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# Multi Resolution Inverse Analysis for Corrosion Detection with Net Element and Genetic Algorithm

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## ABSTRACT

Reinforced concrete is widely used as construction material of social infrastructures such as road, bridge footing, building and so forth. Non-destructive corrosion detection of steels in a reinforced concrete is important for preventing destructive accident and decreasing maintenance cost.

We have proposed an inverse analysis technique to detect rebar corrosion non-destructively from potential distribution on a concrete surface [1]. The technique can detect number, shape and location of corrosion without particular assumption with multi-step genetic algorithms (MGA) and boundary element method (BEM). The technique increases accuracy of solution gradually as necessary.

The proposed technique performs BEM with high-resolution mesh even in obtaining low accuracy solution. Therefore, the computational cost of the technique is expensive.

This research proposes an effective inverse analysis technique with GA and the net element [2] for solving the inverse problem to detect corrosion in reinforced concrete non- destructively.

The followings are practical approaches.

(1)For reducing computational cost, we control analysis precision, i.e. coarseness of BEM mesh, depending on required precision of solution.

(2)Using net element for BEM reduces the number of element for steels in a concrete structure. We focus on the fact that steels have a net arrangement in many concrete structures.

(3)Higher precise analysis is performed only at detected corrosion area in lower precise analysis. Because this approach limits freedom of solution space, we can obtain a solution at short times width GA.

We performed a numerical simulation to solve an inverse problem for detecting steel corrosion in concrete with the proposed technique. Figure 1 shows the result of the simulation. The result shows that the proposed method could detect corrosion with high accuracy. The calculation time of the proposed method is about 1/100 in comparison with that of the previous method.

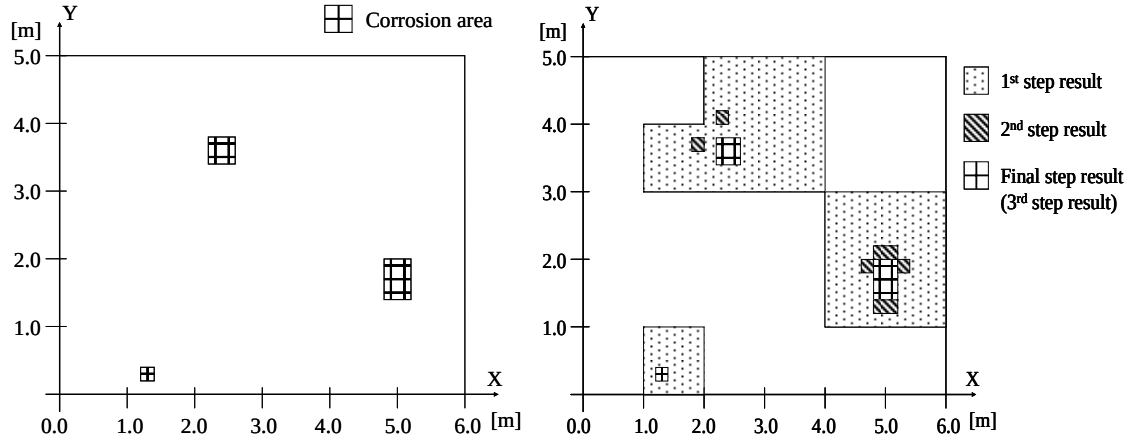


Fig. 1 Numerical simulation: the left figure shows simulated steel corrosion previously, the right figure shows detected corrosion as increasing precision of inverse analysis.

## REFERENCES


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