Defining and Describing Emerging Sources of Freight Data

Executive Brief

Innovations in a variety of technologies and industries have converged, and now make it feasible for transportation practitioners to cost-effectively observe truck movements in greater detail. In particular, four trends are enabling new approaches to observe urban and metropolitan freight movement.

Sensors are commoditized, becoming easy to install and use.

Cloud storage is not only mature, but also secure.

Analytical techniques have been developed to "look" into the data

Business Models have evolved to focus on data services and decision support

Agencies now have options for sensing and acquiring data, storing these data securely without relying on expensive IT systems, employing new analytical techniques for converting observations about traffic and freight into useful information, and working with the private sector in new ways to address public sector objectives.

Eight types of data sources summarized here have the potential to fundamentally change how transportation agencies approach freight in urban and metropolitan areas. Many of the newer sources of data use location-enabled or mobile wireless-based technology devices and components in the data acquisition process.

Global Positioning Systems (GPS)

GPS receivers use signals broadcast from satellites to calculate the **location** of a GPS receiver in time and space. GPS vehicle data can provide real-time measures of vehicle travel **speed** at specific locations. Archives of this location and speed information can be used to trace vehicle routes and performance measures such as congestion or travel time.

Cellular/GSM

Cellular phones and other devices must communicate with base towers placed in fixed **locations**. Tracking a device's "pings" with specific towers can be used to estimate the path of a device through a network. Specific traces can create estimates of trip origins and destinations.

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RADAR

RADAR systems broadcast radio waves at objects, and measure the time it takes for reflected waves to return. Based on this time, **speed** and direction of movement can be measured. Advanced systems can identify shapes based on patterns in returning waves, and **classify** trucks and cars.

LiDAR

LiDAR systems operate on the same principle as RADAR systems, but use light waves instead of radio waves. The primary benefit of using light (usually from a laser) is that the shorter wavelengths of light provide much greater accuracy than radar. LiDAR can provide estimates of **speed** and **classify** trucks.

Inductive Loop Detectors

Inductive loop detectors are installed beneath the surface of roadways, and can detect vehicles based on their magnetic fields. Advanced detectors can record a vehicle's unique magnetic "signature" which can be used to **classify** trucks or track specific vehicles between multiple detectors.

Computer Vision

Computer vision systems analyze images from still and video cameras, and identify attributes of objects such as shape, size, color, and text. In transportation, these systems are trained on feeds from traffic cameras, and the algorithms can **classify** trucks, cars, buses, bicyclists, and other system users, including turning movements and safety behavior such as 'near misses'.

Wireless Address Matching (WAM)

WAM uses short range communication technologies such as Bluetooth to capture a wireless device's unique wireless network address. Observations of a device's address at specific **locations** can be used to track a vehicle's path through a network or queue, and generate **speed** estimates.

Administrative Records

Administrative records are documents that contain information about shipments, delivery times and dates, locations, commodities and other aspects of freight movement. These can be used in analysis to understand characteristics of freight flow. Examples include delivery records and bills of lading.