report as follows:

- F. Kordon, A. Linard, M. Beccuti, D. Buchs, L. Fronc, F. Legond-Aubry, N. Lohmann, F. Hulin-Hubard, A. Marechal, E. Paviot-Adet, F. Pommereau, C. Rodrigues, C. Rohr, Y. Thierry-Mieg, H. Wimmel, and K. Wolf. Web report on the model checlink contest @ petri net 2013, available at http://mcc.lip6.fr, June 2013.

or, in bibtex, as follows:

```
@misc{mcc2013,
   Author = {F. Kordon and A. Linard and M. Beccuti and D. Buchs and L. Fronc and F. Legond-Aubry and N. Lohmann
   and F. Hulin-Hubard and A. Marechal and E. Paviot-Adet and F. Pommereau and C. Rodrigues and C. Rohr and
   Y. Thierry-Mieg and H. Wimmel and K. Wolf},
   Month = {June},
   Title = {Web report on the Model Checlink Contest @ Petri Net 2013, available at http://mcc.lip6.fr},
   Year = {2013}}
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Introduction

This page summarizes the results of this the Model Checking Contest @ Petri Nets 2013 (Milano, Italy). You can have access to the results, all the generated charts and to the scoring of the participating tools.

Data About the Model Checking Contest

Facts about the MCC'2013

Information about Participating tools

Techniques reported to be used by Tools for the MCC'2013

Computed Results

Results for the "known" models

Results for the "surprise" models

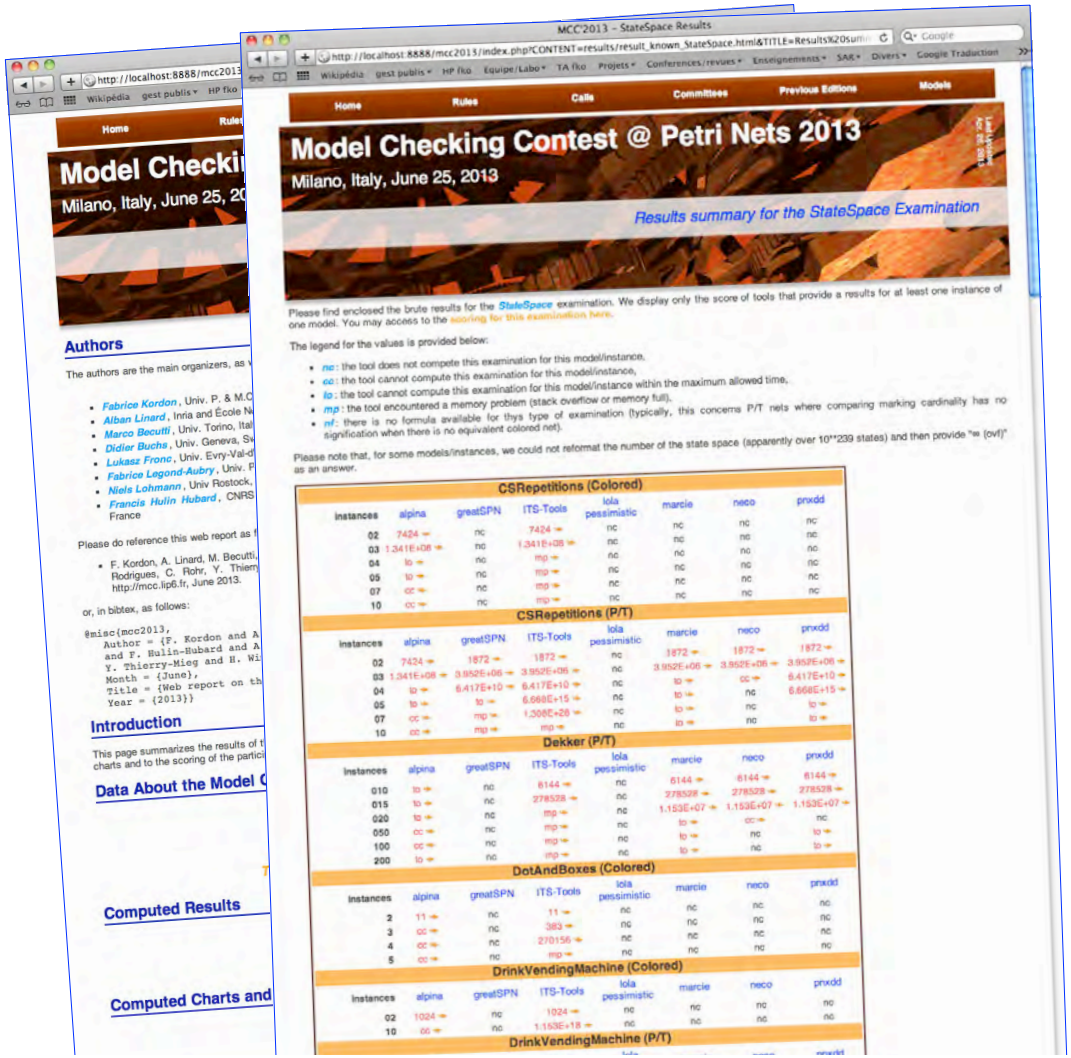
Computed Charts and Tables

Performance Charts

How Models Are Supported by Tools

Available online: http://mcc.lip6.fr

- Partial previews where checked with tool developers



Model Checking Contest @ Petri Nets 2013

Milano, Italy, June 25, 2013

Results summary for the StateSpace Examination

Please find enclosed the brute results for the *StateSpace* examination. We display only the score of tools that provide a results for at least one instance of one model. You may access to the scoring for this examination here.

