Application of Genetic Algorithm on IC Substrate Drilling Path Optimization

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ABSTRACT

In IC substrate industry, the drilling operation requires the longest processing time because of large quantities of holes to be drilled. Depending on the sizes and types of ICs, there can be various numbers of substrates in one panel of copper clad laminate. Usually, about 1000 IC substrates can be produced from one panel, and there are probably 100 holes on each IC substrate. Therefore, one panel of copper clad laminates contains tens of thousands of holes. Due to the enormous number of holes, this drilling path problem becomes a large scale traveling salesman problem.

This research focuses on the drilling path problem with massive number of holes in IC substrate industry. Incorporating with the repeating design pattern on a panel, the genetic algorithm is applied to develop three algorithms: single-substrate, two-substrate, and local fine-tune. Numerical experiment containing test problems with real data collected from the case company is conducted. The experimental results are compared to the solutions obtained by the computer software currently used by the case company. It shows that the proposed algorithms are able to provide solutions with good quality within reasonable run time. Furthermore, in many cases, the proposed algorithms outperform the software currently in use and the improvement percentage is as large as 7.5%.

Keyword: IC substrate   Drilling path optimization   Genetic algorithm   TSP