



UNIVERSITI
TEKNOLOGI
PETRONAS

TEB1113/TFB2023: ALGORITHM & DATA STRUCTURE

Performance Report on Drone Swarm Simulation (Homework 3)

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1.0 DEVICE SPECIFICATIONS

Model: Legion S7

RAM: 32 GB

Storage: 1 TB

Processor: AMD Ryzen 9 5900HX

GPU: Radeon Graphics

Operating System: Windows 11

2.0 APPLICATION DOMAIN

2.1 Introduction

The purpose of this project is to create a fire-extinguishing drone swarm simulation in Unity, designed to mimic real-world scenarios where autonomous drones are deployed to fight fires in large, complex environments. Each drone in the swarm is equipped with a fire extinguisher, and the simulation focuses on monitoring and dynamically adjusting the swarm's behavior based on each drone's fire extinguisher capacity. This allows the simulation to showcase how these drones can effectively distribute resources during emergency situations.

One key aspect of the project is the implementation of an efficient O(N) algorithm to partition the drone swarm into two subgroups based on their fire extinguisher capacities. This partitioning ensures that drones with higher capacities are grouped separately from those with lower capacities, enabling the system to prioritize resources when needed. Drones with higher capacities are assigned blue sprites, while those with lower capacities are assigned red sprites for easy visualization of their roles within the swarm.

The simulation also integrates real-time performance monitoring, capturing key metrics such as partitioning time and frames per second (FPS) to assess the efficiency of the drone swarm in handling firefighting tasks. Additionally, visual enhancements have been made to the drones and the environment to improve the overall realism of the simulation, making it a more accurate representation of a fire emergency response system. The project not only demonstrates the potential of autonomous drone swarms in firefighting but also highlights the importance of optimizing resource allocation and maintaining performance in real-time operations.

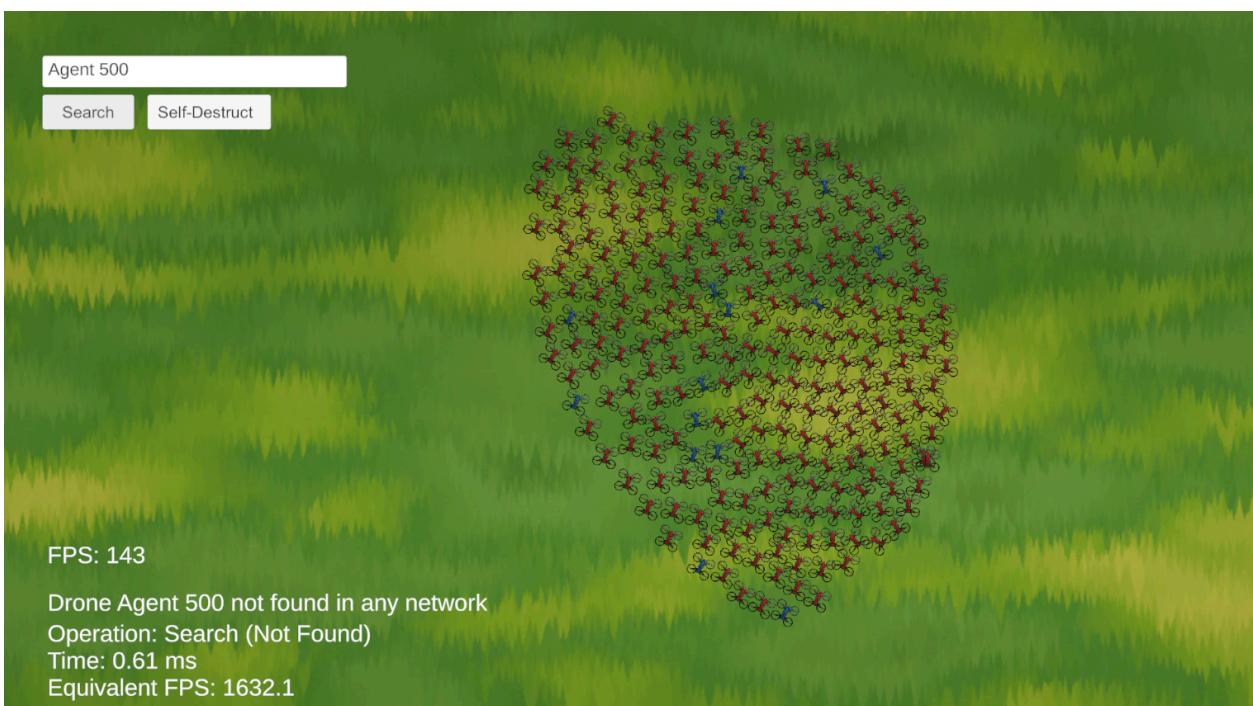
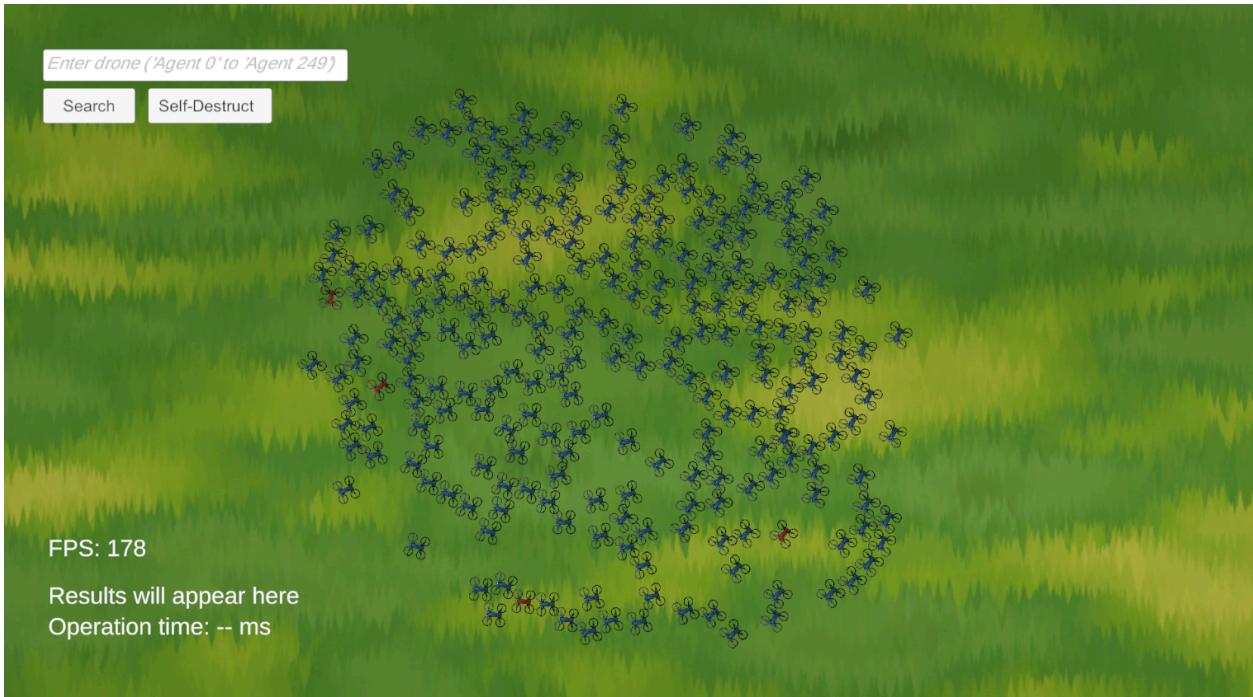
2.2 Performance Analysis