The legend for the values is provided below:

- *no*: the tool does not compete this examination for this model/instance,
- *co*: the tool cannot compute this examination for this model/instance,
- *to*: the tool cannot compute this examination for this model/instance within the maximum allowed time,
- *mp*: the tool encountered a memory problem (stack overflow or memory full),
- *nf*: there is no formula available for thys type of examination (typically, this concerns P/T nets where comparing marking cardinality has no signification when there is no equivalent colored net).

Please note that, for some models/instances, we could not reformat the number of the state space (apparently over 10**239 states) and then provide "∞ (ovf)" as an answer.

CSRepetitions (Colored)

instances	alpina	greatSPN	ITS-Tools	lola pessimistic	marcie	neco	pnxdd
02	7424	no	7424	no	no	no	no
03	1.341E+08	no	1.341E+08	no	no	no	no
04	to	no	mp	no	no	no	no
05	to	no	mp	no	no	no	no
07	co	no	mp	no	no	no	no
10	co	no	mp	no	no	no	no

CSRepetitions (P/T)

instances	alpina	greatSPN	ITS-Tools	lola pessimistic	marcie	neco	pnxdd
02	7424	1872	1872	no	1872	1872	1872
03	1.341E+08	3.952E+06	3.952E+06	no	3.952E+06	3.952E+06	3.952E+06
04	to	6.417E+10	6.417E+10	no	to	cc	6.417E+10
05	to	to	6.668E+15	no	to	no	6.668E+15
07	co	mp	1.506E+28	no	to	no	to
10	co	mp	mp	no	to	no	to

Dekker (P/T)

instances	alpina	greatSPN	ITS-Tools	lola pessimistic	marcie	neco	pnxdd
010	to	no	6144	no	6144	6144	6144
015	to	no	278528	no	278528	278528	278528
020	to	no	mp	no	1.153E+07	1.153E+07	1.153E+07
050	co	no	mp	no	to	co	no
100	co	no	mp	no	to	no	to
200	to	no	mp	no	to	no	to

DotAndBoxes (Colored)

