BASICS 2013 Program

	19 August	20 August	21 August	22 August	23 August
8:00 - 10:00	PRS (I)[1,2]	Presburger Arithmetic[4]	Algorithm for Bisimulation	Decidability of PDA (I)	Sets with Atoms
Tea Break					
10:30 - 12:00	PRS (II) [1,2]	Defender's Forcing[5]	Undecidability of PA	Decidability of PDA (II)	Discussion
Lunch Break					
14:00 - 15:30	Bisimulation Base[2]	Q & A	Equivalence Checking for CCS (I)	Contributed Talk	
Tea Break			Tea Break		
16:00 - 17:30	Tableau [3]		Equivalence Checking for CCS (II)	Contributed Talk	
18:00 - 20:00	Reception	Dinner	Dinner	Banquet	

Tutorial and References (19-20, August)

1. R. Mayr, Process rewrite systems, Information and Computation, vol. 286, no. 1999, pp. 264–286, 2000.
2. O. Burkart, D. Caucal, F. Moller, and B. Steffen, Verification on infinite structures, Handbook of Process algebra, 2001.
3. H. Hüttel and C. Stirling, Actions speak louder than words: proving bisimilarity for context-free processes, Annual IEEE Symposium on Logic in Computer Science, vol. 8, no. 4, pp. 376–386, 1991.
4. Stansifer, Ryan. Presburger's article on integer arithmetic: Remarks and translation. Cornell University, 1984.
5. J. Srba, Strong bisimilarity and regularity of basic parallel processes is PSPACE-hard, STACS 2002, no. 201, pp. 535–546, 2002.

⟹ Download the reference papers and slides.

Abstracts (21, August)

Algorithm for Bisimulation

Time: 8:00-10: 00 am, 21 August

Speaker: Prof. Sławomir Lasota (Warsaw University)

Abstract: Bisimulation equivalence is known to be decidable in polynomial time over graphs generated by normed context-free grammars (known also as BPA graphs), as well as over graphs generated by normed commutative context-free grammars (known also as BPP graphs), since the two seminal papers by Hirshfeld, Jerrum and Moller.

The talk will be devoted to presenting a new algorithm for BPA, working in time $O(n^4)$ up to a polylogarithmic factor, thus significantly improving the previously known complexity. In the special case of deterministic context-free grammars (so called simple grammars) the algorithm works in qubic time. Surprisingly, the basic idea of the algorithm has been borrowed from the polynomial-time decision procedure for BPP. A crucial technical ingredient of the algorithm is subroutines that efficiently manipulate exponentially long strings.

Undecidability of PA with Internal Actions

Time: 10:30-12:00 am, 21 August

Speaker: Qiang Yin (BASICS, Shanghai Jiao Tong University)

Abstract: In 2011, Czerwiński et al. showed that branching bisimilarity is decidable on normed Basic Parallel Processes (BPP). Recently Fu showed that branching bisimilarity is decidable on normed Basic Process Algebra (BPA). These results make the decidability of branching bisimilarity on Process Algebra (PA), which subsumes BPA and BPP, a very interesting question. In this talk we will show that branching bisimilarity and weak bisimilarity are both undecidable on PA, even on the normed subclass. This result also improves Srba's previous work on the undecidability of weak bisimilarity on full PA.

Equivalence Checking for CCS

Time: 14:00-17:30 pm, 21 August

Speaker: Dr. Chaodong He (BASICS, Shanghai Jiao Tong University)

Abstract: In the study of the expressiveness of process calculi, local channels with their name scoping rules play an important role. This talk is devoted to show how they affect the expressiveness and how they affect the decidability of the bisimilarity checking problems. The discussion is made in the framework of CCS. The strong bisimilarity for a pair of processes in the calculi with only static local channels is shown Π_1^0-complete. The strong bisimilarity between those processes and the finite state processes is proved decidable. The strong similarity between the finite state processes and the processes without name-passing capability is also shown decidable.

