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Abstract:

Portland cement concrete has gradually been recognized as an alternative pavement material in our highway pavement community due to its high rigidity and superior bearing capacity, which is more suitable for Taiwan's dramatically increasing traffic loading as compared to conventional asphalt concrete. Since there exists no standardized evaluation procedure for jointed concrete (rigid) pavements in Taiwan's Pavement Maintenance Management System (PMMS), this study first proposed a distress identification manual for rigid pavements based on the Long-Term Pavement Performance (SHRP/LTPP) definitions and domestic considerations.

Furthermore, the PMMS was originally developed under the ideal framework of total pavement management system, whereas the pavement network is defined by thousands of very short "fixed-length sections." After more than 10 years of system implementation, the PMMS can barely meet the needs for "network-level" as well as "project-level" management purposes till now due to extreme difficulties in the requirement of mass data collections and compilations. Thus, this study will focus on the study of intelligent consultant system for concrete pavement evaluation and rehabilitation - development of a prototype evaluation system using the concepts of "uniform sections", "project-level" management, as well as the integration of a computerized Knowledge-Base Expert System (KBES).

Many decision trees and prediction models for pavement structural and functional evaluation originally developed under the well-known EXPEAR program were obtained and modified according to domestic pavement performance and construction practices. Consequently, a prototype Intelligent Consultant System for Pavement Maintenance And Rehabilitation Technologies (ICSMART) program was developed with many Windows-based graphical user interfaces. The prototype system currently has the basic features of identification of pavement distresses and causes, evaluation of present condition; prediction of future condition prior to rehabilitation; and recommendation of needed physical testing based on the consideration of the existing distress characteristics of individual pavement section.

Continuous research effort is still underway to incorporate the selection of major rehabilitation techniques, the development of detailed rehabilitation strategy, prediction of future performance after rehabilitation, as well as cost analysis and the selection of preferred rehabilitation strategy alternatives into the prototype system. The applicability of this prototype system will be further validated through practical case studies of domestic jointed concrete pavement sections. It is strongly believed that the most objective, accurate, and efficient way in selecting most economical rehabilitation strategy alternatives can only be achieved through such a computerized intelligent consultant system so as to assure the best use of our limited resources for pavement rehabilitation.