

Preparation of this newsletter was financed through LTAP, a nationwide effort financed jointly in Iowa by the FHWA and the Iowa DOT. Iowa's LTAP is housed and administered at ISU's Center for Transportation Research and Education (CTRE).

The mission of Iowa's LTAP:

To foster a safe, efficient, environmentally sound transportation system by improving skills and knowledge of local transportation providers through training, technical assistance, and technology transfer, thus improving the quality of life for Iowans.

Subscriptions to *Technology News* are free. We welcome readers' comments, questions, and suggestions. To subscribe, or to obtain permission to reprint articles, contact the editor.

ISU Research Park
2901 S. Loop Drive, Suite 3100
Ames, Iowa 50010-8632
Telephone: 515-294-8103
Fax: 515-294-0467
www.ctre.iastate.edu/

Stephen J. Andrie
Director of CTRE
andrie@iastate.edu

Duane Smith
Director of Iowa LTAP
desmith@iastate.edu

Marcia Brink
Editor
mbrink@iastate.edu

Tom McDonald
Safety Circuit Rider
tmcdonal@iastate.edu

Sharon Prochnow
Program Coordinator
prochnow@iastate.edu

Mark Anderson-Wilk
Michele Regenold
Contributing Writers

Any reference to a commercial organization or product in this newsletter is intended for informational purposes only and not as an endorsement. The opinions, findings, or recommendations expressed here do not necessarily reflect the views of LTAP sponsors. The materials herein are provided for general information, and neither LTAP nor its sponsors represent that these materials are adequate or sufficient for the purposes of the user without appropriate expert advice. ISU makes no representations or warranties, express or implied, as to the accuracy of any information herein and disclaims liability for any inaccuracies.

Iowa State University and the Center for Transportation Research and Education provide equal opportunities and comply with requirements of the Americans with Disabilities Act in programs and employment. Call the Affirmative Action Office, 515-294-7612, to report discrimination.



Laser scanning can improve project efficiency

LASER SCANNING is a state-of-the-art technology with the potential for improving the efficiency and cost-effectiveness of many highway and bridge projects. Laser scanning provides a fast and accurate method for gathering three-dimensional (3D) data to use in surveys, design models, and construction.

How laser scanning works

A laser scanner is taken into the field, attached to a laptop computer, and directed toward a structure up to 150 meters (490 feet) away. A laser beam pulses from the scanner toward the structure (see figure below), capturing detailed 3D data at approximately 2,000 data points per second. Captured data are stored in the computer and can be immediately viewed as a 3D "point cloud" image on the screen. This cloud of points is a dimensionally accurate representation of the existing object.

Laser scanner capabilities

Further enhancements, such as "shrink-wrapping" (a process that makes images clearer), can be made using the capabilities of available laser scanning software. Scanned data can also be exported to CAD applications such as AutoCAD and MicroStation. If desired, two-dimensional drawings can be created from the three-dimensional models.

The 3D models generated through laser scanning include extensive detail and allow for fast and accurate measuring. The virtual database that is created can be used to design modifications to an existing structure or to design new structures.

Though a fairly new technology, laser scanning applications are already being used to improve efficiency in many different areas, as illustrated by the examples below.

As-built surveys. When accessibility and safety issues prevent a traditional survey, laser scanning offers an excellent alternative. Laser scanning can be used to perform accurate and efficient as-built surveys and before-and-after surveys. Inaccessible locations, complex arrangements, and hazardous locations can all be easily modeled.

Construction design. Construction design is one of the largest areas for 3D modeling development. Designing construction projects using 3D modeling has been found to have many benefits:

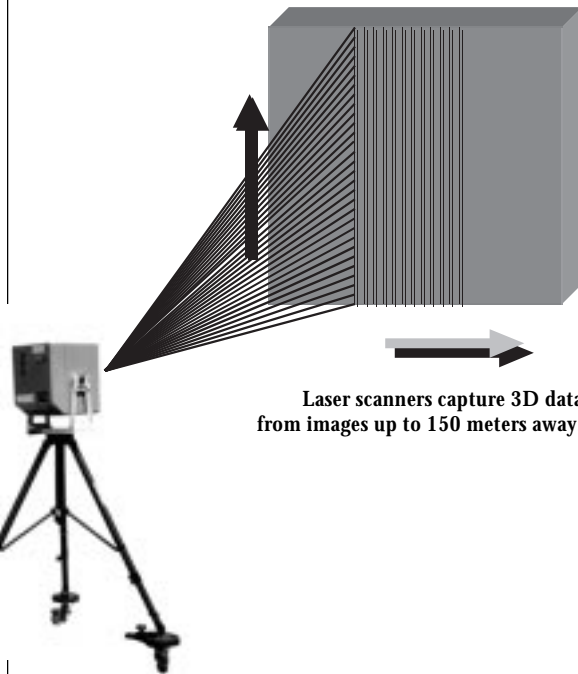
- Coordination issues can be minimized with virtual design and construction.
- 3D modeling provides efficient generation of multiple views.
- The 3D modeling process can generate automated bills of material.
- Data generated through laser scanning and modeling can be efficiently integrated into analysis software.

