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PERFORMANCE BASED DESIGN OF MASONRY INFILLED FRAMES USING FEATURE SENSITIVE NEURAL NETWORKS

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ABSTRACT

The paper presents a potentially feasible approach for training artificial neural networks in performance based seismic design of masonry infilled reinforced concrete (R/C) frame structures in the absence of any feedback on the correctness of the design output (i.e. without any information on the errors in output activations of the network). A counter-propagation neural network with the unsupervised learning paradigm is trained to output the performance based design dimensions and reinforcement of the R/C frame elements without the aid of teacher signals (i.e. target design outputs). The training patterns presented to the network for unsupervised learning are generated by performing displacement-based non-linear dynamic analyses of masonry infilled R/C frames with seismically vulnerable (and preferred) distributions of masonry infill panels over the elevation of the frame under the influence of earthquake ground motions. The present study shows that, in principle, the counter-propagation network (CPN) can learn from the presented training patterns to solve the inverse problem of computing the design dimensions and reinforcement of the R/C frame members that are required to achieve the specified performance objective for a selected seismic hazard level without the supervision of a teacher.

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