Generalized strictly periodic scheduling analysis, resource optimization, and implementation of adaptive streaming applications

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Propositions belonging to the Ph.D. dissertation:

Generalized Strictly Periodic Scheduling Analysis, Resource Optimization, and Implementation of Adaptive Streaming Applications

by Sobhan Niknam

1. Let G be an application modeled as a cyclic Cyclo-Static Dataflow (CDSF) graph. A strictly periodic schedule exists for G iff tasks in each cycle of G can be scheduled in a strictly periodic fashion. (Chapter 3)
2. Let G be an application modeled as a Synchronous Dataflow (SDF) graph. By expanding G using an unfolding graph transformation technique, designers can achieve the same application throughput and behavior while requiring fewer processors, at the cost of higher application latency and memory requirements. (Chapter 4)
3. To achieve higher energy-efficiency, the slack time in the application execution can be effectively exploited by periodically switching the application schedule at run-time among a set of pre-defined energy-efficient schedules. (Chapter 5)
4. The Mode-Aware Dataflow (MADF) model has somewhat similar expressiveness/modeling power to the Scenario-Aware Dataflow (SADF) model. However, a substantial difference between the two models is the protocol, utilized during mode/scenario transitions, which makes MADF latency-invariant to the sequence of mode/scenario transitions. (Chapter 6)
5. In embedded systems research, performing simulations to validate/evaluate a proposed technique is complementary to validation/evaluation by actual prototyping on real hardware, not a replacement for.
6. Research proposals in the field of embedded systems should always be linked to the industry in order to have an impact.
7. The success of a researcher should be evaluated on the impact of his/her research on science and society, not on the number and venues of his/her publications.
8. Software modeling and abstraction help the analysis of (non-)functional properties of applications. However, to design a highly optimized and efficient system, detailed knowledge about the target applications and platform is essential.
9. Patience is the key to publish a paper. No matter how innovative a paper is, there is always a place to publish the paper. However, finding the proper place might take a long time.
10. A PhD study is not just a few years of intense research work, but also a resilience training to learn about how to deal and overcome all sorts of difficulties.