Center for Transportation Research and Education

Iowa State University

Developing a Visual Electronic Design and Specifications System

tech transfer summary

Objectives

- Create a graphical system that can help designers and contactors visualize projects more clearly and construct them more efficiently.
- Turn paper-based design standards and construction specifications into a visual electronic reference library (ERL) or object-oriented design and specification (OODAS) system.

Problem Statement

Currently, individuals including designers, contractors, and owners learn about a project's requirements by studying a combination of paper and electronic copies of the construction documents, including the drawings, specifications, road and bridge standard drawings, design criteria, contracts, addenda, and change orders. This can be a tedious process since one needs to go back and forth between the various documents to obtain information about the entire project.

Object-oriented computer-aided design (OO-CAD) is an innovative technology that can bring a change to this process by graphical portrayal of information. OO-CAD allows users to point and click on portions of an object-oriented drawing that are then linked to relevant databases of information (e.g., specifications, procurement status, and shop drawings).

Technology Description

Visual ERL

Building an electronic reference library is a practical starting point in developing a visual design standards and construction specifications system. An ERL includes 3D objects that are linked to 2D drawings. An ERL provides an index that can be used as a database interface for standard designs and specifications. This approach can minimize the time and effort that would be required to develop a new database. In addition, existing ERL users would be able to easily transition into a full-scale OODAS system in the future.

Iowa's ERL currently has indexed all first-level sections of Iowa DOT and Statewide Urban Design and Specifications (SUDAS) standards and specifications.

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RESEARCH PROJECT TITLE
Development of Object-Oriented Design and Specifications for Iowa DOT and Urban Standards: Phase I (TR-487)

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PRINCIPAL INVESTIGATOR
Ed Jaselskis
Assoc. Prof., Civil, Construction and Environmental Engineering
Iowa State University
515-294-0250
ejaselsk@iastate.edu

CO-PI / CONTACT
Russ Walters
Asst. Prof., Civil, Construction and Environmental Engineering
Iowa State University
515-294-2171
rwalters@iastate.edu

KEY WORDS
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MORE INFORMATION
http://www.ctre.iastate.edu

CENTER FOR TRANSPORTATION RESEARCH AND EDUCATION
IOWA STATE UNIVERSITY
2901 South Loop Drive, Suite 3100
Ames, IA 50010-8634

OODAS System

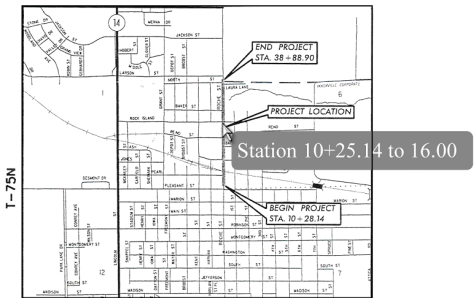
An object-oriented design and specifications system consists of scenes that portray typical features of highway and bridge construction. Urban scenes contain arterial streets, collector streets, and local streets. Rural scenes contain various types of highways (freeway/expressway, super-two/two-lane highway), transitional facilities, and ramps and loops. Each element consists of many objects grouped in levels of complexity.

Implementation Benefits

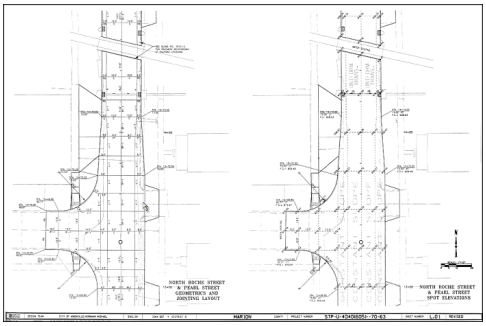
- With a visual electronic design and specification system, all parties involved in transportation projects (including DOT design engineers, specification writers, inspectors, and contractors) can access all of the design standards, specifications, and other project information simultaneously using a 3D graphical interface.
- A visual electronic design and specification system provides a smoother integration of urban and state DOT specifications and design standards.
- A visual electronic design and specification system allows for a more centralized specification and design standard process, thus saving resources.
- With a visual electronic design and specification system, design and specification information can be released faster.

Implementation Readiness

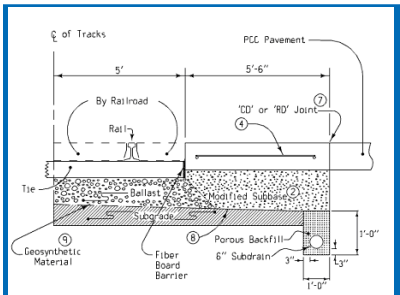
- A project-specific demonstration, the iRoadPlan (intelligent road plan), will be developed in Phase II of this research. An electronic version of the project drawings will include certain object-oriented features, including 2D electronic road standards, photographs of good and bad installation examples, links to bid items, and pop-up windows to show items such as detailed notes and cross-section profiles.
- Training workshops will be needed to explain how to use the visual electronic design and specifications system that is developed and address any questions and issues that arise.
- Someone with knowledge in 3D modeling applications will need to perform regular maintenance and make periodic updates to the system. An internet-accessible approach to interacting with the design and specification system will ensure that users are using the most current version.



Example of project location map



Example of road section plan view

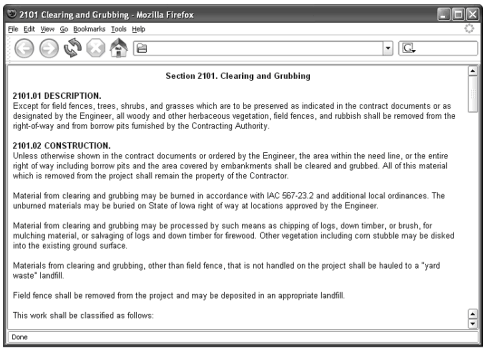


Example of road standard detail

ESTIMATED PROJECT QUANTITIES

ITEM NO.	BIAS NUMBER	DESCRIPTION	UNIT
1	2101-0850001	CLEAR+GRUBB	AC
2	2102-2710070	EXCAVATION, CL 10, RDWY+BORROW	CY
3	2102-2710090	EXCAVATION, CL 10, WASTE	CY
4	2105-8425015	TOPSOIL, STRIP, SALVAGE+SPREAD	CY
5	2107-0875000	COMPACTION W/ MOISTURE+DENSITY CONTROL	CY
6	2113-0001100	SUBGRADE STABILIZATION MATERIAL, POLYMER GRID	SY
7	2115-0100000	MODIFIED SUBBASE	CY
8	2301-1033070	STD/S-F PCC PAVT, CL C CL 3, 7"	SY
9	2301-1083070	STD/S-F PCC PAVT, CL M CL 3, 7"	SY
10	2301-6911722	PCC PAVT SAMPLE	LS
11	2401-6745650	REMOVAL OF EXISTING STRUCTURE	LS
12	2401-6745760	RMVL OF INTAKE	EA
13	2401-6745980	RMVL OF UTILITY ACCESS	EA
14	2502-8213208	SUBDRAIN, PVC, STD, PERFORATED, 8"	LF
15	2502-8220193	SUBDRAIN OUTLET (RF-19C)	EA
16	2503-4460010	INTAKE, TYPE M-A	EA
17	2503-4460030	INTAKE, TYPE M-C	EA
18	2503-4460040	INTAKE, TYPE M-D	EA

Example of bid item list



Example of standard specifications section