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Neural Network-Ant Colony Optimization Model of Residential Building Project Cost: Exploratory Approach

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Abstract

Neural network and ant-colony are two important tools that could be used to provide solution in situation of multivariate environment that requires pareto optima solutions. In this study therefore, combination of neural network and ant colony method was used to generate an optimization cost model. Neural network is a conventional method currently being used in cost modeling, given its advantage over traditional regression method. It is based on this, that this study used the combination of neural network and regression method to model cost of residential building projects. One hundred and fifty (150) samples of residential building projects were selected at random and divided into two; one part is used in developing network algorithm for neural network and ant colony, while the second part is used for model validation. Neural network is used to generate which was divided into modules: the data optimization module, criteria selection with initializing and terminating modules. Regression analysis was carried out and model validated with Jackknife re-sampling technique and previously developed ant colony model (MOACO, MOTACO and MAWA). The co-linearity analysis indicates high level of tolerance and -0.0756 lowest variation prediction quotients to 0.8678 highest variation quotients. Also the Regression coefficient (R-square) value for determining the model fitness is 0.069 with standard error of 0.045. These results attests to the fitness of the model generated. The model is flexible in accommodating new data and variables, thus, it allows for continuous updating.

Keywords: Expert system, Co-linearity, Informatics, Residential-Building.

1.1 Cost Modeling: Historical Perspective

Cost model in construction parlance model can be described as systematic arrangement of project cost center into cost packets for easy manipulation with aid of figures and symbols. Floor area method was discovered in early nineteenth century, while storey enclosure method was developed in 1954. (Skitmore 1990). However, storey enclosure method was discovered to be more accurate in cost estimating than cube and floor area methods (Skitmore 1990). Cost modeling technique using statistical techniques was evolved around mid 1970-1979, this includes the use of approximate quantity and optimized models. Validating the applicability of developed model was the order of the day, given the seemingly applicable nature of models generated, while the models were classified as hedonic model (Rosen 1974). However, Rosen (1974) laid the foundation for the application of model in hedonic form and application of regression-based models. Also, regression models are found to be limited in application as a result of their non-flexible nature and margin of error between input and output, this fact induced paradigm shift later shifted in the direction of application of expert system as Brandon (1987) advocated, the development favored expert system application such as neural network, neuro- fuzzy, ant colony among others. The development was aided by good