instances	alpina	greatSPN	ITS-Tools	lola pessimistic	marcie	neco	pnxdd
2	11	no	11	no	no	no	no
3	co	no	383	no	no	no	no
4	co	no	270156	no	no	no	no
5	co	no	mp	no	no	no	no

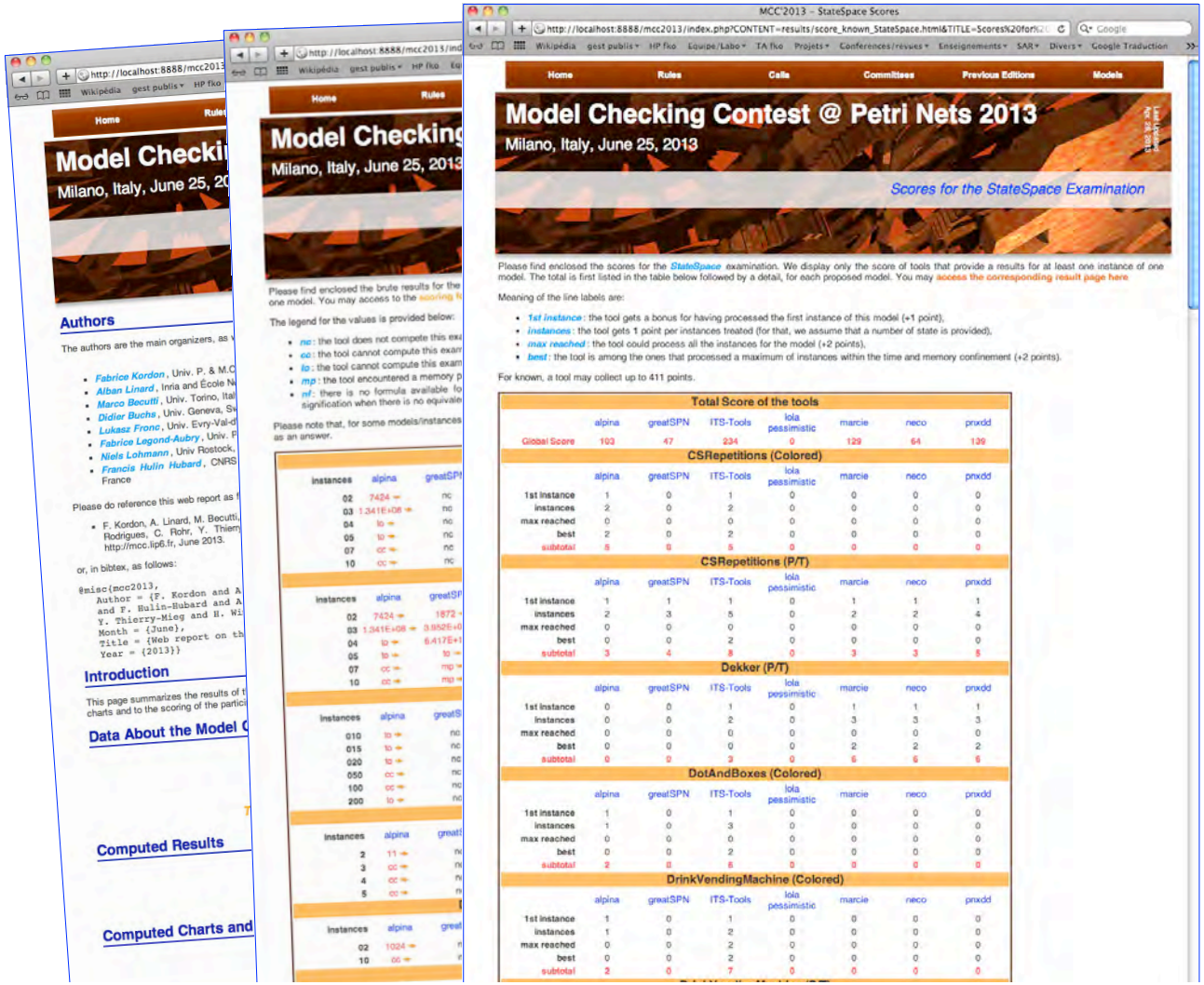
DrinkVendingMachine (Colored)

instances	alpina	greatSPN	ITS-Tools	lola pessimistic	marcie	neco	pnxdd
02	1024	no	1024	no	no	no	no
10	co	no	1.153E+18	no	no	no	no

DrinkVendingMachine (P/T)

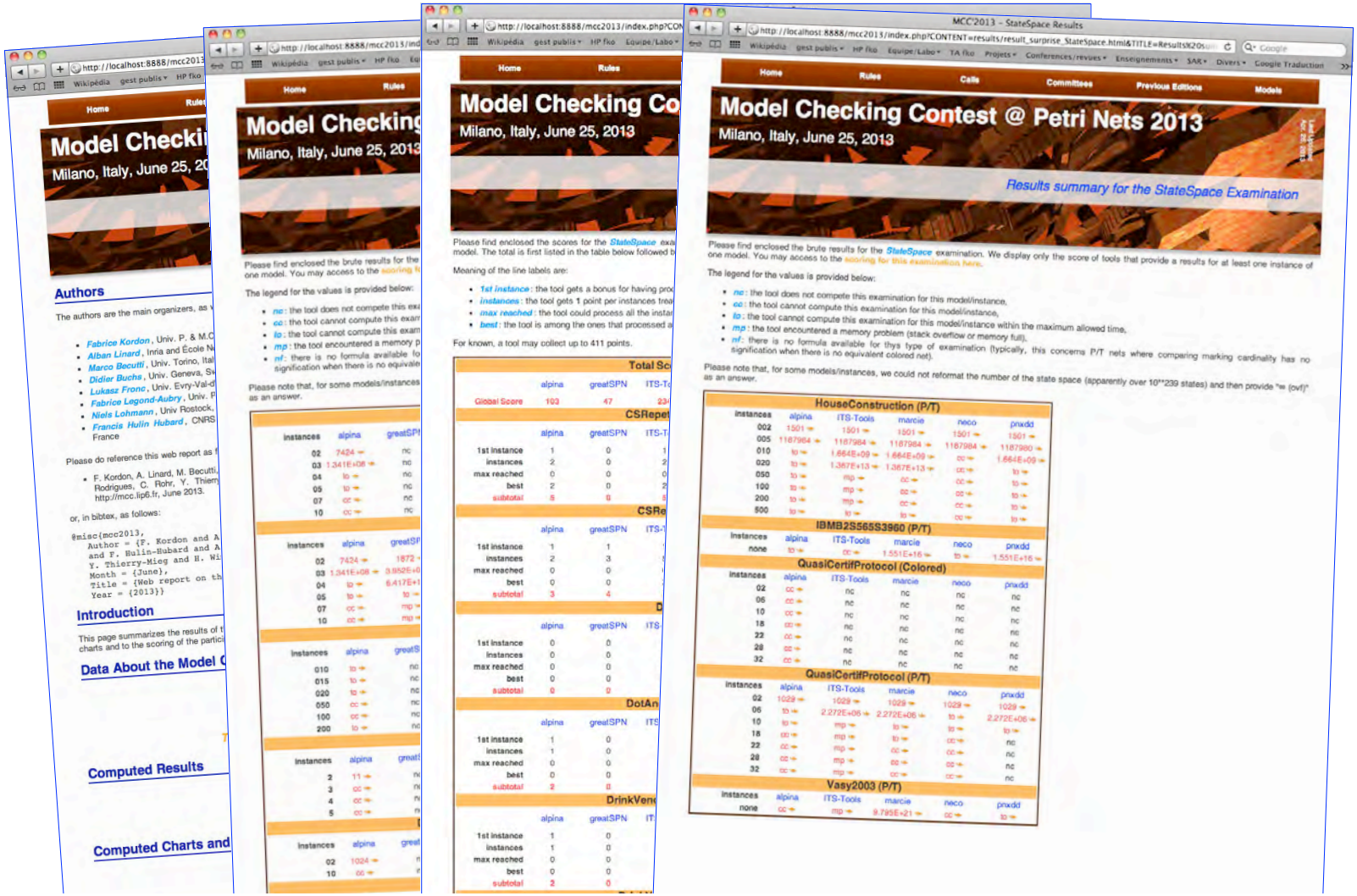
Available online: http://mcc.lip6.fr

- Partial previews where checked with tool developers



Available online: http://mcc.lip6.fr

Partial previews where checked with tool developers



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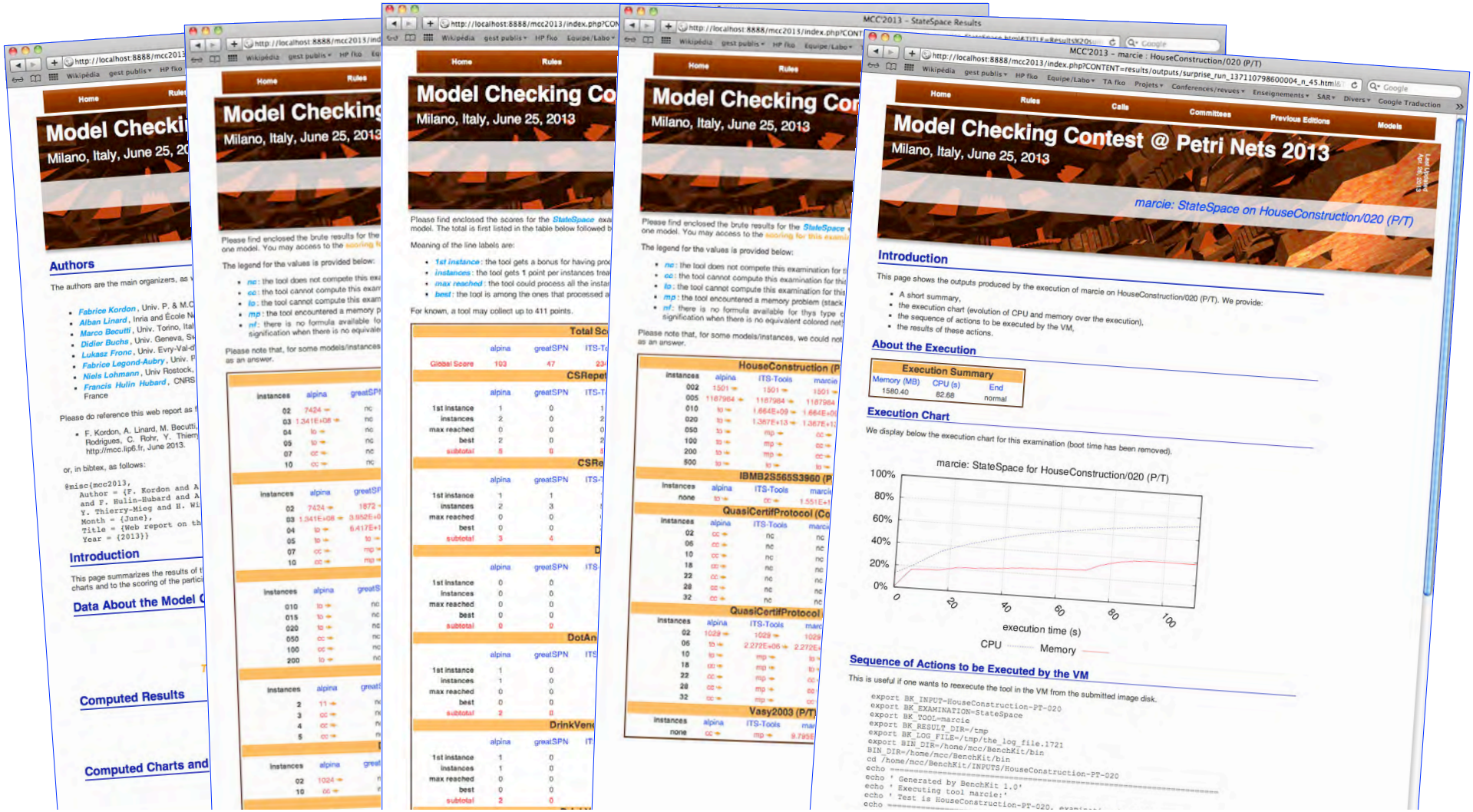
Partial previews where checked with tool developers



Available online: http://mcc.lip6.fr

- Partial previews where checked with tool developers

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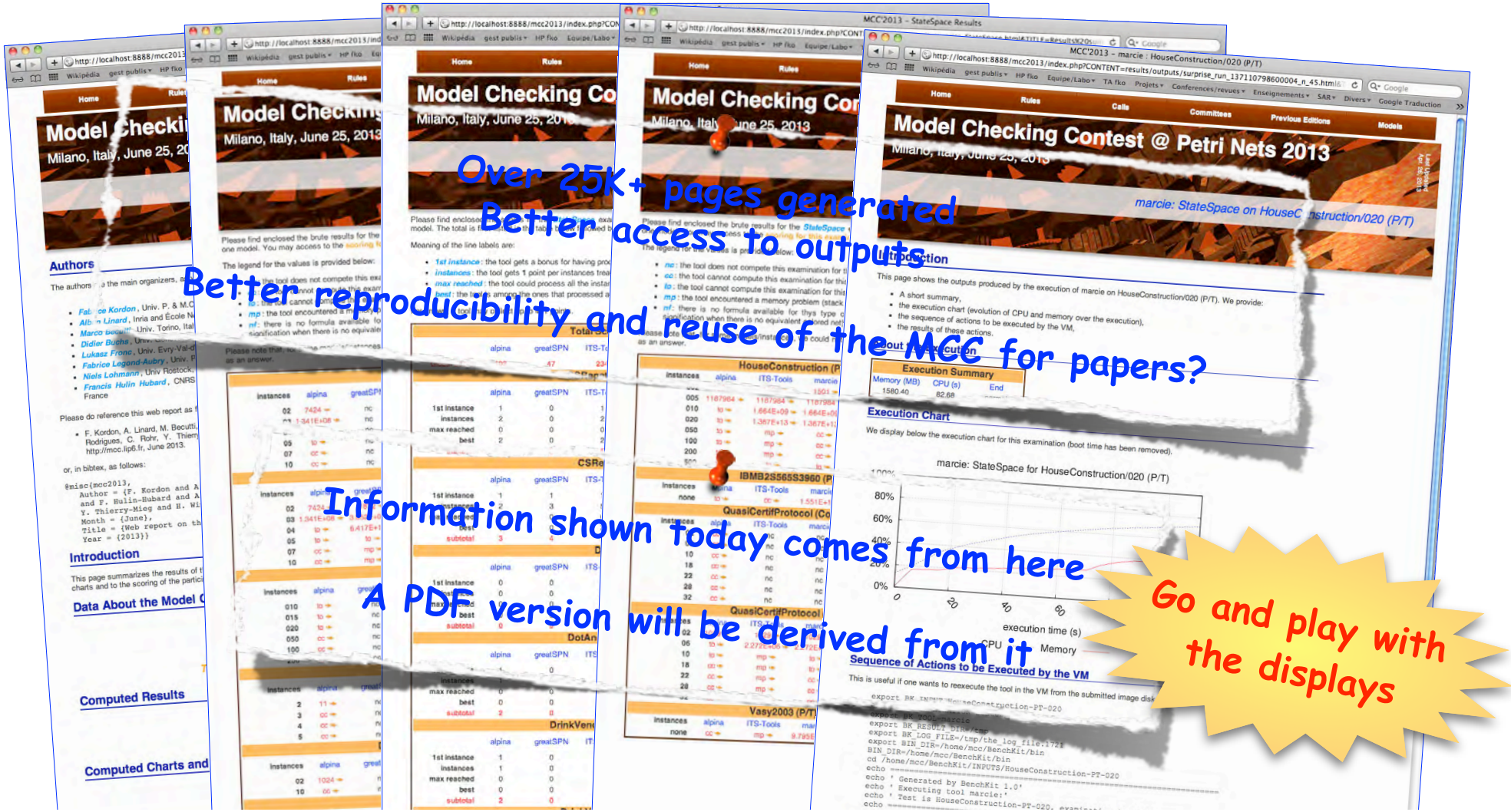

CTL Formulas:
CTLCardinalityComparison

Trophies for the "Known" Models

LoLA
172 (points)

LoLA optimistic
172 (points)

marcie
102 (points)

Trophies for the "Surprise" Models

marcie
22 (points)

LoLA
12 (points)

LoLA optimistic
12 (points)

Trophies for All Models

LoLA
196 (points)

LoLA optimistic
196 (points)

marcie
146 (points)

CTL Formulas:
CTLFireability

Trophies for the "Known" Models

LoLA
198 (points)

LoLA optimistic
198 (points)

LoLA optimistic
incomplete
178 (points)

Trophies for the "Surprise" Models

marcie
17 (points)

LoLA
12 (points)

LoLA optimistic
12 (points)

LoLA optimistic
incomplete
12 (points)

Trophies for All Models

LoLA
222 (points)

LoLA optimistic
