An Examination of Potential Alternative Applications for the CTRE Incident Location Tool

Prepared by
Center for Transportation Research and Education
Iowa State University

Iowa State University Research Park
2901 South Loop Drive, Suite 3100
Ames, Iowa 50010-8632

Submitted to
Federal Highway Administration
Ames Office

Principal Investigator
Reg Souleyrette

Project Manager
Dan Gieseman

January 2000

Introduction

In 1998, the Center for Transportation Research and Education (CTRE) began development of an automated system designed for both in-house and in-field collection of crash location information. Central to this system was a software application employing a map-based graphical user interface (GUI) designed around geographic information system (GIS) technology. The Incident Location Tool was designed to be a stand-alone component used to process paper crash reports, and to be a component capable of integration with other software packages. The modular nature of the Incident Location Tool allowed for the integration with the Iowa DOT's electronic data collection software Advantage Safety. The benefits of GIS technology coupled with the ease of using a GUI-based application customized for a specific task led to a desire for research regarding other potential uses of this technology.

Background

The Incident Location Tool was developed using Microsoft's Component Object Model (COM) technology. The COM architecture allows for the integration of any COM object with other COM-based components. This feature of the Incident Location Tool allows for a multitude of database interfaces and user interface configurations. The flexible nature of Incident Location Tool allowed for different applications to be built around the core spatial databases. This meant that while the underlying map databases can remain the same, the types of data collected from the maps can vary and the rules validating collected data could be changed.

The output from Incident Location Tool is a fixed-width text-string compatible with any ODBC-database or output to an ASCII flat-file. All that is necessary is the design and development of the appropriate client for the tool, supporting the necessary database/flat-file interface. In most cases such a client object already exists from third-party vendors allowing rapid application development and deployment of Incident Location Tool alternatives. Further development would be required if additional rules validating collected data are necessary, or additional data need collection from the user.

The Incident Location Tool spatial databases, as developed, contain the following information:

- Roadway Inventory Data from Iowa DOT
- County Boundary Information from Iowa DNR
- Municipal Corporate Boundary Information from Iowa DNR
- County Township and Section Information from Iowa DNR
- Railway Information from BTS
- Primary Route Milepost Information from Iowa DOT

While system databases are not limited to these files, the aforementioned databases were the basis for consideration of other potential applications of Incident Location Tool.

Location Tool Alternatives

Federal Highway Administration (FHWA) sponsored the exploration of other potential uses of the Incident Location Tool, specifically the collection of asset locations for inventory management purposes. The remainder of this document focuses on the following two potential Incident Location Tool adaptations:

- Sign Location Collection Tool
- Pavement Management Section Location Tool

Sign Location Collection Tool

CTRE explored the potential for using a variant of Incident Location Tool to collect sign location information. In this variant, a prototype was created that allowed a user to enter a sign identifier and designate a sign location using a map interface. This information, once approved by the user, was transferred to an Access database for storage. Access was chosen as the storage database for its compatibility with the databases of third-party sign management software. Further development could potentially integrate an adaptation of Incident Location Tool directly with the database of the sign management software. Such integration would provide a seamless environment for the collection and management of a sign inventory.

Accuracy of sign location information is an issue, as sign locations selected from the map were located on a representation of the roadway centerline. It became apparent that relative accuracy was more important, and attributes such as offset from centerline collected in addition to the map coordinates could be used to enhance accuracy, should the accuracy of the map be improved in the future.

Pavement Management Section Location Tool

CTRE also explored the potential for using a variant of Incident Location Tool to designate pavement management sections using the tool's interactive map. For case study purposes, the Iowa Pavement Management Program (IPMP) managed by CTRE was utilized as a model for researching this type of application.

Currently, IPMP participant cities and counties designate their management sections using literal descriptions sent in by city and county engineers. The literal description information comprises a pavement management section number and a text description of where a section begins and ends. From this literal description, CTRE constructs the sections using GIS software supporting dynamic segmentation. The resulting map is used for display and analysis of pavement information collected by a vendor and joined to the map in a separate procedure.

Drawbacks of this methodology arise from the use of road names not consistent with the road names on the base-map used to create the sections. Large portions of project hours are spent correcting literal description information to allow mapping of sections. In addition to inconsistent road names, a section should not be allowed to start on one particular route and end on a different route. This was also a common problem, especially when one route changed names when entering a municipality. A final drawback of the system was the designation of pavement sections on routes not eligible for federal aid, as IPMP is only responsible for the inventory and management of federal aid/non-National Highway System routes.

Adapting Incident Location Tool for the designation of pavement management sections would add a common map for all city and county engineers to utilize when designating sections. This eliminates the issue of literal description. Users only need to pass coordinates corresponding to the begin and end of each section to CTRE in place of a literal description.

Feedback

While both sign and pavement section alternatives were examined, the adaptation of Incident Location Tool for inventorying pavement management sections is most likely to be pursued further. CTRE is currently designing such a system for the IPMP. This process was greatly expedited when the research performed on this project was presented to a group of Iowa city and county engineers. Feedback stemming from this presentation was overwhelmingly positive, and has led to the programming of funds for the modification of Incident Location Tool to support such a system.

Comments from the IPMP project manager and several potential users of the proposed system indicate that the key to the successful deployment of the system would be rules allowing a section to be located only on a single route and only the federal aid/non-NHS system. Color-coding could be performed on the map, showing the user only the roadways needing section designations, and only the geographic area of the user's jurisdiction. Future development could integrate sending of pavement section location data via the Internet and automated updating of map files when updates are available or additional sections are required.

Concerns raised by potential users related primarily to the timeliness of the underlying cartography files and the issue of how to effectively distribute such an application and its data. As broadband information sharing becomes more available, issues such as data timeliness and distribution will have a variety of potential solutions and have less of an impact on project success. In the short term, distribution via CD-ROM seems to be an acceptable solution, given the limited number of applications necessary to collect information from pavement engineers.

Conclusions

There exists much potential for adapting Incident Location Tool to applications relating to inventory management and collection of location information for assets. This potential seems limited only by project resources and the imaginations of the users. The degree of customization offered by these applications makes field-use possible for even the novice computer user. This paper overviewed several potential adaptations of the Incident Location Tool and discussed the benefits and drawbacks of such adaptations.