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3D Laser Scanning & Modeling System

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3D LASER SCANNING & MODELING SYSTEM

THE NEED

Traditional methods of measuring and modeling the surface geometry of large, complex structures or sites that require engineering or survey-grade accuracy are often inaccurate, incomplete or expensive. Inaccurate or incomplete drawings and models often lead to costly construction errors or delays. Technicians or surveyors using tapes or survey instruments typically performed field measurements, which were used to either mark up existing drawings or create new 2D CAD drawings and 3D CAD models. These traditional methods are particularly problematic if the structures or sites are large, complex or difficult to access.

THE TECHNOLOGY

A portable, auto-scanning laser and PC system that lets users economically obtain accurate, complete, and timely as-built geometry information for large structures and sites.



FIGURE 1 CYRAX LASER SCANNER

The system can remotely measure natural surfaces up to 100m away at the speed of 800 points per second. With spacing between adjacent points as fine as 1mm, users can capture an extremely high level of detail for large, complex structures and sites. Each 3D point is accurate to 6mm and modeled surfaces are as accurate as 2mm.



FIGURE 2 REALITY

As 3D measurements are collected, each point appears on the system's laptop screen. As points accumulate, detailed graphic images quickly emerge (see Figure 3). The system's software lets users create initial 3D models right on site and accurately "stitch" adjacent scans together. Detailed 3D or 2D models are easily exported to popular CAD and rendering software.

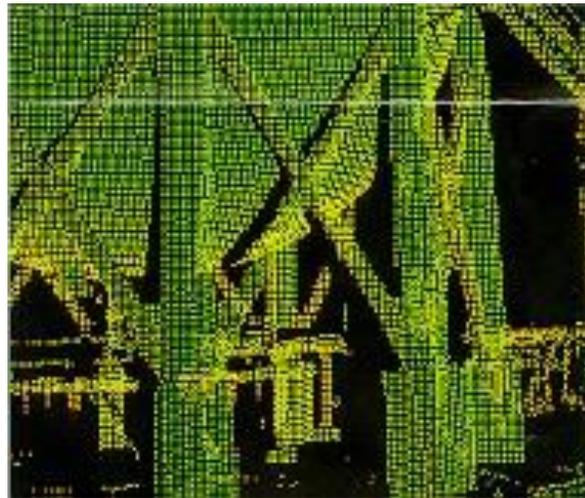


FIGURE 3 3D POINT CLOUD

By using an innovative, pulsed laser, the system has a number of advantages over conventional lasers. First, the high power of each pulse allows the operator to conduct a survey without the use of targets or reflectors. Part of the emitted laser energy is naturally reflected back to the instrument by the natural surface of the object being measured, even for surfaces that are not perpendicular to the incident laser beam. This reflector-less feature also lets you accurately measure structures that are inaccessible, such as mine walls or suspended utility cables, or that are unsafe to occupy such as busy highways, airport runways



or areas with hazardous materials. The Cyrax system can be used without disrupting ongoing site operations. The system's integrated software gives you 3D measurements and results immediately in the field. Unlike other methods, there are no intermediate processing steps. These immediately available "point clouds" of 3D measurements provide an intuitive backdrop for ongoing fieldwork and modeling activities.

THE BENEFITS

The system provides the following advantages:

- Reduces costly construction errors and delays by providing highly complete, accurate and timely 3D geometry measurements and models of existing structures and sites.
- Allows as-built records and surveys for complex or difficult to access areas.
- Provides detailed as-built and topographic surveys to obtaining immediate, highly accurate profiles and volumes.
- The system can be used indoors or outdoors under any lighting conditions.
- Eye-safe (Class II) laser does not interfere with ongoing operations or construction activities.
- Remote operation of the scanner via modem allows the system to be used for problem solving.
- No need to attach special reflecting targets to the object being measured.

STATUS

Cyrax has been used successfully by major organizations (including Chevron, Fluor Daniel, Raytheon, Disney, U.S. Navy). The technology was awarded with the "R&D 100 Award" from the R&D magazine as one of the 100 most technological significant products of 1998 and the 1998 "Innovation Award" from Computer Graphics World as one of the top 20 new products shipped in 1998.

BARRIERS

The current technology does not address measurement accuracy requirements tighter than 2mm and the scanner must be stationary (usually tripod-mounted) while it is scanning. While the system can measure to the vast majority of natural surfaces, some specific surfaces such as mirrors and pure black surfaces can be temporarily treated with powder in order to be measured directly.



POINT OF CONTACT

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REFERENCES

1. CYRAX Product Catalog

REVIEWERS

Peer reviewed as an emerging construction technology

DISCLAIMER

Purdue University does not endorse this technology or represents that the information presented can be relied upon without further investigation.

PUBLISHER

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