AUSCI GOES SOLO

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Advanced Video Detection For Minneapolis
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In what may be the world's largest beta test site for a new machine vision product, testing is underway for Minneapolis' AUSCI project. The aim is to reduce congestion and improve traffic flow in the city's central business district.

Autoscope Solo™, the latest sensor unit in Image Sensing Systems' (ISS) Autoscope family of machine vision technology, is undergoing installation as part of the Adaptive Urban Signal Control and Integration (AUSCI) project in the city of Minneapolis, Minnesota, USA. The project is a cooperative effort between the Federal Highway Administration (FHWA), the Minnesota Department of Transportation (MnDOT), and the City of Minneapolis. The purpose of AUSCI is to reduce congestion and improve traffic flow in the north-west area of the city's central business district (CBD), an area prone to extreme surges in traffic. In what may be the world's largest beta test site for a new machine vision product, the testing will verify performance and finalize overall system components and performance integration issues.

Autoscope Solo video sensor units will be installed at 65 Minnesota intersections. An estimated 140 units will provide detection on over 350 lanes of traffic. AUSCI will provide city traffic engineers with the option of switching between an adaptive Split Cycle Offset Optimization Technique (SCOOT) control algorithm, currently being added to the central control system, and an existing T2000C traffic responsive control system.

MEETING OBJECTIVES

The ISS partnership contract for AUSCI was signed in February this year, and runs for two years. The MnDOT and the City of Minneapolis will conduct a project evaluation in October 1998. The project was initiated by the MnDOT in September 1995 with a request for partners that could offer advanced, video-based traffic detection technology to support the operational test. AUSCI aims to demonstrate that adaptive traffic signal control methods can be implemented on an existing network of signalized intersections; and that they provide operation and more efficient use of limited staff time within a typical US CBD road network. This will be achieved as a result of the following efforts:

- Integration of SCOOT with the existing T2000C traffic control system;
- Application of traffic data collection technologies.

Autoscope Solo was selected for its special features that will be of particular value to the project. It will provide the required SCOOT detector data and an independent traffic flow measurement system. It will also provide video snapshots for planning and recording, selectable detector configurations, and full motion video.

Video detection was recommended for the project because it:

- Can provide the detection accuracy required by SCOOT and will allow variations in detection zone layout for model testing;
- Will allow each lane of an intersection approach to be independently detected;
- Will allow fine-tuning adjustments to be made to the final detector locations by repositioning the zone of detection;
- Supports testing of adaptive control detector location schemes without requiring roadway disturbances;
- Can be installed in the Minneapolis CBD with the minimum of disruption to traffic flow (no in-street construction);
- Will allow maintenance in all weather conditions.

Autoscope Solo expands the application possibilities of machine vision vehicle detection to include sites where transmission of video to a central site is cost-prohibitive or where clean video transmission is difficult or impossible. The integrated package improves video quality for detection, since there is no loss of image quality due to video transmission.

Additionally, Autoscope Solo transmits data communication and video by twisted pair. Therefore, there is no need for a high-cost coaxial cable, microwave link, or fiber optic transmission path. This means convenient installation and lower system costs. This feature, and Solo's modular design, make it ideal for special applications, such as mid-block arterial traffic monitoring, small intersections, or freeway system detection stations where only one or two intelligent cameras are necessary.

TECHNOLOGICAL ADVANTAGES

Autoscope Solo provides new and revolutionary features, as well as incorporating benefits of the proven Autoscope machine vision technology. Primary benefits are:

- Wide-area detection permitting the extraction of meaningful traffic parameters such as vehicle presence, vehicle speed, vehicle space occupancy, detection of stopped vehicles, wrong-direction vehicles, queue lengths, and automation extraction of measurements of effectiveness;
- Users are able to verify visually the detection in real time on a monitor;
- The system can be installed and maintained year-round with minimal disturbance, if any, to traffic;
- Detector placement offers enormous flexibility; users are able to customize and optimize the detector layouts according to the geometry of the installation to meet their detection or surveillance needs. It can also offer cost savings by allowing users to place many detectors in the camera's field-of-view, as well as the ability to add, remove, and move detectors at not cost.

