



## **SOLUTION OF TASK SCHEDULING PROBLEM FOR AUTONOMOUS TRANSFER VEHICLES ON GPU-CPU AND PERFORMANCE EVALUATION**

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### **Abstract:**

Autonomous transfer vehicles (ATVs) are critical components of Industry 4.0. They help realizing flexible manufacturing systems in an efficient way. It is very important to have a fast problem solution for task scheduling of ATVs. However, task scheduling is a NP-hard problem, and finding a proper solution takes a long time using classical methods. In order to find a solution in a reasonable time, meta-heuristic algorithms are widely used. They provide an acceptable balance between solution quality and time spent. Additionally, GPUs are highly effective for making computations on vectors and matrices. Since meta-heuristic algorithms generally use vectors for their solution data structure, GPUs help decreasing the solution time of these algorithms.

In this study, it was aimed using the parallel computational power of GPUs for solving task scheduling problem of ATVs. Simulated Annealing (SA) Algorithm was implemented on CUDA toolkit. It provides libraries and software tools for this purpose. Also, it is the most widely used tool for GPU programming. The challenge includes making problem suitable for parallel computation. Firstly, the sub-steps of the SA Algorithms that includes vector or matrix operations was determined. Then, these parts were implemented on GPU while the remaining was implemented on CPU. The overall solution was also compared to CPU-only solution to find the savings.

**Keywords:** Simulated Annealing, GPU, CUDA, ATV, Task Scheduling

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