A deterioration prediction for tunnel lighting facilities using simplified dynamic macro model

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The maintenance and management of transport infrastructure including structures, electrical systems such as street lighting and traffic lights, have become a major social concern in Japan. This paper is an attempt to predict the deterioration of tunnel lighting facilities considering practical application issues such as analyses with a small amount of visual inspection data. Firstly, this paper explains an evaluation method to identify the health degree of lighting facilities in a tunnel. The health degree is on a scale of 0 to 100. A score of 100 represents good state such as newly attached facilities. As the facilities deteriorate, the degree decreases and finally reaches 0 whose state indicates that the facilities can no longer remain in service. Then, the simplified dynamic macro model to predict the deterioration of lighting facilities is proposed. The model is formulated by master-equation and Markov stochastic process. Moreover, as shown in Figure 1, the applicability and validity of the model is shown by illustrating numerical examples using visual inspection data of the existing tunnel lighting facilities that are made from stainless steel.

Fig.1. Health degree curve of tunnel lighting facilities (stainless steel)