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Sentient OS : AI-Enhanced CPU Scheduling in Modern Operating Systems

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Abstract: *Successful process scheduling is critical in mul- titasking operating systems. It provides high CPU utilization, reduced waiting time, reduced turnaround time, and improved responsiveness. Round Robin (RR) is among the most widely used scheduling algorithms today due to it being easy to implement and equitable. RR has a significant drawback, though: it is based on a fixed time quantum that does not change according to varying process burst times. This results in sub-optimal performance, heavy context switching, and poor utilization of resources when processes have significantly diverse execution times.To address these challenges, this paper introduces the Absolute Difference Based Time Quantum Round Robin (ADRR) scheduling algorithm. ADRR is a dynamic method that varies the time quantum according to absolute differences in process burst properties. Through this, ADRR addresses long and short processes. It eliminates unnecessary preemptions and guarantees that no process goes hungry for CPU time. The suggested method also employs machine learning to enhance scheduling decisions. Using a supervised decision tree-based learning model to predict CPU burst times, the scheduler can select time quanta that are a closer fit to process requirements. Upon execution and observation of the simulation, we compare the performance of the novel ADRR algorithm with standard Round Robin scheduling. Experimental evidence demonstrates that ADRR reduces average waiting time, turnaround time, and context switching overhead substantially while maintaining fairness and enhancing CPU efficiency.These results demonstrate the advantages of combining artificial intelligence techniques with adaptive scheduling. They show how machine learning is utilized to enhance the perfor- mance of contemporary operating systems.*

Keywords: Operating systems, Sentient OS, Round Robin, Dynamic Time Quantum, Machine Learning, Decision Trees, CPU Scheduling, and Adaptive Scheduling

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