*The 2025 World Congress on*
***Advances in Structural Engineering and Mechanics (ASEM25)***
*BEXCO, Busan, Korea, August 11-14, 2025*

# Pseudo-Nonlinear analysis of reinforced concrete structures based on Moment-Curvature relationships

*Gyeonghwan Won[1)] and Hyo-Gyoung Kwak[2)]

[1), 2)] *Department of Civil Engineering, KAIST, Daejeon 34141, Republic of Korea*
[1)] rudghks9090@kaist.ac.kr
[2)] kwakhg@kaist.ac.kr

## ABSTRACT

Reinforced concrete (RC) structures are commonly designed to satisfy two criteria of serviceability and strength. To ensure these two criteria, it is necessary to accurately predict not only the cracking and deflection under service loads but also the resisting capacity under the ultimate loads, and these predictions are based on the material nonlinear analysis of RC structures. As the nonlinear analysis requires great computational effort for iterations with the adoption of many load steps, a simple but effective numerical approach which can describe the nonlinear behavior of RC structures has been asked to be introduced. With this background, this paper introduces a numerical solution procedure which can simulate the nonlinear behavior of RC structures through the pseudo-nonlinear analysis. Instead of taking the sophisticated layered section approach, the moment-curvature relation of RC section is based. Upon the consideration of the characteristics in the moment-curvature relation, the bending stiffness at the cracking stage is directly evaluated and, in advance, the loading steps are minimized. Considering the plastic hinge length in the finite element discretization of RC structures leads to a significant reduction in the number of elements used. The validity of the introduced numerical solution procedure is established by correlation studies between the analytical results and experimental data, and additional parametric studies for various RC structures are performed to examine the applicability of the introduced approach.

## ACKNOWLEDGEMENT

This work was supported by the Korean Government as the Korea Agency for Infrastructure Technology Advancement (KAIA) grant (No.RS-2023-00246154) and the Korea Ministry of Land, Infrastructure and Transport (MOLIT) as an “Innovative Talent Education Program for Smart City”.

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[1)] Graduate Student
[2)] Professor, Corresponding author