

Development of improved bottleneck-based heuristic for re-entrant flow shop with dominant machine at M1 and M4

Abstract

This project investigates the possibility of developing scheduling heuristic using bottleneck approach for a four machine permutation re-entrant flow shop with the process routing of M1,M2,M3,M4,M3,M4 where M1 and M4 have high tendency of being dominant machine. Due to the re-entrant and permutation nature of the process routing, the actual bottlenecks were identified as M1 and combinations of M4+M3+M4 and it utilized two makespan algorithms to identify bottleneck categories. Each algorithm was only valid under several conditions identified as absolute bottleneck conditions. Using these conditions, a new bottleneck based heuristic which called NH is developed and tested using Macro Programming in Microsoft Excel. A total of 3000 simulations were conducted using randomly data in order to evaluate the accuracy of the heuristic. The heuristic performance was evaluated for six and ten job problems. The dominance level groups are divided into levels of weak, medium and strong dominance. For each job problem, the NH results were compared with previously developed absolute bottleneck adjacent matching (ABAM) heuristic. For six job problems, it was shown that the NH performances at medium dominance level are better than ABAM. For ten job problems, the result indicated that NH only produced better result than ABAM at the strong dominance level.