An Automated Optimal Robotic Assembly Sequence Planning Using Artificial Bee Colony Algorithm

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Abstract : Robots play an important role in the operations like pick and place, assembly, spot welding and much more in manufacturing industries. Out of those, assembly is a very important process in manufacturing, where 20% of manufacturing cost is wholly occupied by the assembly process. To do the assembly task effectively, Assembly Sequences Planning (ASP) is required. ASP is one of the multi-objective non-deterministic optimization problems, achieving the optimal assembly sequence involves huge search space and highly complex in nature. Many researchers have followed different algorithms to solve ASP problem, which they have several limitations like the local optimal solution, huge search space, and execution time is more, complexity in applying the algorithm, etc. By keeping the above limitations in mind, in this paper, a new automated optimal robotic assembly sequence planning using Artificial Bee Colony (ABC) Algorithm is proposed. In this algorithm, automatic extraction of assembly predicates is done using Computer Aided Design (CAD) interface instead of extracting the assembly predicates manually. Due to this, the time of extraction of assembly predicates to obtain the feasible assembly sequence is reduced. The fitness evaluation of the obtained feasible sequence is carried out using ABC algorithm to generate the optimal assembly sequence. The proposed methodology is applied to different industrial products and compared the results with past literature.

Keywords : assembly sequence planning, CAD, artificial Bee colony algorithm, assembly predicates

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