222 (points)

LoLA optimistic
incomplete
202 (points)

CTL Formulas:
CTLMarkingComparison

Trophies for the "Known" Models

sara
87 (points)

LoLA
71 (points)

LoLA optimistic
71 (points)

Trophies for the "Surprise" Models

sara
12 (points)

marcie
3 (points)

Trophies for All Models

sara
111 (points)

LoLA
71 (points)

LoLA optimistic
71 (points)

CTL Formulas:
CTLPlaceComparison

Trophies for the "Known" Models

LoLA
192 (points)

LoLA optimistic
187 (points)

LoLA optimistic
incomplete
135 (points)

Trophies for the "Surprise" Models

marcie
22 (points)

LoLA
6 (points)

LoLA optimistic
6 (points)

LoLA optimistic
incomplete
6 (points)

Trophies for All Models

LoLA
204 (points)

LoLA optimistic
199 (points)

LoLA optimistic
incomplete
147 (points)

CTL Formulas:
CTLMix

Trophies for the "Known" Models			Trophies for the "Surprise" Models			
						
LoLA **191 (points)**	LoLA optimistic 191 (points)	LoLA optimistic incomplete 158 (points)	**marcie** **17 (points)**	LoLA 12 (points)	LoLA optimistic 12 (points)	LoLA optimistic incomplete 12 (points)

Trophies for All Models		
		
LoLA **215 (points)**	LoLA optimistic 215 (points)	LoLA optimistic incomplete 182 (points)

- Globally on CTL
  - Marcie comes often first on «surprise» models
  - Rostock Tools (LoLA, Sara) compete well on these examinations

LTL Formulas:
LTLCardinalityComparison

Trophies for the “Known” Models	Trophies for the “Surprise” Models
 Neco 114 (points)	

Trophies for All Models
 Neco 114 (points)

LTL Formulas:
LTLFireability

Trophies for the “Known” Models	Trophies for the “Surprise” Models
 Neco 88 (points)	

Trophies for All Models
 Neco 88 (points)

