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Mapplets

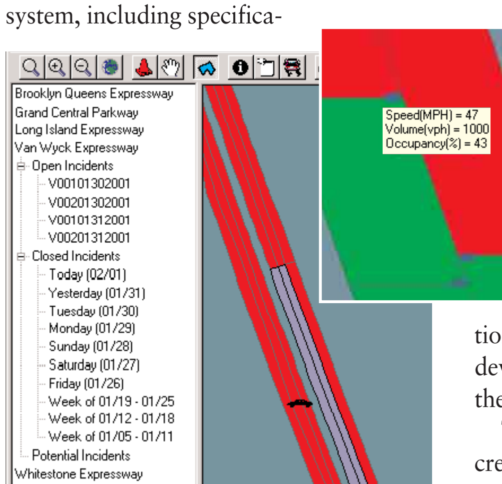
GIS Takes a Bite out of **Big Apple Traffic**

Faced with the inability to build new highways and burdened with transportation infrastructure that requires much rehabilitation, New York City has some of the worst traffic in the world. One accident can lead to hours of delay, sending delay repercussions across the city.

To help alleviate congestion and keep the cars moving on the Big Apple's busiest highways, the New York State Department of Transportation (NYSDOT) set out to implement an automated traffic management system (ATMS) consisting of roadway detectors, closed-circuit television, weather stations, variable highway message signs, and GIS-based traffic management software. The primary goal of the system is to improve response time to accidents, thus reducing traffic delays.

NYSDOT hired Edwards and Kelcey (EK) to plan, design, and implement the system to monitor more than 40 miles of roads, including the Grand Central Parkway and the Long Island, Brooklyn-Queens, Van Wyck, and Whitestone Expressways.

At EK, we began by establishing the scope of the project in a planning study that focused on the costs and benefits of the various components. From there, working closely with the state, we assessed where to place traffic monitors, including video cameras and radar and loop traffic detectors. Installation of the devices was done by third-party contractors selected by NYSDOT. We worked closely with the contractors providing the documents needed to construct the system, including specifications and GIS-derived placement maps. Variable message signs were usually placed where drivers enter or exit the flow of traffic, detectors were placed at 0.25–0.5-mile intervals (depending on conditions), and cameras were typically situated at 0.5–1-mile intervals. The completed system includes 100 closed-circuit television cameras, 221 traffic flowdetectors, and more than 60 variable message signs.



When roadway sensors indicate abnormal traffic flow, the ATMS automatically displays a map to show JTOC operators possible trouble spots (in purple). Operators can zoom in on the map and click icons showing the sensor location to obtain data about traffic speed and volume.

Each traffic monitoring device is equipped with a wireless or landline modem for transmitting data to and from a central database server. The devices are addressable, having an assigned number. A server located at the Joint Traffic Operations Center (JTOC), the agency responsible for monitoring New York City traffic on a daily basis, polls the devices every 30 seconds for updated data. A server application makes the connection between the devices and their location on a map via the identification numbers.

To provide access to the data, we created a front-end system using a GIS interface modified to accept real-time data. Using the interface, JTOC traffic operators configure the ATMS with information about typical traffic patterns, including speed, occupancy, and volume for each specific stretch of roadway for any time of day. Operators input this information using standardized electronic forms and view the information on a hierarchical incident tree.

Three to four JTOC operators are on duty at any given time, with as many as seven during rush hour. Each operator is responsible for a specific roadway section. After the ATMS server polls traffic monitoring devices, the GIS program updates the map views with the new data. If traffic conditions exceed the operator-defined limits, the ATMS pops up that road segment in the hierarchical incident tree to notify the controller that a disruption exists. The controller can then query the ATMS for additional information, such as live video from roadway cameras, to verify the location of a possible incident.

If an accident is pinpointed, JTOC traffic operators manage the response by notifying the appropriate fire, rescue, or law enforcement agencies as well as towing/service vehicles. The ATMS maintains a log of the people or agencies notified, and allows operators to input information about when the dispatched personnel arrived at a scene, when they departed, and when the incident was cleared. Operators can also use the ATMS GIS to send accident location and expected delay information to the variable message signs, informing drivers of the situation. As well, the application enables data entry about the type of incident, number of vehicles involved, weather conditions, and other information needed for state and federal reporting.

The ATMS has been quite a success. It has enabled JTOC to work closely with the Highway Emergency Local Patrol program — an NYSDOT initiative that puts more emergency assistance vehicles on the road to aid drivers of disabled vehicles — to reduce the average response time from 30 to 15 minutes on monitored highway sections. New York City's tele-vision Channel 7 even did a news feature about the ATMS.

Based in part on the success of the system, plans are already under way to expand coverage to additional sections of roadways. Pavement-mounted sensors that gather localized temperature readings are also being installed to provide important safety information in the winter months when freezing temperatures can cause icing on some stretches of road, while leaving other sections ice-free. In addition, 35 traffic lane control lights are being installed, which can also be controlled by remote JTOC operators using the ATMS interface.

EK created a custom interface, known as FMView, for the ATMS based on ESRI's (www.esri.com) MapObjects. The system uses a Microsoft (www.microsoft.com) Access database server. ⊕

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