研究成果報告

Road Survey with ROMDAS System: A Study in Akita Prefecture

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Road Asset Management System is key issue of each state owned road company which recent days urging managers at decision-making level change their perception. Road Asset Management System allows track assets (all structures) easy, fast and stimulates to take proper action in right time. In order to have well organized road asset management, it requires conducting comprehensive set of road surveys such as Local Reference Points (LRP), Roughness (IRI) and Global Positioning System (GPS) surveys and Video logging. Additionally, data management of collected data is worth-mentioning aspect. This report outlines following sections: Survey description, Principles of conducting survey, Data processing, Data representation, and analysis.

Keywords: Asset Management, Road Survey, ROMDAS, Data Analysis

1. Introduction

Asset management is a systematic process of maintaining, upgrading, and operating physical assets cost-effectively. It combines Engineering principles with sound business practices and economic theory, and it provides tools to facilitate a more organized, logical approach to decision-making. Thus, asset management provides a framework for handling both short- and long-range planning [1]. Data collection is essential part of any asset management. There are numerous types of data need to be collected to successfully apply Road Asset Management System (RAMS). For instance, inventory data, condition rating data, cost data, descriptive data, and others. Over the years these data will expand and new challenge faces such as data management and storage of existing data and updating with new data. Therefore along with data collection, data storage and management should be considered before implementing RAMS.

This report describes conducted road survey and how collected data can be useful for further utilization RAMS based on survey carried out in Akita Prefecture. Roads M64, P143, P205-2, P209, P210, and P217 were examined, all together in total – 47 km surveyed. Survey includes: LRP survey, roughness survey (IRI) and GPS surveys and video logging.

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1.1 ROMDAS

The "ROad Measurement Data Acquisition System" (ROMDAS) has been developed by Data Collection Ltd. (DCL) as a generic system for collecting data on road condition and travel time. It is possible to use ROMDAS for: roughness surveys; travel time and congestion surveys; condition rating surveys; inventory surveys; moving traffic surveys; transverse profile/rutting surveys; video log surveys; recording the location of digital photographs; creating voice records which are associated with road attributes; collecting global positioning system (GPS) data; collecting skid resistance data using the Findlay Irvine GripTester; as a digital trip meter. [2]

2. Road Survey

2.1 Description

Before conducting survey, every step of survey was thoroughly planned and all instruments calibrated properly. Calibration of equipments is crucial and can not be overemphasized. One of the first steps is to calibrate odometer; main point here is to reduce error in distance measurement. The section 500 m was selected and 5 runs made. Based on this calibration factor was chosen if the results of runs didn't satisfied certain statistical criteria, extra runs made. Secondly bump integrator should be calibrated against high level accuracy profilometers so called 1st class precision profiles (dipstick, rod-and-level survey, TRL Beam and other). Bump Integrator calibration was performed in test track of Tsukuba Research Institute. Initially, 3 sections with

different surface profile (good, average, poor) were selected by visual inspection. Then in each section in 3 different speeds (30 km/h, 50 km/h, and 70 km/h) bump integrator's reading were recorded, similar to odometer calibration if records didn't meet accuracy extra runs made. After all these sections' profiles were manually recorded by using profilometer of Tsukuba Research Institute. Once processing readings of manual profilometer, we obtain International Roughness Index (IRI) for each section. According to these IRI, it is possible build regression equation for bump integrator counts in each section at different speeds. Coefficients found through regression equations can be saved in romdas software templates. Video logging also involves some tweaks and adjustments like frames per sec. auto focus disabled, and so forth.

2.2 Principles of Conducting Survey

LRP survey serves as initial and irreplaceable step in performing survey due to it has several positive sides to accomplish precise and complete survey.

Location referencing is the most commonly overlooked element of a roads project. However, without a correct location reference method it is impossible to ensure that the data from different surveys are correctly collected, cross-referenced or applied. The first field task of every project should be to conduct a location reference point (LRP) survey. When this is not done, the extra time spent reconciling data from different surveys more than offsets any additional time or effort spent in the LRP survey or collecting the LRP data at the same time as the roughness [3]. During LRP survey digital photos were taken of each reference points (km stones, bridge and other structures).

