Formal Modeling and Verification using Graph Transformation Systems

Formal modeling is a crucial first step in the analysis of mission critical communication protocols, such as IP telephony, which are notoriously resistant to formal modeling and verification. Modeling the Distributed Feature Composition protocol, we found that graph transformation offers several key advantages over naive methods in modeling the dynamic evolution of a reactive communication protocol. Graph transformation semantics enables a clean separation of concerns when describing a protocol, which is key for dealing with even modestly sized protocols.

In this talk, I show how GTS modeling can facilitate verification of invariant properties of potentially unbounded communication systems. Verifying an ordering among these service components to be invariant is essential to guarantee the desirable behavior of these services.

I also show how the verification can be performed by the analysis of a finite set of transformation rules describing the GTS system model and prove that invariant properties are preserved in a GTS model.

Zarrin Langari is a Ph.D. student from the Formal Methods lab in the School of Computer Science at the University of Waterloo, Ontario, Canada. She has been doing research in software verification, formal methods, and visual modeling. She expects to finish her Ph.D. studies this August. Her research work includes the following: 1. Provided visual semantics (graph transformation systems) to model the behavior and provide a formal analysis of communication protocols. 2. Proposed a verification approach for proving graphical encoding of safety properties of models described in graph transformations. 3. Proposed symmetry reduction for dynamic systems modeled as graph transformations.

DATE: Wednesday, June 30
TIME: 2:00 p.m.
LOCATION: CS Room 221

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