LTL Formulas:
LTLMarkingComparison

Trophies for the “Known” Models	Trophies for the “Surprise” Models
 Neco 54 (points)	

Trophies for All Models
 Neco 54 (points)

LTL Formulas:
LTLPlaceComparison

Trophies for the “Known” Models	Trophies for the “Surprise” Models
 Neco 114 (points)	

Trophies for All Models
 Neco 114 (points)

LTL Formulas:
LTLMix

Trophies for the "Known" Models	Trophies for the "Surprise" Models
 Neco 110 (points)	

Trophies for All Models
 Neco 110 (points)

- Globally on LTL
  - Neco is the only too to deliver some output
  - Rostock tools participate but cannot compute

Reachability Formulas:
ReachabilityCardinalityComparison

Trophies for the "Known" Models

LoLA
174 (points)

LoLA optimistic
174 (points)

LoLA optimistic
incomplete
148 (points)

Trophies for the "Surprise" Models

marcie
24 (points)

LoLA
12 (points)

LoLA optimistic
12 (points)

LoLA optimistic
incomplete
12 (points)

Trophies for All Models

LoLA
198 (points)

LoLA optimistic
198 (points)

LoLA optimistic
incomplete
172 (points)

Reachability Formulas:
ReachabilityDeadlock

Trophies for the "Known" Models

Sara
251 (points)

LoLA
216 (points)

LoLA optimistic
216 (points)

Trophies for the "Surprise" Models

Sara
37 (points)

LoLA
37 (points)

LoLA optimistic
37 (points)

LoLA optimistic incomplete
37 (points)

Trophies for All Models

Sara
325 (points)

LoLA
290 (points)

LoLA optimistic
290 (points)

Reachability Formulas:
ReachabilityFireability

Trophies for the "Known" Models

LoLA
200 (points)

LoLA optimistic
200 (points)

LoLA optimistic
incomplete
161 (points)

Trophies for the "Surprise" Models

Marcie
18 (points)

ITS-Tools
