prediction of a smart home heating energy consumption by adaptive neural – fuzzy inference system (ANFIS) optimization

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Abstract The importance of energy in increasing development of industry and economy has attracted so much attention such that the need to save it is very crucial every specially in developing countries. The waste of energy is more common in developing countries which makes the saving process more important. According to the recent studies, Using intelligent systems not only reduces energy consumption and running costs of buildings up to 20 percent, but also increases the life span of the utilities and reduces related costs by shutting down and controlling them. The control methods base on adaptive neuro-fuzzy networks can predict heating load consumption of a building and lead to improvement of energy efficiency of it. By Combining an ANFIS network with meta-heuristic optimization algorithms to improve training and testing implementation of the network. In this thesis, an ANFIS network has been chosen because of its numerous numerical efficiency, inferential capability and adaptation to adaptive and optimization methods. The database of this study has been extracted openei.org website which contains heating loads of a residential building thorough a 3-year period in San Diego, CA, USA. One of the most likely ways to optimize the structure of neuro-fuzzy network is by regulating the membership function parameters of inputs and outputs. Furthermore, every optimization problem need a criterion to measure the superiority of each member to another. In this case the modelling error is the most likely and the best measurable criterion. In this study, a standard ANFIS network has been optimized by use of Particle Swarm Optimization method and Genetic Algorithm. The improvement of mean square error of testing is 19.84% for PSO method and 9.04% for GA method over standard ANFIS network implemented in MATLAB. Finally, Improving the ANFIS network by use of PSO method not only leads to a better results but also has fewer run time (around a quarter).

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