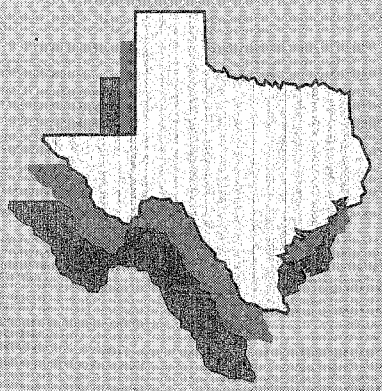

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INTERACTIVE GRAPHICS INTERSECTION DESIGN SYSTEM: FIRST-STAGE DEVELOPMENT

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PROBLEM STATEMENT

The complexity of intersection design requires that various aspects of transportation engineering—specifically transportation planning, traffic engineering, and geometric design—all come together to identify the best solution for handling the traffic of a proposed or existing intersection. This design process involves application of manual and computer-assisted procedures to determine the best alternative that satisfies the design objectives. In the case of computer-assisted methods, design engineers frequently use several applications—a time-consuming process that is further impeded by a cumbersome data transfer procedure. Thus, what such a design process needs is an integrated, interactive graphics-based system, one that is capable of combining several selected computer applications into a single, multi-task design tool. Such a system, if successful, would streamline the process by minimizing the number of applications required, eliminating at the same time the awkward transfer of data from the various programs traditionally used by intersection designers.

OBJECTIVES

The Center for Transportation Research (CTR) of The University of Texas at Austin, in cooperation with the Texas Department of Transportation (TxDOT) and the Federal Highway Administration, defined an operational framework for a first-stage Interactive Graphics Intersection Design System (IGIDS) capable of assisting design engineers in the analysis and design of isolated at-grade intersections (including diamond interchanges). The CTR project team, in pursuing this initial system, established the following objectives: (1) define the requirements, capabilities, and structure of the system; (2) review current and emerging interactive graphics technology for implementation in the system; (3) create a common database in which data necessary for the execution of different computer analysis applications could be stored and retrieved automatically; and, finally, (4) design a system that was user friendly, could support the use of different types of computer hardware, and, to avoid duplication of efforts, could utilize existing software applications.

FINDINGS

The first task was to identify and evaluate candidate hardware and software components that could comprise the IGIDS. Following a review of current and emerging interactive graphics engines, the study team then developed a first-stage system (conceptually illustrated in Figure 1) based on Intergraph's MicroStation and Autodesk's Autocad for graphics engines, with initial development based primarily on Intergraph's MicroStation. Turning next to data base engines, the CTR researchers selected

Informix and Oracle, with first-stage development making use of Informix. The operating system chosen for initial implementation in the IGIDS was AT&T's Unix (or a Unix clone), a system that allows multitasking (i.e., the concurrent operation of multiple programs). The computer software language chosen for the system was a higher level computer language, termed simply "C." Computer hardware was the Intergraph workstation, selected for its versatility and its widespread use by both private and public engineers (though additional hardware will be supported in subsequent system development). Finally, the study team chose the TEXAS Model for Intersection Traffic for the external analysis program. As developed, IGIDS will handle at least five intersection design alternatives, with analysis of the traffic of each alternative achieved by accessing one or more of the analysis packages supported with system commands. Provisions were incorporated to allow staged implementation of several other computer applications as needed.

CONCLUSIONS

The project team, in linking selected computer hardware and software components, was successful in establishing a flexible foundation for initial and future development of a comprehensive Interactive Graphics Intersection Design System for use in analyzing and designing new intersections (or in modifying existing ones). In its initial development, IGIDS graphics are two dimensional in plan view, though future versions will feature three-dimensional graphics. The research thus demonstrates the feasibility of integrating computer hardware and software components into a powerful yet user friendly interactive graphics system. Presently, this design system is being test implemented to demonstrate system reliability and practicality. Texas Department of Transportation design engineers, following their review of the pilot system's performance and features, have suggested several modifications. The CTR project team, in a follow-up study, is currently developing a modified, second-stage system, one that incorporates the suggested changes. Once these modifications have been made, the IGIDS will be ready for implementation into intersection design practice.

"The information described in this summary is reported in detail in Research Report 1139-1, "Interactive Graphics Intersection Design System: First-Stage Development," by Thomas W. Rioux, Robert F. Inman, Charles H. Berry, Jr., Clyde E. Lee, and Randy B. Machemehl, November 1991.

Figure 1. Components of the Interactive Graphics Intersection Design System (IGIDS).