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STUDY OF THE FEASIBILITY OF VIDEO LOGGING WITH PAVEMENT CONDITION EVALUATION

PROBLEM STATEMENT

Until recently, the Florida Department of Transportation (FDOT) has used forward-view images of the highway network, which are made available on a three-year cycle through a consultant. Due to the demands within the FDOT offices for different types of data and the excessive costs involved in outsourcing data acquisition, a need exists to improve the current FDOT video-log program to provide the following: (1) increased frequency of imaging, (2) upgraded functionality of image acquisition to obtain right-of-way data, including *safety related features* such as bridge and railroad crossing identification, edge line of pavements, and images of ramps, and (3) pavement images for automated pavement distress evaluation. Hence, a study was initiated to develop a fully automated, high-speed survey vehicle to meet the functional needs of various offices of the Department.

OBJECTIVES

It was envisioned that the above needs could be fulfilled by using a laser profiler van equipped with a video camera system for imaging in forward, sideward, and downward directions**;** an Inertial Measurement Unit (IMU) for collecting pavement cross-slope, grade, and curvature data; and Differential Global Positioning System (DGPS) equipment for geo-referencing. It was also decided to explore the feasibility of implementing the imaging operation as part of the annual Pavement Condition Survey (PCS) conducted by the State Materials Office. The study was to be accomplished by realizing the following objectives:

1. Conduct a survey of other transportation agencies with similar practices to learn from their experiences.

2. Verify, on a limited basis, the accuracy and precision of the evaluation data provided by each sub-system of the evaluation vehicle.

3. Conduct a pilot survey of Hillsborough County's State Highway System to assess the reliability of the evaluation vehicle and its sub-systems.

FINDINGS AND CONCLUSIONS

The experiences of other agencies with similar evaluation capabilities were enlightening and encouraging, especially with respect to system reliability and costs of operation. The laser

profiling system provides accurate and repeatable pavement roughness and rut measurements. The IMU provides precise cross-slope, grade and curvature data irrespective of speed and was found to be accurate and within FDOT specification up to speeds of 30 mph on tangent sections. The DGPS system provides precise readings in the stationary mode. However, determination of the accuracy of DGPS data with respect to known reference GPS points, is presently under evaluation. The majority of traffic and right-of-way images captured with the evaluation vehicle had to be post-processed to upgrade their resolution and color reproduction.

Further studies are needed to investigate the camera lens types and optimum software settings to achieve better image quality. Distress images captured by the pavement camera were seen to reveal accurate details of fine cracks up to speeds of 45 mph, under well-lit conditions. Also, further investigation is needed to verify the accuracy of automated distress evaluation and the reliability of simultaneous image capture at speeds up to 65 mph under relatively inferior lighting conditions. The simultaneous performance of multi-function evaluation and PCS is deemed feasible and speedy based on the experience from the Hillsborough County pilot study. Researchers observed that, when one sub-system malfunctions, all other operations could be carried out unhindered. However, further refinement of the sub-systems is required to optimize overall system reliability and minimize equipment downtime, which is critical for a production operation. In addition, more efficient data transfer processes and techniques have to be explored prior to state-wide implementation of the system process.

BENEFITS

The automated pavement condition survey would be safer, less time-consuming and certainly more accurate than the current manual surveys. Furthermore, roadway designers would be able to better identify specific sections that have inadequate drainage (which creates water logging problems), based on the continuous cross slope profile provided by the survey vehicle. With forward-view and side-view cameras, the newly developed survey vehicle would provide more images of the roadway and safety features with their locations precisely defined by GPS coordinates. Above all, based on preliminary cost analysis and cost information obtained from other states, FDOT could anticipate significant cost savings when such a vehicle is put into a production mode for pavement condition surveys.

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