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Establishing an Intelligent Transportation Systems (ITS) Lab at LTRC

INTRODUCTION

The U.S. Department of Transportation (DOT) depicts Intelligent Transportation Systems (ITS) as an integrated system to improve safety and mobility and enhance productivity through the use of advanced information and communication technologies. Traffic surveillance and monitoring systems are key components of existing architectures of ITS, which primarily rely on an array of information and communication technologies. In the state of Louisiana, the ITS program has been rapidly evolving in the past few years. Major ITS instrumentation efforts have been made on highways in order to allow state transportation authorities to better serve the traveling public. In order to achieve this goal, there is a pressing need to use current and future ITS data to improve various operational and management functions at the traffic management center and other state agencies. This requires state agencies to collect, store, and analyze as much ITS data as possible to maximize the efficiency of existing transportation networks. This has raised a need for a permanent facility to house and process ITS data collected from remote locations within the state of Louisiana. Such a facility is envisioned to serve academics, researchers, and practitioners in different capacities as well as lend itself as a tool to inspire interest in the field of advanced traffic management systems among students from within and outside Louisiana.

OBJECTIVE

The primary goal of this research project was to investigate and lay the foundation for establishing a state-of-the-art ITS lab at the Louisiana Transportation Research Center (LTRC). The purpose of the lab is to develop and demonstrate procedures that successfully transform existing ITS data into useful information, and then pass the procedures on to agencies in order to apply them on a routine basis. It is also expected that the lab will be utilized to complete analysis functions for the Louisiana Department of Transportation and Development (LADOTD) and other local agencies to develop, evaluate, and refine procedures for more effectively utilizing the ITS system offline.

SCOPE

The scope of this study was limited to the state of Louisiana. The ITS lab at LTRC is intended to operate according to the specifications and standards set by the state of Louisiana and to be compatible with the existing technology and communication infrastructure. ITS data that will be collected and archived at the new lab will be retrieved from different sources within the state of Louisiana. The data will support various applications that are beneficial to LADOTD.

METHODOLOGY

This phase investigated current state-of-the-art ITS labs in other states to acquire as much information on the hardware and software components necessary to build the new facility at LTRC. Examples were found in Portland State University, University of California (Performance Evaluation Monitoring System or PeMS), and Florida International University. The study also examined the current hardware and communication infrastructure at the intended location of the new ITS lab in order to

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identify and acquire the main hardware and software components required to operate the lab as well as identify any compatibility issues with the existing infrastructure. This phase also identified various data sources such as the I-10/12/110 detectors, which can be streamed through the Advanced Traffic Management Center (ATMC), AUTOSCOPE devices located in the southern region, and weight enforcement stations for development of axle load spectra. The study provided a tentative layout and cost estimates for the ITS lab, including a video wall, projection screen, database server, and a few workstations. Operating policies were also proposed to maintain secure and efficient operation of the lab. The study concluded with a set of recommended applications that can be supported by the lab, such as automatic incident detection, travel time estimation and prediction, work zone management, crash prevention and safety, ramp metering, managed lanes, congestion monitoring and pricing, highway breakdown analysis, and several others.

CONCLUSIONS

The lab will primarily serve the metropolitan and state transportation authorities in their service to the traveling public. The information will assist transportation officials in developing applications that improve their service to the public (e.g., providing current and expected future traffic conditions and developing operational strategies for the existing infrastructure). The lab will also serve academics, researchers, and practitioners in providing access to raw and processed data of traffic flow. The lab is also anticipated to be a tool to retain, recruit, and inspire interest in the field of advanced traffic management systems for students in Louisiana as well as potential graduate students from outside Louisiana. The short-term measure of success of the lab will be reflected by the capability to stream traffic data in real time from traffic monitoring sites that are connected to the Traffic Management Center (TMC). Also, the lab will offer technical reporting capabilities that assist users in extracting the most relevant information needed from such data. During the course of this project, the research team highlighted the importance of ITS data and two types of data (text and video) that can be streamed in real time to the ITS lab. As a proof of concept, the research team was successful in setting up an automated procedure to stream traffic data in real time from Baton Rouge ATMC to LTRC. Two high-end workstations were set up as servers for traffic data, and the data streaming process was successful in downloading data packets every 30 seconds from a total of 62 detectors along the corridors of I-10, I-12, and I-110 in the Baton Rouge area. Other data sources were also identified and include the southern region of Louisiana, which consists of 25 sites monitored by video detectors that are accessible via a Web interface. Another viable data source that was identified is the use of weigh-in-motion (WIM) stations throughout the state of Louisiana for truck weight enforcement. Those sites, in addition to the portable and long term pavement performance (LTPP) sites, provide crucial axle load data that are currently essential to the new pavement design procedures. Such data are not routinely stored at one central location or in a format that is readily accessible for development of axle load spectra of trucks. During the course of this project, the research team identified several applications that can be supported by the ITS data to be collected at the lab. In order to build the lab, cost estimates were provided for a proposed layout to be completed in subsequent phases.

RECOMMENDATIONS

Based on the results of the phase of this project, the research team strongly recommended the pursuit of the full scale implementation of the ITS lab and the acquisition of equipment to support the data collection, screening, archival, and reporting functions. This is to be pursued in the next phase of this project, which will also focus on one or more applications that can be supported by the lab and serves the needs of LADOTD and the public. To properly and securely maintain the continuous operation of the ITS lab, a few policies were established for the ITS lab users/operators. The policies include access privileges to data as well as normal administrative procedures of the system. Since the lab will be housed at the LTRC facility, all LTRC rules and regulations must apply to the lab as well. To ensure continuity of the lab operation, the research team on this project strongly recommends that one graduate student (preferably of senior status) be appointed to assist in data collection and preliminary analysis processes.