Department of Mathematical Sciences Colloquium

Steve Roach

Department of Computer Science, UTEP

Building Reliable Software from Proofs Amphion, Deductive Synthesis, and Space

The automated construction of computer software takes many forms. In one form, deductive synthesis, a program is developed from a formal specification. The specification is given in first-order logic in the form $\forall i \, \exists o(P_0, P_1, \ldots, P_n)$, where i is a set of inputs, o is a set of outputs, and the P_is are propositions relating inputs to outputs. A proof of this conjecture is conducted in classical logic but is restricted to be constructive. Not only do we prove that the required o exists, but we must also indicate how it is constructed. This gives the basis for constructing a computer program from the proof.

Amphion is a general purpose, deductive, program synthesis system that facilitates reuse of domain-oriented software libraries. It assists a user in constructing the statement of a problem in an abstract, domain-oriented vocabulary using a graphical notation. Amphion automatically generates a program that implements a solution to the problem specification. The generated program consists of assignment statements and calls to subroutines from the software library. It takes significantly less time for an experienced user to develop a problem specification with Amphion than to manually generate and debug a program. More importantly, a novice user does not need to learn the details of the components in the library before using Amphion to create useful programs. This removes a significant barrier to the use of software libraries.

Amphion/NAIF, the most mature of the Amphion applications, has generated programs that are in use by space scientists, including programs that perform geometry calculations and construct animations to assist in planning for the Cassini mission to Saturn. In this talk I will introduce Amphion and discuss several areas of active work based on the Amphion system.

Friday, February 2, 2006 at 3 pm in Bell Hall 143
The University of Texas at El Paso

Refreshments will be served in front of the colloquium room, 15 minutes before the start of the colloquium.

For further information, please contact Dr. Pavel Šolín, Bell Hall 220. Phone: (915) 747-6770, email: `solin@utep.edu`.