Decision support system for optimal bridgeô maintenance

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Abstract

Bridges represent a significant percentage of the economy of many countries. They are a vital component of the country's road and highway network. Bridges are subjected to harsh environmental conditions throughout their service-life and consequently structural deterioration occurs. Asset managers are required to maintain networks in good service conditions and; in many cases with limited funds. The objective of this research is to develop a decision support system (DSS) for concrete bridges that provides assistance to the decision maker in evaluating and prioritizing the maintenance strategy of bridges. Thus, the decision maker can identify the urgency level of repair and select the optimal maintenance plan, either for a network of bridges, or on a single level, taking budget limitations into consideration. A comprehensive survey was conducted for data collection in order to build the system's database. This database includes different factors which are incorporated into the evaluation process. These factors include the bridge's defects, repair techniques and repair costs. Dynamic programing software was used to develop the optimal solution for the maintenance plan via creating a family of Pareto optimal alternatives for the DSS developed. A case study for DSS validation was implemented using Egyptian bridge networks. Results were also verified by questionnaire surveys sent to engineers working at the General Authority for Roads, Bridges and Land Transports who are dealing with Egypt's BMS. The responses to the questionnaires show that the developed DSS is comprehensive as it contains most of the critical parameters and its results are reasonable.

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