Comparison of Methods for Supervisory Control and Submodule Construction

Gregor v. Bochmann and Bassel Daou
University of Ottawa

Over the last 25 years, methods for supervisory control of discrete event systems and methods for submodule construction based on state machine specifications have been developed quite independently by different research communities. The purpose of this paper is to give a summary of the results in these two areas and to point out the many similarities and certain differences between the approaches taken by these two communities. The basic problem, in both cases, is to find the behavior of a single submodule X such that combined with a given submodule C, this composition exhibits a behavior that conforms to a given specification S. In the case of supervisory control, the submodule C is an existing system that is to be controlled by the controller X in such a manner that a behavior compatible with S is obtained. We discuss the main issues that must be addressed for solving this problem, review certain conditions for the existence of a solution, and present the major solution algorithms. We also discuss the different treatment of allowed and required behavior, and the difficulties that arise in the context of different communication paradigms (for instance, distinguishing controllability, observability, input/output, synchronous and asynchronous communication) and different specification formalisms.

Gregor v. Bochmann is a professor at the School of Information Technology and Engineering at the University of Ottawa since January 1998. Previously, he was professor at the University of Montreal for 25 years. He is a fellow of the IEEE and ACM and a member of the Royal Society of Canada. He has worked in the areas of programming languages, compiler design, communication protocols, and software engineering and has published many papers in these areas. He has also been actively involved in the standardization of formal description techniques for communications protocols and services. His present work deals with methodologies for the design of distributed systems, quality of service negotiation for distributed multimedia applications, and optical networks.