Neuro-Fuzzy Cost Estimation Model Enhanced by Fast Messy Genetic Algorithms for Semiconductor Hookup Construction

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Abstract

Semiconductor hookup construction (i.e.,constructing process tool piping systems) is critical to semiconductor fabrication plant completion. During the conceptual project phase, it is difficult to conduct an accurate
cost estimate due to the great amount of uncertain cost items. This study proposes a new model for estimating semiconductor hookup construction project costs. The developed model, called FALCON-COST, integrates the component ratios method, fuzzy adaptive learning control network (FALCON), fast messy genetic algorithm (fmGA), and three-point cost estimation method to systematically deal with a cost-estimating environment
involving limited and uncertain data. In addition,the proposed model improves the current FALCON by devising a new algorithm to conduct building
block selection and random gene deletion so that fmGA operations can be implemented in FALCON. The results of 54 case studies demonstrate that the proposed model has estimation accuracy of 83.82%, meaning it is approximately 22.74%, 23.08%, and 21.95% more accurate than the conventional average cost method, component ratios method, and modified FALCON-COST method, respectively. Providing project managers with reliable cost estimates is essential for effectively controlling project costs.

Keyword：Semiconductor hookup construction, semiconductor process tool, cost estimates,