Transportation applications

There are many benefits to using laser scanning for highway design, including the ability to survey during heavy traffic times without positioning surveys in the roadway and without closing the road. Laser scanning has been successfully utilized for highway widening projects and for creating as-built drawings of bridges to assist in modifications.

The Pennsylvania Department of Transportation used laser scanning to efficiently generate a 3D rendering of an existing bridge (see figure, top of page 3). This process has the potential to significantly reduce the costs of many highway and bridge rehabilitation projects.

In addition to many other potential transportation applications, laser scanning also provides an



Laser scanners capture 3D data from images up to 150 meters away.

LASER SCANNING . . . continued top of next page

excellent method for rebar tie-wire inspection, assessing potholes, and inspecting roads for rutting.

For more information

For more information contact Associate Professor Edward Jaselskis, Department of Civil and Construction Engineering, Iowa State University, 515-294-0250, ejaselsk@iastate.edu. •



Laser scanned 3D images of existing bridges, like this one in Pennsylvania, could help agencies reduce rehabilitation costs.

DOWN UNDER . . . continued from page 1

making it “very political,” according to Dr. Jahren. In the state of Western Australia, all maintenance has been privatized.

Road building basics

Gravel roads. More progressive road agencies build gravel roads with a four percent cross fall that allows them to shed water and resist pothole development. Gravel roads are built in two layers: a strong bottom layer with clean crushed stone to provide strength, and a top layer of crushed stone mixed with clay binder to mitigate dust and corrugation.

Paved roads. Most paved roads in Australia (including a few four-lane expressways) are actually layers

Australians’ road use expectations are slightly different from ours.



of unbound aggregate with a seal coat surface. Superior quality control of the base construction process helps make this method successful. However, differences in weather, vehicle loads, maintenance practices (these can be fragile roads that require immediate maintenance action when problems develop), and user expectations (sometimes these roads do get bumpy as they age) may cause challenges if we attempt to transfer the technology here.

Cementitious stabilization. Seal coat roads are often rehabilitated through cementitious stabilization. Australia’s and New Zealand’s practices minimize additive requirements and add quality control efforts in comparison to our regional practice.

For more information

The Minnesota Local Road Research Board funded a report of Dr. Jahren’s findings. For a copy, call the Minnesota Department of Transportation’s Office of Research Services, 651-282-2274. Ask for report number P2002-01. It is also online: mnroad.dot.state.mn.us/research/. (Click on “Products,” then on “Online reports.”)

For additional information, contact Dr. Jahren, 515-294-3829, cjahren@iastate.edu. •

This article is adapted, with permission, from one in the spring 2002 issue of The Exchange, the newsletter of the Minnesota LTAP program, University of Minnesota. Our thanks to Pamela Snopl, managing editor.

LTAP Advisory Board

The people listed below help guide and direct the policies and activities of Iowa’s Local Technical Assistance Program (LTAP). Contact any of the advisory board members to comment, make suggestions, or ask questions about any aspect of LTAP.

Saleem Baig
Local Systems
Iowa DOT
Telephone: 515-239-1051

Gary Fox
Traffic and
Transportation Director
City of Des Moines
Telephone: 515-283-4973

Kevin Gilchrist
Senior Transportation Planner
Des Moines Metropolitan
Planning Organization
Telephone: 515-237-1316

John Goode
Monroe County Engineer
Telephone: 414-932-7123

Neil Guess
Howard R. Green Company
Telephone: 515-278-2913

Susan Klekar
Iowa Division, FHWA
Telephone: 515-233-7302

Wally Mook
Director of Public Works
City of Bettendorf
Telephone: 319-344-4128

Tom Parham
Local Systems
Iowa DOT
Telephone: 515-239-1256

Bob Sperry
Story County Engineer
Telephone: 515-515-382-7355

Wade Weiss
Greene County Engineer
Telephone: 515-386-5650



Center for Transportation Research and Education

IOWA STATE UNIVERSITY