Inhomogeneous Poisson Model for Peeling/Falling of Concrete

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Summary

Convenient methods for predicting the peeling and of cover concrete falling off based on reinforcement corrosion amount require a lot of inspection data, and assume the correction based on several inspections because there are many uncertainties. In this study, the authors propose a methodology using inhomogeneous Poisson process for estimating the peeling and falling process based on a small amount of inspection data. In addition, the proposed model was applied to the data on the inspection of the railings of RC railway viaducts, which would undergo the composite deterioration due to neutralization and salt damage, and it was found that the proposed model enables the prediction that takes into account the increase in reinforcement corrosion rate and explains the process of peeling and falling more accurately than a homogeneous Poisson model.

Keywords: inhomogeneous Poisson model; peeling and falling; composite deterioration; deterioration prediction;

1. Introduction

Statistical deterioration prediction models using visual inspection data have been developed rapidly, as prediction models that take into account uncertainties in the deterioration of structures. There have been some researches into the prediction of the peeling and falling of cover concrete [1]. Statistical deterioration prediction models extract regularities from deterioration data and enable the deterioration prediction taking into account various uncertainties of deterioration. On the other hand, since such models are statistical, precision significantly depends on the volume of accumulated data on deterioration. Especially, if the inspection or inspection data is limited, it is difficult to secure precision.

Meanwhile, a model for predicting the peeling and falling of cover concrete has been proposed in the model code for maintenance of concrete railway structures enacted in 2006 [2](hereinafter called “the model code”). This method is based on the theoretical and empirical findings accumulated through previous researches, and the progress of peeling or falling is predicted based on reinforcement corrosion. This method is deterministic, and so assumptions on the safe side have to be made, to cope with significant uncertainties in the process of peeling and falling. The model code assumes the acquisition of data and the correction of estimates through regular inspection. By developing a methodology that can analyze many uncertainties statistically based on theoretical and empirical findings, it becomes possible to predict deterioration precisely.

In this situation, the authors propose a methodology for predicting peeling and falling while considering uncertainties, based on inspection data. Its detailed method is to estimate reinforcement

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