

**MULTI-AGENT BASED DYNAMIC SCHEDULING SYSTEM
FOR MANUFACTURING**

G.B. Prabash Darshanapriya

168280B

Degree of Master of Science in Artificial Intelligence

Department of Computational Mathematics

University of Moratuwa

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G.B. Prabash Darshanapriya

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Thesis submitted in partial fulfilment of the requirements for the degree of Master of Science
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Declaration

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Name of Student

G.B. Prabash Darshanapriya

Signature of Student:

Date:

The above candidate has carried out research for the Master's Dissertation under my supervision.

Name of Supervisor

Prof. A.S. Karunananda

Signature of Supervisor:

Date:

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Abstract

Manufacturing scheduling is considered one of the hardest scheduling problems due to its highly dynamic and uncertain nature. The existing approaches for dynamic scheduling with machine learning techniques require a large amount of past-data to be analysed, which results in a substantial amount of time taken to generate schedules.

This study aims to discuss the DynoSchedule system in resolving this highly complex scheduling problem in manufacturing organizations with the help of Multi Agent Technology. In the developed system, depending on the structure of the organization, Agents are generated dynamically for handling of Orders, Machinery (Work-centres). Each of these Agents communicate in an advanced market-like negotiation mechanism considering different factors and try to schedule operations of an order while meeting the required constraints in a greedy manner. However, there's a Manager Agent who oversee the communication and prioritize the requests by evaluating a set of criteria. In addition, the DynoSchedule system introduces the novel concept of Prioritized-Adaptive Scheduling mechanism, an extension to the existing Adaptive Scheduling algorithm, alongside the market-like negotiation mechanism, which makes dynamic scheduling more efficient and effective. The developed DynoSchedule system has been critically evaluated by comparing it with a dataset acquired from a different scheduling system that uses a combination of manual and dynamic scheduling to solve issues that arise due to planned and unplanned interruptions on work centres, or part unavailability. Various indicators such as the percentage of orders to-be-completed on-time, the percentage of tardy orders, work centre availability, Overall Equipment Effectiveness (OEE) and the amount of time taken for the dynamic scheduling process, were considered when evaluating the system. From the obtained results, it was evident that the DynoSchedule system delivers well in terms of the number of orders delivered on-time, the work centre utilization as well as the OEE, providing impressive results.

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