12 (points)

LoLA
12 (points)

LoLA optimistic
12 (points)

LoLA optimistic
incomplete
12 (points)

Trophies for All Models

LoLA
224 (points)

LoLA optimistic
224 (points)

LoLA optimistic
incomplete
185 (points)

Reachability Formulas:
ReachabilityPlaceComparison

Trophies for the "Known" Models

LoLA
170 (points)

LoLA optimistic
170 (points)

LoLA pessimistic
120 (points)

Marcie
120 (points)

Trophies for the "Surprise" Models

Marcie
22 (points)

LoLA
12 (points)

LoLA optimistic
12 (points)

Trophies for All Models

LoLA
194 (points)

LoLA optimistic
194 (points)

Marcie
164 (points)

Reachability Formulas:
ReachabilityMarkingComparison

Trophies for the "Known" Models

Sara
71 (points)

LoLA
71 (points)

LoLA optimistic
69 (points)

Trophies for the "Surprise" Models

Sara
12 (points)

Marcie
3 (points)

Trophies for All Models

Sara
95 (points)

LoLA
71 (points)

LoLA optimistic
69 (points)

Reachability Formulas:
ReachabilityMix

Trophies for the "Known" Models			Trophies for the "Surprise" Models			
						
LoLA optimistic 189 (points)	LoLA 184 (points)	LoLA optimistic incomplete 154 (points)	**Marcie 24 (points)**	LoLA optimistic 12 (points)	LoLA 12 (points)	LoLA optimistic incomplete 12 (points)

Trophies for All Models			
			
LoLA optimistic 213 (points)	LoLA 208 (points)	Marcie 166 (points)	LoLA optimistic incomplete 166 (points)

- Germany gets (almost) all Reachability Analysis 
  - Rostock (LoLA, Sara)
  - Cottbus (Marcie)
  - ITS-Tool is not German but appears once only ;-)

State Space Generation

Trophies for the "known" Models			Trophies for the "Surprise" Models		
					
