MACHINE LOADING OPTIMIZATION IN FLEXIBLE MANUFACTURING SYSTEM USING A HYBRID OF BIO-INSPIRED AND MUSICAL-COMPOSITION APPROACH

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Abstract

Manufacturing industries are facing mere challenges in handling product competitiveness, shorter product cycle time and product varieties. The situation poses a need to improve the effectiveness and efficiency of capacity planning and resource optimization while still maintaining their flexibilities. Machine loading - one of the important components of capacity planning is known for its complexity that encompasses various types of flexibilities pertaining to part selection, machine and operation assignment along with constraints. Various studies are done to balance the productivity and flexibility in flexible manufacturing system (FMS). From the literature, the researchers have developed many approaches to reach a suitable balance of exploration (global improvement) and exploitation (local improvement). We adopt hybrid of population approaches; Hybrid Genetic Algorithm and Harmony Search algorithm (H-GaHs), to solve this problem that aims on mapping the feasible solution to the domain problem. The objectives are to minimize the system unbalance as well as increase throughput while satisfying the technological constraints such as machine time availability and tool slots. The proposed algorithm is tested for its performance on 10 sample problems available in FMS literature and compared with existing solution approaches.

Keywords: Flexible manufacturing system, Machine loading, System unbalance, Throughput, Hybrid Genetic Algorithm and Harmony Search