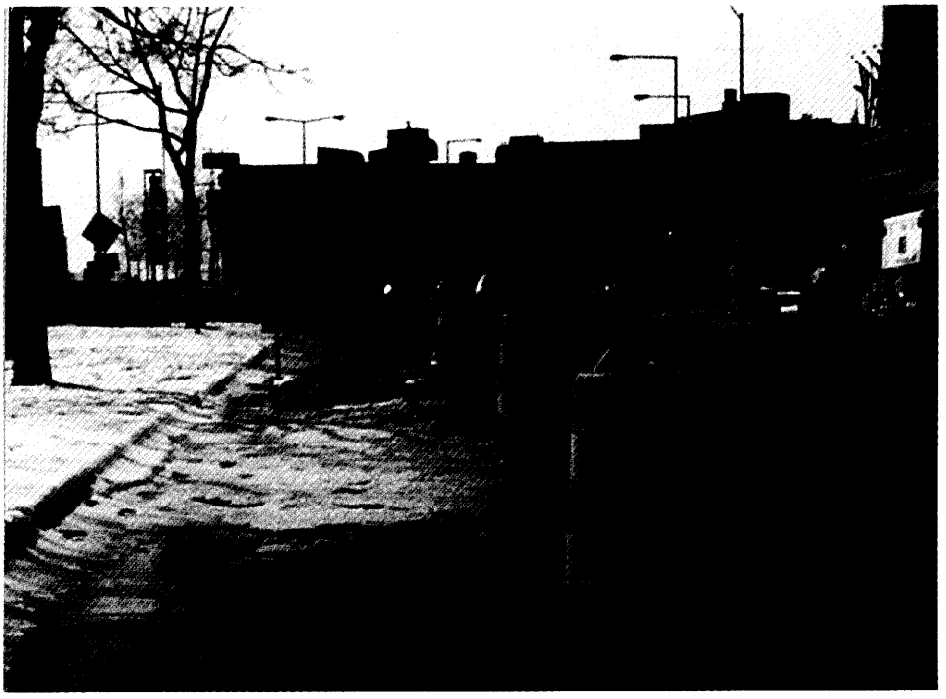
United States Department of Transportation
Federal Highway Administration
Federal Transit Administration

Technology in Rural Transportation "Simple Solution" #7

E N T E R@P R I S E

Lane Drop Driver Awareness



Introduction

This application was identified as a promising rural Intelligent Transportation Systems (ITS) solution under a project sponsored by the Federal Highway Administration (FHWA) and the ENTERPRISE program. This summary describes the solution as well as opportunities for expansion into the broader context of rural ITS.

Technology Overview

Lane drops occur as a result of restricting roadways caused by construction work or other planned or unplanned events. When vehicles fail to merge in a timely fashion, delays or traffic accidents often occur. This simple solution uses advance warnings to calm the traffic and induce smoother transitions into limited lane areas.

Real-World Example - **The Indiana "Lane Drop Smoothing" System**

Overall goal: To improve workzone safety and traffic operations by encouraging drivers to merge sooner in advance of construction zones.

Technical approach: A series of portable "DO NOT PASS" signs equipped with flashing beacons is placed at the approach to a construction site. Electronic occupancy sensors are placed in the roadway. At the outset of operations only the sign nearest to the workzone has activated beacons. When a certain threshold is detected by these sensors, that is, as the volume of traffic grows more heavy at the approach to the construction, the beacons on the next sign upstream will also be activated, and so on. As traffic flow varies, the signs are activated or deactivated in sequence.

Current status: Five signs comprising one lane drop smoothing system are currently in use. A system specification is currently being developed. The state agency that developed the system then plans to circulate this to contractors.

Location / geographic scope: This is a site-specific application used as necessary in construction zones in Indiana.

Agencies involved: Indiana DOT

Cost information: The current system cost approximately $3,500 per sign.

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Have goals been achieved? Anecdotal reports from construction personnel indicate the system is effective in encouraging drivers to merge earlier when approaching a work zone.

Solution timeline: The system is in use. There are no formal plans to commission additional systems.

Further Description of Application

Additional technologies may include:

The alternatives to this system for providing advice to drivers to merge into an alternate lane could be limited due to the very location specific nature of the warnings. It is conceivable that in the future, if roadside instrumentation and vehicle-to-roadside communications were widely deployed, that vehicle specific warnings could be provided to a driver using sensors triggered by a vehicle approaching a lane-drop area. Warnings could be provided to drivers via in-vehicle graphical display units, speech synthesis, or head-up displays. However, the costs associated with such a system would make it viable only if it was incorporated into a system providing wider functionality, such as a traveler information, route guidance, or automated highway system.

