Prediction of Concrete Column Reinforcement Corrosion Degree Under Initial Strain Based on Support Vector Regression

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Abstract

Faraday's law is usually used to predict the corrosion degree of reinforced concrete column members in the electric accelerate corrosion experiment. However, this law doesn't consider the influence of initial compressive strain on the corrosion degree. In this paper, using the experimental data of concrete column members under different initial compressive strain levels, the support vector regression (SVR) model is developed to forecast the reinforcement corrosion degree of column members. The predicted results are compared with the experimental results. The results show that when there is the initial strain in the column member, the reinforcement actual corrosion degree decreases, and the main reinforcement's actual corrosion degree is significantly less than that calculated by Faraday's law. The SVR model proposed can accurately and quantitatively reflect this phenomenon.

Keywords: reinforcement corrosion; column member; support vector regression; initial strain.

1 Introduction

The corrosion of steel reinforcement in concrete column members reduces the bearing capacity of column members and endangers the safety of bridge structures [1-3]. At present, there is much research on corroded column members. However, most are carried out under the condition of no continuous compressive strain, which is different from the column members in the actual bridge structure [4-9]. When the real column member is corroded, there is a continuous compressive strain in the column member. Some researchers have found that compressive strain can change reinforcement corrosion degree in column members [4,10-11]. The established Faraday's law cannot consider the change of strain on the corrosion degree and the different corrosion amounts between the main reinforcement and stirrup. This paper collects the existing test data of corroded column members under compressive strain [4,10-11]. It uses the SVR model to predict the corrosion amount of reinforcement and stirrup by training this model on the existing data. The model can consider the strain level and predict the actual corrosion amount nicely. A ten-fold cross-validation method is used to verify the model's generalization ability and prevent overfitting. Finally, the influence of strain level on the actual corrosion amount is analysed.

2 Predict the corrosion under strain

This paper uses the SVR model to predict the corrosion degree of corroded reinforcement in corroded columns under initial strain. The model inputs are strain, corrosion time, current amount, length of corroded main reinforcement and stirrup, the diameter of corroded main reinforcement and stirrup, eccentric distance, and the output is the

https://doi.org/10.2749/nanjing.2022.1154
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