

PROJECT PROPOSAL

Operating System Simulator to visualize various scheduling algorithms

Team Name: Kernel

Group Code: 8ETR

Team Members:

- 1. Pauravi Nagarkar**
- 2. Bharti Prakash**
- 3. Jash Hemant Shah**

Summary

We are proposing to create an Operating System Simulator Application in Python. We are creating desktop applications to simulate working of Operating System, on which different processes are executed as per different scheduling algorithms like First in first come first serve, shortest job scheduling first, Round Robin for preemptive as well as non-preemptive. We are not just executing processes on traditional scheduling algorithms but also dynamic and more efficient versions of these scheduling algorithms so that users get a clear understanding of the trade off between efficiency, speed, and complexity of execution.

We will Compare execution timelines of each scheduling algorithm using gantt chart & graph.

Our focus is to show advantages and disadvantages of these algorithms in different scenarios

We are also planning to implement Banker Algorithm and provide a What If mode in our OS application, in this what If mode each process declares the types of resources it requires, we will simulate resources by log files. Given the set of log files and their lines each process has read/processed, and the max resources/logs required by the process to complete the processing the OS would be able to determine a Safe/Unsafe state for the system and give out the job execution order. Later the users can do actual submission of these jobs and simulate processing.

Rationale for the project:

The overall objective of this Course is to understand and use the basics of operating systems. In the course we mainly talk about various kinds of operating systems, which acts as an interface between machine and programmer. This course introduces us to very important topics like process management, synchronization, and memory management. So basically, An operating system acts as an intermediary between the user of a computer and the computer hardware. It is very difficult from the perspective of a student to imagine what is exactly going inside the operating system, how different scheduling algorithms work and how are jobs scheduled, in which scenarios which will be the best scheduling algorithm to be used. so, in this project we are creating an operating system simulator.

Using this simulator, we can describe the services an operating system provides to users, processes, and other systems. We will also discuss the various ways of structuring an operating system which is also the goal of studying this course. The intent is to introduce the notion of a process, which forms the basis of all computation. We also construe the various features of processes, including scheduling, creation and termination, and communication. With the assistance of a simulator, introduction to the notion of a thread—a fundamental unit of CPU utilization that forms the basis of multithreaded computer systems will be effortless to understand. With covering all the align scheduling algorithms covered during course we are also studying and implementing dynamic round robin algorithm, to understand how a better CPU scheduling algorithm results in faster OS performance using minimal resources over small amounts of time.

With a proper visualization we want the class to understand how different scheduling algorithms work and how different scheduling algorithms differ in runtime based on n factors. Also with help of visual simulation overall comprehension of the Operating system will be transparent/simple.

The successful student will be able to understand the basic components of an operating system, whose processes are distributed, and how preemptive and non-preemptive algorithms work for different processes. For a given scenario which process which completes the execution first, why and how will it affect the throughput & efficiency of the CPU.

Specific goals of the project:

- Application will act as an Operating System which will be able to take in the process of executions as the input from the user.
- Processes will be created as a thread in this application.
- In this simulation OS will be the main thread, and each process taken up by the OS for execution will be a new thread.
- To simulate the working of the resources and processes, processes will be reading from long log files, where these log files will be the resources.
- IO lags will be simulated by timed random delays between reading each line from the log files.
- Several Job Scheduling Algorithms will be implemented to display the working of the operating system for scheduling these processes.
- These Algorithms will display both their non-preemptive and pre-emptive job scheduling capabilities, to do a comparative analysis of their behavior.
- All the Algorithms working will be made understandable to the user through gnat chart and graphs for comparative analysis among different scheduling algorithms.
- There will also be an implementation of Banker Algorithm which will provide a What If mode in our application, through this what If mode each process declares the types of resources it requires. Given the set of log files(resources) and their lines each process has read/processed, and the max resources/logs required by the process to complete the processing this application will determine a Safe/Unsafe state for the system and give out the job execution order. Later the users can do actual submission of these jobs and simulate processing.

A detailed plan of activities:

Activities	Responsibilities	Our due data
Finding and reading the research paper for the topic.	Jash, Bharti, Pauravi	10/15/2022
Finalizing the project topic.	Jash, Bharti, Pauravi	10/20/2022
Writing a formal project proposal.	Jash, Bharti, Pauravi	10/21/2022
Deciding on the implementation languages and the libraries to use	Jash, Bharti, Pauravi	10/22/2022
Deciding on a user interface design that best demonstrates the performance of various algorithms in the most user-friendly manner	Jash, Bharti, Pauravi	10/25/2022
Finding the correct candidates of scheduling algorithms for the implementations of the project.	Jash, Bharti, Pauravi	10/29/2022
Understand the nuances of all scheduling algorithms.	Jash, Bharti, Pauravi	11/03/2022
Creating the test cases for each and every algorithm.	Jash, Bharti, Pauravi	11/07/2022

Creating the resource files which would specify the resources being used by the processes.	Jash, Bharti, Pauravi	11/09/2022
Creating a final executable version of the project	Jash, Bharti, Pauravi	11/20/2022
Test the project for any errors	Jash, Bharti, Pauravi	11/25/2022
Make a PowerPoint presentation for the project.	Jash, Bharti, Pauravi	11/28/2022

Description of the final product:

- The simulator for the operating system which will simulate each process as a thread.
- It will execute the processes based on various scheduling algorithms.
- The simulation will also help us understand the working of these algorithms and how short-term schedulers schedule the job.

References:

- <https://github.com/rrrokhtar/Visual-OS-Scheduler>
- <https://github.com/shouryaraj/Process-scheduling-simulator>
- J. D. Northcutt, "Mechanisms for Reliable Distributed Real-Time Operating Systems: The Alpha Kernel" in , Academic Press, 1987.
- P. K. Saraswat and P. Gupta, "Design and Implementation of a Process Scheduler Simulator and an Improved Process Scheduling Algorithm for Multimedia Operating Systems," 2006 International Conference on Advanced Computing and Communications, 2006, pp. 513-517, doi: 10.1109/ADCOM.2006.4289946.
- S. Cahya, "Designing Operating System Simulator: A Learning Tool," 2009 11th International Conference on Computer Modeling and Simulation, 2009, pp. 156-160, doi: 10.1109/UKSIM.2009.92.
- A. Alsulami, Q. A. Al-Haija, M. I. Thanoon and Q. Mao, "Performance Evaluation of Dynamic Round Robin Algorithms for CPU Scheduling," 2019 SoutheastCon, 2019, pp. 1-5, doi: 10.1109/SoutheastCon42311.2019.9020439.