23XT54 - Design and Analysis of Algorithms

Runway Scheduling Problem

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ABSTRACT:

Air traffic control is one of the most important tasks in aviation, especially at busy airports like London Heathrow, where many aircraft wait to land every few minutes. Each aircraft must land within a certain time window and also maintain a safe distance from the aircraft ahead of it. If the schedule is not managed properly, it can cause long delays and inefficient use of the runway. This project is based on the research paper **Scheduling Aircraft Landings at London Heathrow Using a Population Heuristic** by **J.E. Beasley**, **J. Sonander**, and **P. Havelock**, published in the **Journal of the Operational Research Society (2001)**.

The paper explains how a population heuristic algorithm can be used to improve the landing sequence of aircraft. This approach uses ideas from natural evolution to find better solutions for difficult scheduling problems. Instead of checking every possible order of aircraft, the algorithm works with a group of possible schedules, improves them step by step, and gradually finds an efficient landing order. It considers important factors such as target landing times, safety gaps between aircraft, and available time windows.

In this project, the same algorithm will be implemented using **C++**. The program will take input details of aircraft such as earliest and latest landing times and required separation times. It will then generate a sequence that satisfies all safety conditions while trying to reduce the total landing time and waiting delays. The main goal is to show how heuristic-based optimization can help solve complex real-life scheduling problems using algorithmic techniques learned in the course.

This project will follow the logic of the research work and test the algorithm with suitable input data. It aims to provide a simple and clear demonstration of how population heuristics can improve runway scheduling efficiency using a practical and computational approach.