

## **A CONTENT-ORIENTED CODING SCHEME FOR PROTOCOL ANALYSIS AND COMPUTER-AIDED ARCHITECTURAL DESIGN**

HSIEN-HUI TANG AND JOHN S. GERO  
*Key Centre of Design Computing and Cognition*  
*The University of Sydney*  
*NSW 2006 Australia*  
*{hhtang, john}@arch.usyd.edu.au*

**Abstract.** In this paper we introduce a content-oriented scheme for protocol studies of designers and demonstrate its benefit for CAAD research. The structure of the coding scheme is described. We discuss how this method can benefit CAAD research and its differences from the process-oriented method used previously. With this method we analyze data to describe the design process as the combination of sensor-driven and process-driven processes. The results emphasize the importance of the sensor-driven processes in the design process. As a consequence we are able to propose some areas for CAAD tools that are based on the cognitive behaviours of designers.

### **1. Introduction**

Protocol analysis has been widely used to investigate behaviours of individual designers and to examine collaborative design. In most of the literature, concurrent or think-aloud protocols have been used, in which process-oriented coding schemes were utilized. In a previous study (Gero and Tang, 1999), we provided empirical evidence to show the similarities between concurrent and retrospective protocols when using a process-oriented coding scheme. Those results demonstrated that both coding methods produced similar results at the large scale, but there were some differences at the detail level. Also the results provided some cues for establishing computer-aided architectural design (CAAD) tools.

In CAADRIA'99, Wang (Wang, 1999) applied protocol analysis to compare design reasoning when using traditional drawings to that when using virtual reality. The results suggested that the designers who use virtual reality employ experimental archetypes and one-to-multiple or multiple-to-one reasoning. The results were derived from the process-oriented characterisation of design. However, there is an interesting problem triggered

















