Architectures and Technologies
INSIGHTS INTO COOPERATIVE GROUP DESIGN: EXPERIENCE WITH THE LAN DESIGNER SYSTEM

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Introduction

The design of complex artifacts has become, increasingly, a cooperative endeavor carried out by multiple agents with diverse kinds of expertise. For example, the design of a car may require experts on potential markets, function, manufacturability and so on. The development of tools and underlying theories for supporting cooperative group design has lagged, however, behind the growing needs implied by this evolution [18]. In particular, while conflict-free cooperation has been well-studied (e.g. [33], [23], [21], [2]), how design agents can interact when conflict occurs has received little attention.

The goal of our research in this area has been to develop a system for supporting cooperative group design based on a model of how human design agents actually interact; in particular on how they cooperatively detect and resolve conflicts. This development has consisted to date of two major phases. The first phase involved studies of cooperative group design in human groups in two different domains (Architectural and Local Area Network design). These studies led us to develop a model of the cooperative group design process that, in the second phase, was realized as an implemented cooperative group design system (the LAN Designer) that designs Local Area Networks (LANs) using machine-based design agents.

The purpose of this paper is to describe what our experience with designing and implementing the LAN Designer system has revealed about conflict detection (CD) and conflict resolution (CR) in cooperative group design and how computers can support it. These insights can be summarized as follows. Conflict resolution plays a central role in cooperative group design. Conflict resolution can be effectively operationalized by instantiating general CR expertise via interaction with domain expertise. Cooperative group design systems should use a design model designed to support conflict avoidance, early conflict detection and effective use of CR expertise, as well as explanation and modification of design actions.

In the remainder of this paper we describe these insights, including the evidence supporting them, the implications for cooperative group design system development, the strengths and deficiencies of relevant research to date, and how we incorporated each insight into the LAN Designer system. We conclude by discussing directions for future work.