

## **A toolbox and web application for seismic performance assessment of buildings**

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### **ABSTRACT**

Different methodologies have been introduced in the past, which can be used to fulfill the vision of Performance-based Earthquake Engineering (PBEE). Some of these methods are already implemented in regulatory documents and standards, while next generation of performance-based methodologies are still under development. In addition there is also constant need for further development of software tools for PBEE, which can speed up the implementation of performance-based methodologies in engineering practice, open doors towards new research areas and to more accurate prediction of seismic risk. Recently, a PBEE toolbox for the seismic performance assessment of reinforced concrete frames and the web application for prediction of the approximate IDA curves of reinforced concrete structures have been developed as a part of the software tools for PBEE. The PBEE toolbox includes several functions which provide calculations of the moment-rotation relationship of plastic hinges in columns and beams, rapid determination of simplified nonlinear structural models, the post-processing of the results of analyses and structural performance assessment with different methods. The user can add new functions to the PBEE toolbox in order to support additional procedures for the seismic performance assessment of RC frames, or can just change the rules for determining the moment-rotation relationship of plastic hinges in columns and beams, which are the main source of uncertainty in simplified nonlinear models. The use of the PBEE toolbox can be combined with the web application for prediction of approximate IDA curves, which involves huge response database of the single-degree-of-freedom system and enables quadrilateral idealization of the pushover curve including the strength degradation. Advantages of such environment are operating system independence, no need for installation and no maintenance cost of the user. In addition, the response database can be easily upgraded and the web application can be accessed from anywhere at any time, which makes it even more attractive. In the paper, the capabilities of the developed computing environment are first explained and its use is demonstrated with an example of reinforced concrete frame building.