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Real-Time Construction Component Tracking System

Purdue ECT Team
Purdue University, ectinfo@ecn.purdue.edu

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EMERGING CONSTRUCTION TECHNOLOGIES

Sensors – Construction Equipment & Methods

REAL-TIME CONSTRUCTION COMPONENT TRACKING SYSTEM

THE NEED

Accurate and timely identification and tracking of construction components are critical to operating a well-managed and cost efficient construction project. Establishing standards to support identification and tracking technologies has the potential to enable the construction industry to seamlessly integrate work processes at the job-sites. Knowledge of this information in a quick and accurate fashion, would dramatically improve productivity and reliability.

THE TECHNOLOGY

The prototype component tracking system developed for this technology integrates field sensors, portable computers, wireless communication, and real-time kinematic (RTK) global position (GPS) equipment. Individual objects scheduled for arrival on the construction site are tagged at the fabricators using bar codes or radio-frequency transponders (RFID). The encoded information is scanned directly into a portable computer and wirelessly relayed to a remote project database. A database query returns graphical representations (e.g. computer aided design (CAD) information, or virtual reality mark-up language (VRML) models of scanned objects and additional information as appropriate (see Figure1).

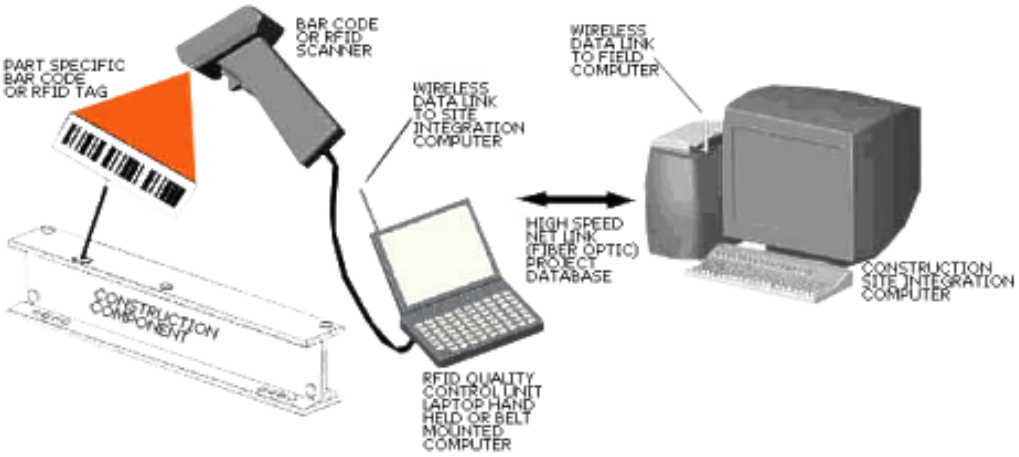

FIGURE 1 SCHEMATIC INFORMATION FLOW FOR DISCRETE COMPONENT TRACKING

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These models, coupled with user-friendly web browsing software, guide field workers through the acquisition of key fiducial points using scanning devices integrated with GPS technology to determine an object's position and orientation.

The Benefits

- Develop standards for part ID and tracking that the construction industry will adopt.
- Develop means for real-time tracking of these items and wirelessly transmitting that information to a construction project database.
- Demonstrate the utility of these techniques on full-scale construction sites.

Status

The research on this technology will work with industry to develop realistic business cases for deployment of the technologies based on the standards. Collaborations will be sought with construction industry partners to ensure that the standards being developed are responsive to industry needs and are compatible with other industry standardization efforts.

This technology project is an extension of specific technologies developed during the National Automated Manufacturing Testbed research conducted in FY98. It will be tested first at the Building 205 emission control system project on the NIST, Gaithersburg campus, scheduled to begin FY 1999. The procedures developed during this project will be extended to the much larger Advanced Measurements Laboratory construction project (also on the NIST campus) during FY 2000.

Barriers

- The field data logger must be able to interface not only with standard bar codes, but also with proprietary RFID tags, and a host of potential "plug-in" position, attitude, and auxiliary "aiding" sensors.
- A standard uplink protocol is needed to permit third-party software developers to enter the market and thereby develop specialty plug-ins which access the dynamic database and calculate derivative quantities useful to contractors and project managers.

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POINTS OF CONTACT

Karen M. Furlani, *Research Structural Engineer, Structures Division, National Institute of Standards and Technology*
Phone: (301) 975-6078, FAX: (301) 869-6275, E-Mail: karen.furlani@nist.gov
William C. Stone, Leader*, Construction Metrology and Automation Group. National Institute of Standards and Technology*
Phone: (301) 975-6075, FAX: (301) 869-6275, E-Mail: william.stone@nist.gov

REFERENCES

1. National Institute of Standards and Technology, Gaithersburg, MD http://www.nist.gov
2. Karen M. Furlani and William C. Stone, Architecture for Discrete Construction Component Tracking, Construction Metrology & Automation Group, National Institute of Standards and Technology.

REVIEWERS

Peer reviewed as an emerging construction technology

DISCLAIMER

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