A Study on the Efficient Operation of a Component-Mounting Machine in a PCB Assembly Process

손 진 현, 박 성 수
한국과학기술원 산업공학과

ABSTRACT

Nowadays, automatic surface mounting devices are increasingly being used in the electronic printed circuit board (PCB) assembly process. We consider the problem of minimizing the operation time to assemble a PCB using an automatic component-mounting machine which has a turret with multi-gripper.

The problem can be considered as a composite problem which consists of the traveling salesman problem and the quadratic assignment problem. We need to study two different aspects of the problem, which are the optimal permutation of the reels in a rack and the optimal mounting sequence of the components with a fixed reel-allocation. First, we compose an initial allocation of reels and component-mounting sequence. Next, we concurrently consider pair-exchange of reels and adjustment of mounting sequence to get improved solutions.

To evaluate the algorithm, we applied it to real industrial problems (having 327 and 583 components) and a problem found in open literature. We present computational results and give some comment on the difference between multi-gripper and single gripper instances.