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# Study on Variation of Mode Shapes as a damage index in Vertical Geometric Irregularity RC buildings

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## Abstract

According to the current developments in the construction industry, especially the construction of irregular structures, it is necessary to identify the performance of these structures under earthquakes. Seismic assessment and determination of structural damage by selecting the appropriate index, probably evaluates the performance of the building according to the potential risk. Due to the inherent uncertainties in determining the amount of damage and uncertainty in assessing the actual response of the building to the earthquake, the selection of damage assessment indicators is of particular importance. For this purpose, regular and irregular structures have been modeled and subjected to earthquake records. Nonlinear dynamic analysis of structures is done by using damage assessment indices that the seismic response obtained from the analysis of structures is examined by the mode shape index for the first and last modes. The result show that the variation of mode shapes damage index (for the first mode and last mode) in the first floors to assess structural damage showed that the first Mode Shape due to proper correlation with other damage indices, can be an appropriate indicator to assess the severity of structural damage, but the last mode shape has a high weak correlation with other indicators and is not considered a suitable indicator.

**Key words:** Variation of Mode Shapes, Vertical geometric irregularity, RC frame, Damage magnitude, Correlation.