**PARTICLE SWARM OPTIMIZATION (PSO) FOR**

**MACHINE LOADING PROBLEM IN FMS**

In flexible manufacturing systems (FMSs), the loading problem is considered as a vital pre-release decision because its operational effectiveness largely depends on a good quality solution to the loading problem. Decision making problems in FMS can be divided into four stages such as design, planning, scheduling and control.

The machine-loading problem of FMS has been recognized as one of the most important planning problems. The problem is to assign the machines, the operations of the selected jobs and the tools necessary to perform the operations by satisfying the technological constraints (available machines in the scheduling period and tool slots in the machines) in order to ensure maximum utilization of machines when the system is in operation.

In the past, numerous techniques have been suggested and found to be efficient, but they take long computational times when the problem size increases. In order to address the above issues, a meta-heuristic approach based on particle swarm optimization (PSO) has been proposed in this thesis to improve the solution quality and reduce the computational effort.

The proposed algorithm attempts to minimize the system unbalance and maximize the throughput while satisfying the technological constraints, such as the availability of machining time and tool slots. The proposed algorithm produces promising results in comparison to existing methods for the same machine loading problem available in the FMS literature.

In computer science, particle swarm optimization (PSO) is a computational method that optimizes a problem by iteratively trying to improve a candidate solution with regard to a given measure of quality.

PSO optimizes a problem by having a population of candidate solutions, here dubbed [particles](http://en.wikipedia.org/wiki/Point_particle), and moving these particles around in the [search-space](http://en.wikipedia.org/wiki/Optimization_(mathematics)#Concepts_and_notation) according to simple [mathematical formulae](http://en.wikipedia.org/wiki/Formula) over the particle's [position](http://en.wikipedia.org/wiki/Position_(vector)) and [velocity](http://en.wikipedia.org/wiki/Velocity). Each particle's movement is influenced by its local best known position and is also guided toward the best known positions in the search-space, which are updated as better positions are found by other particles. This is expected to move the swarm toward the best solutions.