

Problem-solving Strategies and Expertise in Engineering Design

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A study is reported which focused on the problem-solving strategies employed by expert electronics engineers pursuing a real-world task: integrated-circuit design. Verbal protocol data were analysed so as to reveal aspects of the organisation and sequencing of ongoing design activity. These analyses indicated that the designers were implementing a highly systematic solution-development strategy which deviated only a small degree from a normatively optimal top-down and breadth-first method. Although some of the observed deviation could be described as opportunistic in nature, much of it reflected the rapid depth-first exploration of tentative solution ideas. We argue that switches from a predominantly breadth-first mode of problem solving to depth-first or opportunistic modes may be an important aspect of the expert's strategic knowledge about how to conduct the design process effectively when faced with difficulties, uncertainties, and design impasses.

INTRODUCTION

Technological domains such as engineering and programming are dominated by the production of artefacts that fulfil specified requirements. The full process of artefact development typically encompasses numerous subsidiary processes such as conceptual design, detailed design, prototype testing, and product

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