Report for Visit to Liafa Paris

Marcus Nilsson

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Purpose of the Visit

I visited the laboratory Liafa and Ahmed Bouajjani for four weeks during January 2000. The purpose of the visit was to pursue our common research, techniques for automatically verifying the dynamic behaviour of systems with unbounded data structures or with an arbitrary topology. Our aim is to provide a uniform environment for verifying large systems consisting of variables over infinite domains, e.g., clocks, queues and integers. My thesis work aims to accomplish this using regular languages from formal language theory. Ahmed and I have been coauthoring a paper in CAV'99[ABJN99] about verification of systems with an arbitrary number of processes, using regular languages. A generalization of this framework is to appear in TACAS'2000[JN00].

During the visit, we planned to write a joint contribution for CAV'2000 and also to set new directions for future research.

Outcome

During the visit I met and discussed with several of the members of Liafa both about our current results and about our new ideas. Many of them are from a more theoretical community and think differently. Thus, the discussions gave new insights into our problems and also new directions for further research.

In the first two weeks we worked on the planned contribution to CAV'2000, titled *Regular Model Checking*, and we submitted the paper on the 15'th of January. This paper discusses different approaches to compute the effect of an unbounded number of execution steps of a program, using regular sets. For example, if a program has a loop adding one to a counter, the effect of an unbounded number of execution steps would include adding an arbitrary amount to the counter. During these weeks, we also found some new ideas and research directions to extend these techniques, which we plan to pursue during this year.

I held a seminar at Liafa at the beginning of the last two weeks about our current research. This started some discussions, especially among people from a group working on automata and regular languages. It was very good to get feedback from these people, since there has been a lot of research into automata and regular languages in the past that should be useful to our work.

References

[ABJN99] Parosh Aziz Abdulla, Ahmed Bouajjani, Bengt Jonsson, and Marcus Nilsson. Handling global conditions in parameterized system verification. In *Proc.* 11^{th} *Int. Conf. on Computer Aided Verification*, volume 1633 of *Lecture Notes in Computer Science*, pages 134–145, 1999.

[JN00] Bengt Jonsson and Marcus Nilsson. Transitive closures of regular relations for verifying infinite-state systems. In *Proc. TACAS '00,* 6^{th} *Int. Conf. on Tools and Algorithms for the Construction and Analysis of Systems*, Lecture Notes in Computer Science, 2000. to appear.