Application of MAX-MIN Ant System on IC Substrate Drilling Path Optimization

Student：Shih-Hsiung Wu   Advisor：Dr. Chi-Yang Tsai

Institute of Industrial Engineering and Management
Yuan-Ze University

ABSTRACT

In a highly competitive market of IC substrate industry, rapid delivery is one of the major factors for success. This research studies the drilling path problem in the drilling process of IC substrate. Usually, tens of holes are to be drilled on an IC substrate and there are about 1,000 substrates on a piece of copper clad laminate. A drilling path that connects the tens of thousands of holes on a piece of copper clad laminate has to be laid out for the drilling process. A drilling path of shorter length is desired to reduce operation time. Thus, this problem is usually treated as 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 Max-Min Ant System is applied to develop two methods: single-substrate-sequential and various-link. Numerical experiment with cases from Liu (2009) is conducted. Results are compared to those reported by Liu (2009) who proposed a genetic algorithm approach to the same problem. It is shown that single-substrate-sequential method is able to effectively obtain the approximate optimal value similar to the solutions of case company. Furthermore, the various-link method successfully improves execution time and solution stability.

Keyword: IC substrate、Drilling path optimization、Max-Min Ant System、TSP