Roughness survey, Condition rating, GPS survey and Video logging carried out simultaneously. Romdas software saves raw data in a single data after processing data each survey located in a separate file in MS Access format (mdb).

3. Data Processing

Since romdas software collects all data in raw format, it needs processing. Under processing should be understood following, for example during survey roughness saved in bump integrator counts per km. During processing these counts converted into IRI values with assistance built regression equation (done in calibration). Sample of processed data showed in fig 1 including processed roughness (IRI), GPS data, condition rating, and video log data. These data can be converted to other formats for further data analysis and presentation.

4. Data Representation

Data representation plays a significant role in visual analysis of various data collected during the survey. Charts, diagrams and other tools are very convenient for such purposes.

GPS data were further utilized by applying GIS software MapInfo 7.0 and build several thematic maps such as condition map, dynamic sectioning map, and cost estimation map (condition scenario example given in Fig 2). By employing such thematic maps, it allows create different scenarios in turn this assists to find the most appropriate solution within limited funds.

5. Analysis and Reporting

Collected data such as roughness, condition rating, and others can be used additionally for analyze roads for economic or policy studies (for example HDM4, dTIMS). Based on these investigations, it is possible produce a range of reports such as statistics, economic indicators, and other.

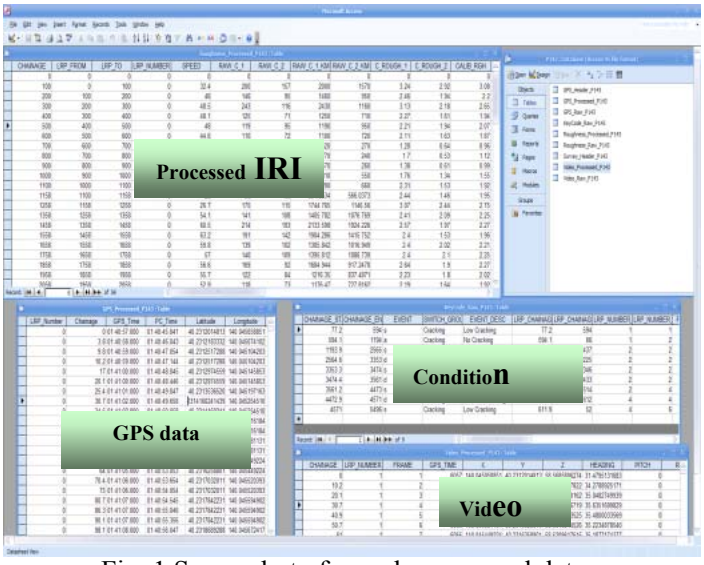

Fig. 1 Screenshot of sample processed data

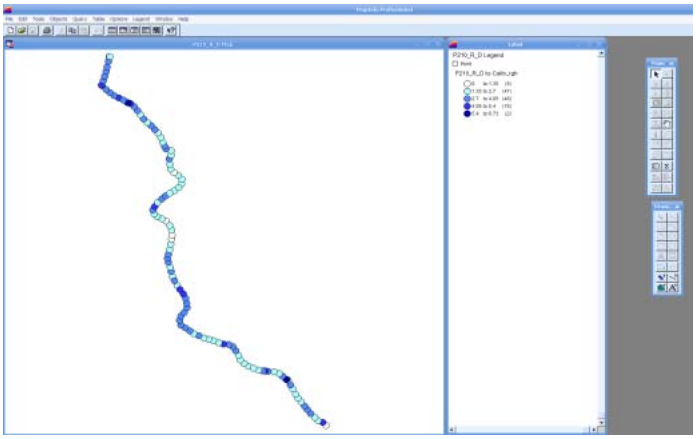

Fig. 2 Screenshot of IRI scenario

Reference

1) Asset Management: Advancing the State of the Art Into the 21st Century Through Public-Private Dialogue. Federal Highway Administration and the American Association of State Highway and Transportation Officials, 1996, page 3.
2) ROMDAS for Windows User's Guide 14 August 2004, page 1.
3) http://www.romdas.com/surveys/sur-lrp.htm
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