"Solo merges the heart of the proven Autoscope technology with the camera offering improved video detection"

SYSTEM CONFIGURATION

Autoscope Solo can be configured as one smart camera for traffic monitoring or as a networked system of cameras along a freeway or arterial or grid work of intersections, all working in concert, or independently, such as for the AUSCI project.

Other key features of the system are improved communications, increased reliability, robustness, and expandability. The PC communications software runs under the Windows NT or Windows 95 operating systems. It can run fully on a notebook computer or desktop system. Users can configure the system to support one-on-one communications, as well as a network of Autoscope Solos. In addition, Solo complies with NTCIP guidelines.

Solo offers the flexibility to configure the system to provide communications tailored for each application. For example, traffic officials can obtain traffic data directly from Solo by RS485/RS232 communications for arterial monitoring. Or, for intersection control applications requiring NEMA TS2 or TS1, interface cards will translate Solo video sensor detector actuation into the necessary electrical format.

The Autoscope Solo software suite is a seamless package of client applications to facilitate system configuration and communications. These applications support

detector layout and operations verification for installations as simple as an Autoscope Solo image sensor up to a large network of interconnected units. The system's software suite can be run on a notebook computer as well as a powerful communications server PC running at a traffic management center.

Easily customized, the client applications allow the users to "browse" through a large network of sensors to run diagnostics functions and examine operations logs, and during normal operation retrieve traffic data and event alarm status conditions. The heart of the software suite is a robust, multithreaded 32-bit communication server that provides the client applications via TCP/IP access to the traffic detection network in the field.

"Autoscope Solo can be configured as one smart camera for traffic monitoring or as a networked system along a freeway"

Autoscope Solo features new and complementary system architecture to the Autoscope 2004 by integrating the camera and machine vision processor into one compact unit to offer more flexibility, simplicity, and enhanced performance. "Solo merges the heart of the proven Autoscope technology with the camera, offering tremendous opportunities and benefits for improved video detection performance," said Craig Anderson, technical director for ISS.

By integrating the camera and machine vision processor, software can control the camera for improved video detection performance. "In addition, the Solo has direct, real-time iris and shutter speed control, allowing adjustment for lighting changes. This provides a consistent image, improving the unit's video detection performance.

OTHER APPLICATIONS

There are more than 5,000 Autoscope 2003 and 2004 cameras installed worldwide, successfully providing traffic data and alarms for applications including adaptive intersection signal control, freeway incident detection and traffic management, traffic intrusion security, and tunnel traffic management.

The Autoscope system provides traffic detection in major ATMSs throughout the world. For example, in Atlanta, Georgia, USA, one of the world's largest integrated installations of traffic technologies, the Autoscope system provides data to manage traffic better in the city and surrounding communities. The system provides details of average speeds, volumes and occupancy, and stopped vehicle detection in this freeway application. Officials in Seoul, South Korea, selected the Autoscope system for a large multiphase transportation management system. The Autoscope system will provide vehicle speed, volume, and occupancy data, while the system's incident detection algorithm will detect incidents on the freeway.

The FAST-TRAC program in Oakland County, Michigan, USA, is another major project using Autoscope. This project is the world's largest installation of machine vision-based vehicle detection for adaptive intersection control. There are more than 275 Autoscope processors and over 1,000 image sensors. At FAST-TRAC intersections, Autoscope provides vehicle volume and presence information to the local SCATS controller.

Econolite Control Products, Inc., of California is the manufacturer of the Autoscope 2004 system and distributor of Autoscope products in North America. ISS of Minnesota is the R&D company behind the Autoscope technology. It distributes the Autoscope products outside North America through various strategic partners.