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BIONIC ARCHITECTURE BY USING DEEP LEARNING ALGORITHMS

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The main reason of Bionic Architecture is the designs of curved forms reminiscent of structures in biology and fractal mathematics. In the past decades, the methods that are much more economical to achieve reasonable accuracy are always required. In recent years, there has been a growing interest in using Artificial Neural Networks (ANNs), a computing technique that works in a way similar to that of biological nervous systems. Many researchers used ANN to study a beam using multilayer perceptron (MLP) ANN. Furthermore, another application of ANN is to evaluation of the failure probability and safety levels of structural systems. Bakhshi and Vazirizade used a radial network in order to predict the stiffness of the each member in a frame according to its response to a record. In fact, they showed ANN can provide a mapping from the maximum story drifts to columns stiffness. Gomes et al. and Bucher used ANN for obtaining the failure probability for a cantilever beam and compared ANN with other conventional methods. They found that ANN methods that can approximate the limit state function may decrease the total computational effort on the reliability assessment, but more studies, including large systems with non-linear behavior must be studied. Elhewy et al. studied about the ability of ANN model to predict the failure probability of a composite plate. They compared the performance of the ANN-based RSM (Response Surface Methods) (ANN-based FORM and ANN-based MCS) with that of the polynomial-based RSM. Their results showed that the ANN-based RSM wasmore efficient and accurate than the polynomial-based RSM. It was shown that the RSM may not be precise when the probability of failure was extremely small as well as the RSM requires a relatively long computation time as the number of random variables increases. Zhang and Foschi employed ANN for seismic reliability assessment of a bridge bent with and without seismic isolation, but in that case they used explicit limit states. However, most of them are utilized explicit and approximate limit states and more focused on the reliability assessment of components by ANN. In this regard, this study is focused on two separate parts; (1) localization and quantification of structural damages using ANN; (2) seismic reliability assessment of one structure using ANN-based MCS.

Figure 1. Most of the designs are of curved forms reminiscent of structures in biology and fractal mathematics.

The main purpose of **architectural design using Artificial Neural Networks** is to bring different components together into a whole functional building despite the given limitations. **Architectural** designers is considered one of the best ways or practices of planning and **designing** different buildings following a specific style. The established ANN is more economical and achieves reasonable accuracy in detection of structural damage under a set of ground motions. The ANN is trained by suing the Monte Carlo Simulation (MCS) and ANN technique. Finally, the trained neural network specifies the failure probability of the proposed structure. Although MCS can predict the failure probability for a given structure, the ANN model helps simulation techniques to receive an acceptable accuracy and reduce computational effort. Neural Computing & Applications is an international journal which publishes original research and other information in the field of practical applications of neural computing and related techniques such as genetic algorithms, fuzzy logic and neuro-fuzzy systems. All items relevant to building practical systems are within its scope, including contributions in the area of applicable neural networks theory, supervised and unsupervised learning methods, algorithms, architectures, performance measures, applied statistics, software simulations, hardware implementations, benchmarks, system engineering and integration and case histories of innovative applications.

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