More general advice on the location of construction or work zones, or any lane drops needed for special events, could be provided to the drivers of vehicles via wireless data broadcast, using AM, FM, or HAR subcarriers. Messages could either be provided to travelers using roadside signs or in-vehicle devices, including regular radios. Again, the costs to support this service using radio subcarrier technologies would be prohibitive as a stand-alone service. However in areas already disseminating data over wireless radio, the additional cost to encode and deliver this information would be minimal.

Potential additional uses for this technology may include:

Given the portable nature of the signs used for this system, various additional uses for the equipment can be envisioned. These may or may not need to be used in conjunction with the occupancy sensors which are part of the Indiana lane drop smoothing system. Numerous additional uses can be envisioned including:

- Warnings to drivers about construction personnel in or near the roadway ahead.
- Sensors could provide data on current travel times or average operating speeds to maintenance or construction personnel.
- Temporary speed limits - either regulatory or advisory limits.
- Directions to parking facilities with dynamic information on available spaces for special events.
- Diversion advice.
- Warnings of temporary hazardous roadway or weather conditions.
- Temporary vehicle width, height or weight restrictions.

Dependent on the various types of uses suggested above, different communications, additional sensors, or alternate data needs would need to be accommodated. For example, in the case of providing information to drivers on parking facilities with available spaces, appropriate instrumentation at these facilities would need to be installed.

Benefits of Application

	Benefits to travelers / the community	Benefits to business / industry	Benefits to the public sector
Direct benefits	Increased safety at the approach to, and within, workzones and other areas where the number of lanes decrease	Less delay due to construction and maintenance work Decrease in vehicle repair and other costs due to fewer accidents	Increased safety for construction and maintenance personnel
Indirect benefits	Less delay due to construction and maintenance work		Smoother traffic flow at construction sites

Step One: This system is low cost, and signs could be purchased and introduced in a modular fashion, dependent on the needs and finances of the agency. For example, a simplified version of the lane drop system could be implemented in the first instance, using only two or three signs instead of the five that comprise the system as used in Indiana. Nevertheless, the first stage for an agency would be to consider whether the nature of maintenance and construction zones in their jurisdiction would warrant use of this system. Data could be gathered on safety records within work zones and on the delays typically experienced at select zones.

Step Two: In order to gain maximum use of any signs purchased, agencies should also consider what additional functionality, such as what extra types of messages the signs could display, taking into account the associated costs. It could be that for minimal additional financial outlay, multi-function signs could be procured, which due to their wider applicability would be very cost-effective.

Step Three: The appropriate combinations of sensors and portable signs could then be specified and procured.

Step Four: The use of these systems would need to be incorporated into the workzone traffic plans of an agency. Lane drop systems could then be procured and operated as required by the agency.

Potential Implementation Issues

A potential implementation issue associated with this technology is ensuring that construction personnel are given adequate training and guidance as to the appropriate positioning of the signs in the roadway to achieve the desired results. For example, if signs are positioned too closely to the work zone, positive benefits may not be achieved. Indeed work zone safety could even be negatively affected. As was described above, the lane drop system signs could be used for a variety of other messaging purposes. It is likely that different sign sitings would be required depending on the messages being displayed, in which case care should be taken to ensure that personnel are aware of the different sign locations appropriate for each type of message.

As a means of encouraging use of these signs, State DOT could consider purchasing the signs which could then be "rented" by cities and counties or contractors, if appropriate, for their use.

Solution's Contribution to Broader Rural ITS Developments

This simple solution is a prime example of a site-specific, stand-alone application of technology, given that it provides information to drivers to encourage merging when approaching restrictions to the number of highway lanes. The potential contribution of this solution to rural ITS deployment is described below:

Roadway Management - By managing the traffic approaching lane-restricted areas, incidents, including delays and crashes, can be avoided and the transportation infrastructure managed more effectively.

The Technology in Rural Transportation: "Simple Solutions" Project: This project was performed within the ENTERPRISE pooled-fund study program, and aimed to identify and describe proven, cost-effective, "low-tech" solutions for rural transportation-related problems or needs. "Simple solutions" studied within the project focussed on practical applications of technologies, which could serve as precursors to future applications of more advanced systems, or intelligent transportation systems (ITS).

More than fifty solutions were initially identified and documented. Of these, fourteen solutions were documented and analyzed in detail. The transportation technology applications were also categorized according to the seven Critical Program Areas (CPAs) defined within the U.S. Department of Transportation's Advanced Rural Transportation Systems Program. It is hoped to utilize the information gathered within this study to perform outreach to local level transportation professionals to introduce them to ITS and its potential benefits.

For More Information: A full report on this study is available from the FHWA R&T Report Center, telephone no. 301-577-0818. **Title:** Technology in Rural Transportation: "Simple Solutions." **Publication No.:** FHWA-RD-97-108. This research was conducted by Castle Rock Consultants, Eagan, Minnesota. For more information, contact Paul Pisano of FHWA, HSR-30, 703-285-2498. For more information about ENTERPRISE, contact Bill Legg, Washington State DOT, 206-543-3332.

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