Component Pick-and-Place Scheduling robot

Abstract – This work focuses on improving the throughput of a pick-and-place surface mount device placement machine. These machines are designed to place electronic components onto a printed circuit board. The machines considered in this work are economical and medium speed machines that have four fixed feeder carriers, a fixed printed circuit board table, two vision cameras, a tool bank, a trash bin and a positioning arm head (i.e. a head that is moveable in both X and Y axes simultaneously) that is equipped with two pipettes. As nozzle change operations are very time consuming, the constructive heuristic presented in this paper gives priority to reducing the number of nozzle change operations in order to schedule the component pick-and-place operations when assembling printed circuit boards. Based on the average machine operation time, provided by the machine manufacturer, we compute the effectiveness of each pick-and-place operation type and assign a weighted value for each type of the operation. The nozzle pairs are ranked based on their effectiveness that indicates how many good pick-and-place operations can be performed by the nozzle pair. The heuristic begins by choosing the best nozzle pair to be applied. Next, we schedule the pickup-and-placement of all points that are expecting components from the chosen nozzle pair. Based on the availability of component feeders and the remaining placement points to be scheduled, we then re-rank the nozzle pairs and the procedure is repeated. Computational results show that, on average, a weighted nozzle rank heuristic is superior to an *Ordered* heuristic that was presented in our previous work.