Abstracts (22, August)

Dividing Line between Decidable PDA's and Undecidable Ones

Time: 8:00-12:00 am, 22 August

Speaker: Prof. Yuxi Fu (BASICS, Shanghai Jiao Tong University)

Abstract: Stirling proved that the strong bisimilarity is decidable for Normed PDA. Sénizergues proved that the strong bisimilarity is in fact decidable for the full PDA. On the other hand, Srba demonstrated that the weak bisimilarity is undecidable for Normed PDA as well as the full PDA. Later Jančar and Srba established Σ_1^1-completeness of the weak bisimilarity. These contrasting results make extremely interesting the decidability issue of the branching bisimilarity of (Normed) PDA. We will take a look at the issue in this talk.

Well-Structured Pushdown Systems

Time: 14:00-14:40 am, 22 August

Speaker: Dr. Xiaojuan Cai (BASICS, Shanghai Jiao Tong University)

Abstract: Pushdown systems (PDSs) model single-thread recursive programs, and well-structured transition systems (WSTSs), such as vector addition systems, are useful to represent non-recursive multi-thread programs. Combining these two ideas, our goal is to investigate well-structured pushdown systems (WSPDSs), pushdown systems with well-quasi-ordered control states and stack alphabet.

In this talk, we focus on subclasses of WSPDSs, in which the coverability becomes decidable. We apply WSTS-like techniques on classical P-automata. A $Post^*$-automata (resp. Pre^*-automata) construction is combined with Karp-Miller acceleration (resp. ideal representation) to characterize the set of successors (resp. predecessors) of given configurations. As examples, we show that the coverability is decidable for recursive vector addition system with states, multi-set pushdown systems, and a WSPDS with finite control states and well-quasi-ordered stack alphabet.

Liveness Property under Fairness Requirements

Time: 14:50-15:30 am, 22 August

Speaker: Dr. Teng Long (Institute of Software, Chinese Academy of Sciences)

Abstract: Liveness property is among the most important properties of programs. This paper studies deductive rules for proving liveness properties under different kinds of fairness requirements (constraints). It is based on method where a program is augmented by a non-constraining progress monitor based on a set of ranking functions, and further abstracted by predicate abstraction in order to allow the use of algorithmic verification techniques. The main contributions are deductive rule under different fairness requirements (constraints) for proving liveness properties and algorithm for automatically deriving deductive proof constructs.

Prof. Jiang's talk

Time: 16:00-16:40 am, 22 August

Speaker: Prof. Ying Jiang (Institute of Software, Chinese Academy of Sciences)

Abstract: TBA

Decidability of nBPA

Time: 16:50-17:30 am, 22 August

Speaker: Prof. Yuxi Fu (BASICS, Shanghai Jiao Tong University)

Abstract: The decidability of weak bisimilarity on normed BPA is a long standing open problem. It is proved in this talk that branching bisimilarity, a standard refinement of weak bisimilarity, is decidable for normed BPA and that the associated regularity problem is also decidable.

Abstracts (23, August)

Sets with Atoms

Time: 8:00-10: 00 am, 23 August

Speaker: Prof. Sławomir Lasota (Warsaw University)

Abstract: Sets with atoms are a variant of set theory originating from the work of Fraenkel and Mostowski, later rediscovered in computer science by Gabbay and Pitts (and known as nominal sets). Recently it has been observed that when interpreting classical definitions, like definition of finite automaton, in sets with atoms, one may capture in an elegant syntax-independent way several different infinite-state models, like register automata of Francez and Kaminski, or timed automata of Alur and Dill. This is because the natural notion of finiteness in nominal sets, namely orbit-finiteness, is more relaxed than in classical sets.

The talk will contain a gentle introduction to the theory of sets with atoms, motivated and illustrated using register automata. It will be argued that many other models may be naturally captured, for instance timed automata and Petri nets with data. Finally, algorithmic issues will be briefly discussed, for instance applicability of well quasi orders.