ITS-Tools 234 (points)	PNXDD 139 (points)	Marcie 129 (points)	**Marcie 24 (points)**	PNXDD 15 (points)	ITS-Tool 12 (points)

Trophies for All Models		
		
ITS-Tools 258 (points)	Marcie 177 (points)	PNXDD 169 (points)

- Interesting inversions for the State Space Generation
  - The winning triplet
    - ITS-Tools,
    - Marcie,
    - PNXDD

Globally

- These podiums do not show all aspects of tools
  - Expressivity
  - Formula translation problems
  - Reminder: we only considered the outputs for formula this year
  - Various bugs
  - etc.

- So this should not be considered as an absolute classification!
  - See it as outputs for tool developers
  - They can focuse their effort and evaluate some strategies
    - Fours variants of LoLA submitted!

MCE 2013

Concluding Remarks

Outcomes

- An HTML report
  - More available data reachable contextually
  - Still many difficulties... and lessons learned
    - Automation of the analysis must be enhanced
    - Think about a better way to rate examinations.
  - BenchKit (http://benchkit.cosyverif.org)

- MCC 2014 @ Petri Nets?
  - The team is ready to go
- What to be proposed in MCC 2014 @ Petri Nets?
  - IMPORTANT : the integration effort of this year will be reused
  - More models: models from 2013 and more?
  - Enable personal use of BenchKit to ease preliminary tests by tool developers
  - Enhance the generation of formulas
    - Possibly include some «by hand» when available
    - Generate the others (this year, we needed 40800 formulas)
  - Live Event
    - Evaluate usability of tools

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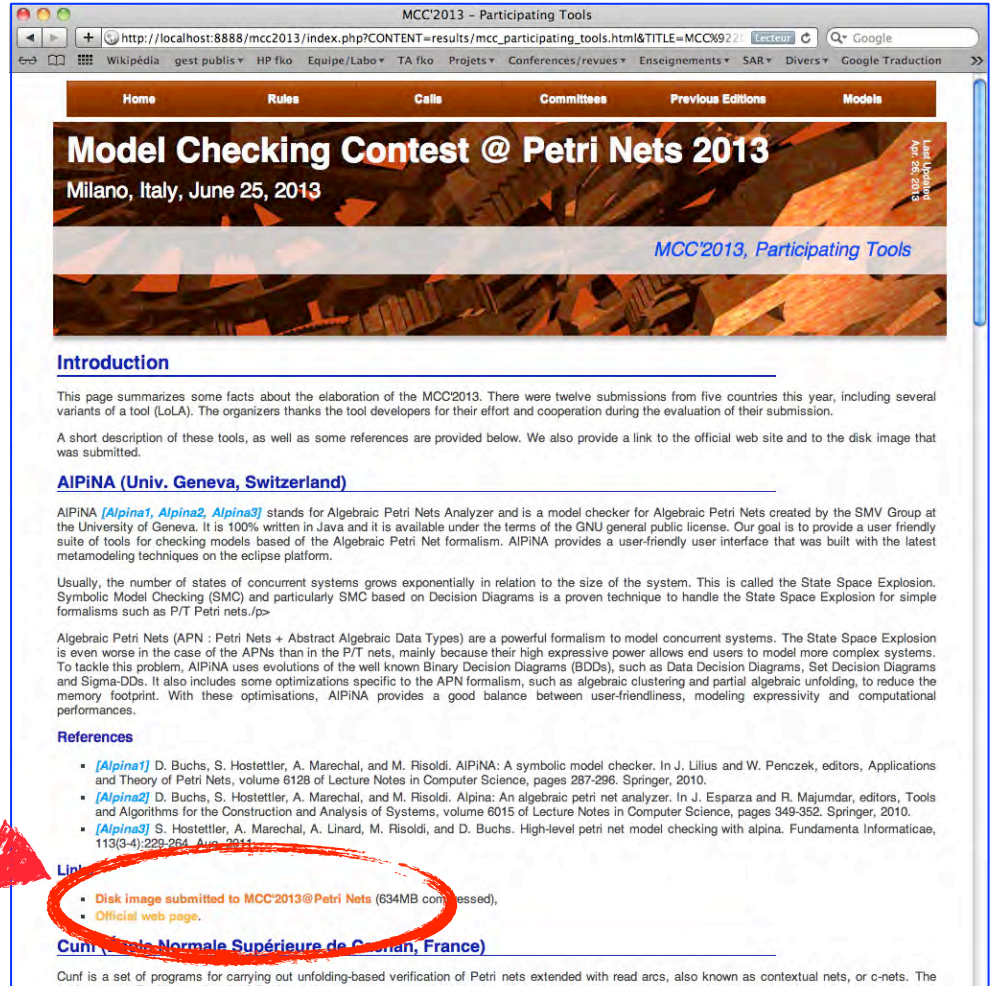
Interesting things to notice

We really need help!

