Thanks to research at UI's new National Center for Advanced Transportation Technology (NCATT), truckers may someday have their rigs weighed and measured while moving, instead of having to stop, wait in line, and lose precious time.

The automated port of entry may become a reality with the use of Video Traffic Detection Systems (VTDS), which are being used to study and monitor the flow of traffic in a variety of transportation facilities.

Vehicle detection or sensing through video image processing is a major focus of the Intelligent Vehicle and Highway Systems research group, headed by Dr. Michael Kyte, associate professor of civil engineering. Kyte's research group is one of four operating groups established as part of NCATT.

NCATT researchers have been using video image processing since 1990 when the University of Idaho began use of the Autoscope Video Traffic Detection System. Originally
developed at the University of Minnesota, the Autoscope system offered the potential to greatly enhance the surveillance and control capability that up to that time had been provided through more invasive means such as in-pavement loop detectors.

Kyte's research team successfully tested the Autoscope system in a number of different surveillance environments, with the primary objective of monitoring the flow of traffic through intersections. The success of this first project caused the Idaho Department of Transportation (DOT) to fund a second research project to apply the Autoscope video detection functions to the monitoring of trucks through ports of entry. DOT was interested in identifying trucks whose dimensions violated legal limits on height, width, and length. This research project showed the feasibility of using video imaging technology for this task.

The VTDS technology used in Autoscope combines video and computer technology to extract traffic flow data directly from video images. The images are transmitted either live from a video camera or from a video playback machine to a specially equipped personal computer (PC). The PC then captures and digitizes each video image at a rate of 30 frames per second, and the Autoscope computer processes each digitized image. The stationary background luminance is stored and any change in the luminance is identified as a possible vehicle movement. Special algorithms sort out actual vehicle movements from spurious or non-relevant image changes such as vehicle shadows or clouds.

The user identifies up to 35 detector location points to measure traffic movements on the video display, and the computer records all vehicle movements passing each detector location including the time and duration of each detector activation. The computer also tracks the position of each vehicle over
time, enabling the computation of vehicle speed and acceleration. Detector information is processed to identify the events or information of interest, including traffic flow rates, vehicle paths, delay, or vehicle lengths or heights. New technology is being integrated into the Autoscope system which will allow the reading of license plates and other standard signs or markings on vehicles.

Several new private corporations are now involved in the development of the Autoscope video imaging technology. Image Sensing Systems, Inc., was formed to continue the development of the basic image processing and detection technology. Econolite Corporation, a manufacturer of traffic signal and control equipment, manufactures and markets the Autoscope system. Hughes Missile Systems Company is merging their video technology – originally developed to track missiles and identify targets – both to track vehicles and to read letters or markings on them so that specific vehicles can be positively identified. This latter technology is important in the identification of vehicles carrying hazardous or explosive loads that need to be restricted to certain roadways or highways.

These three companies and the Idaho Department of Transportation are now working with NCATT to implement a new Machine Vision Laboratory, which will provide research opportunities to graduate students and faculty for the study of traffic flow and facility operation and control. In addition, laboratory staff will train DOT and other professional transportation engineers as well as undergraduate transportation engineering students in machine...