Downloading Participating Tools

- See the description page on the web site
  - Possibility to download the disk image used in MCC'2013
  - Access to the official distribution page



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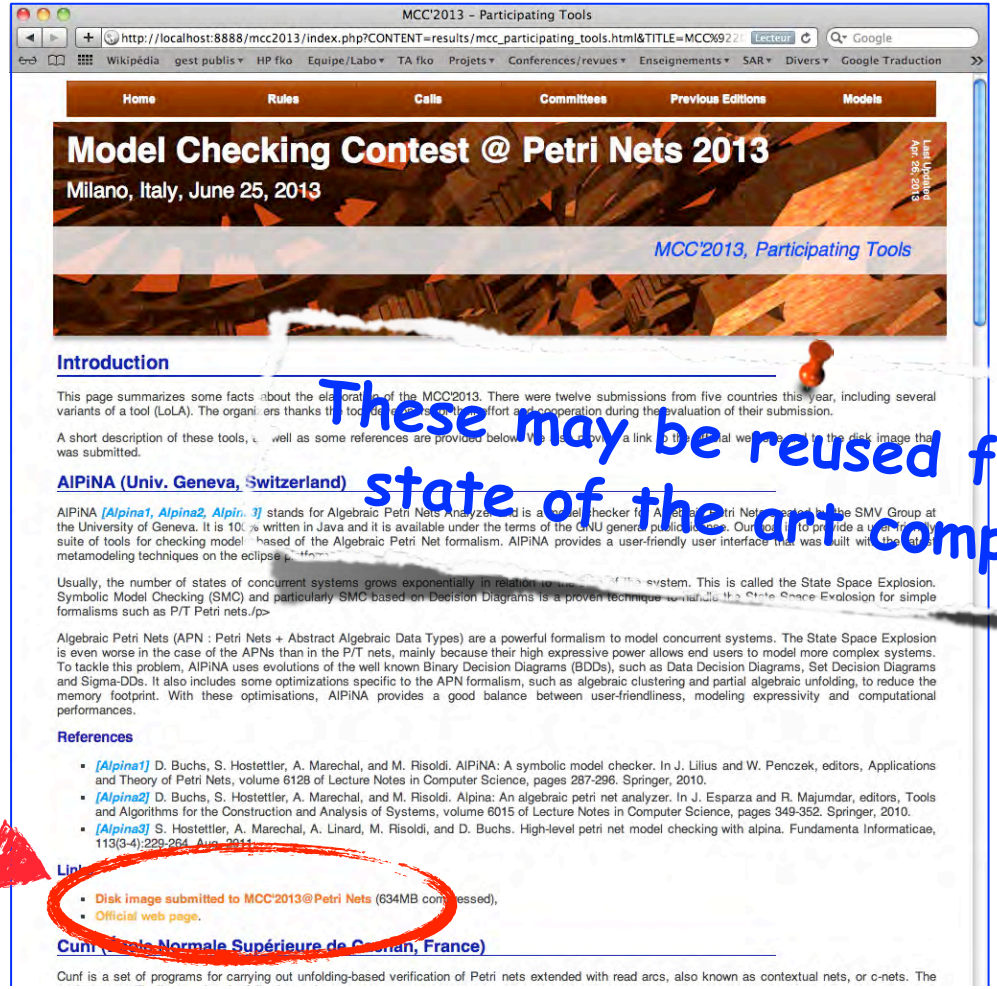

These may be reused for better state of the art comparisons

Thank you for your attention

Ready For Discussion?

I will try to report outcomes
of this discussion in a «issues» page