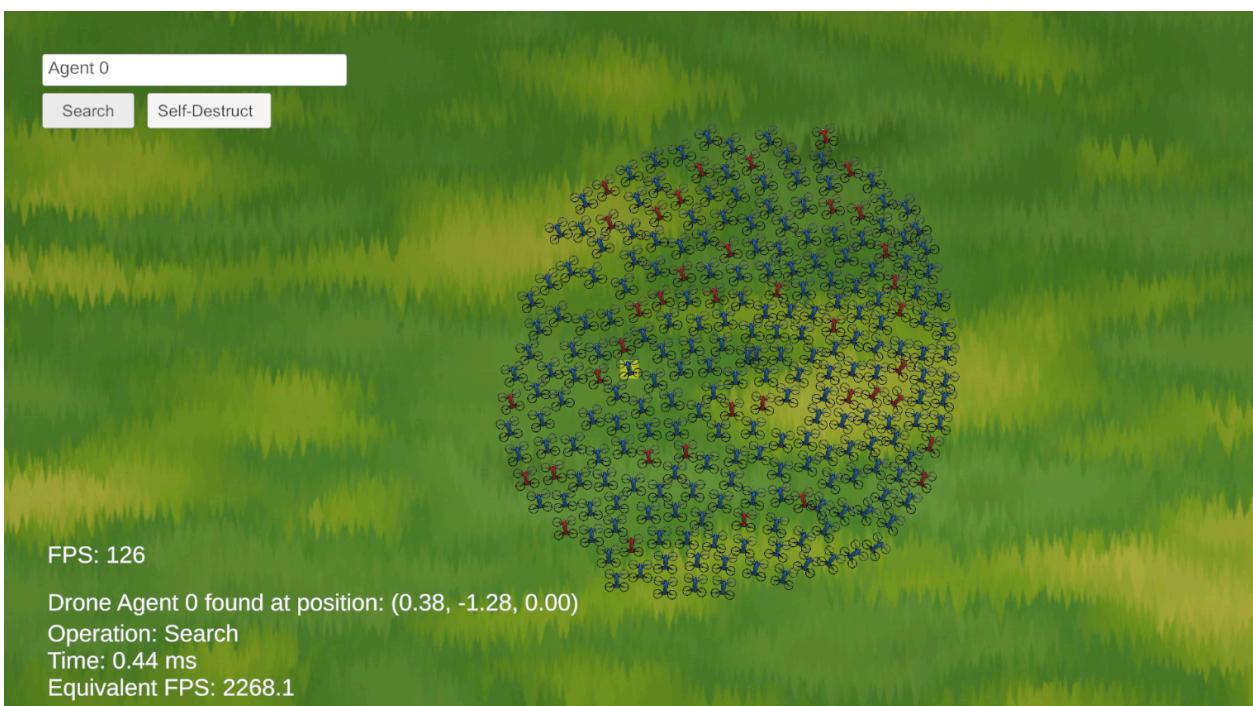
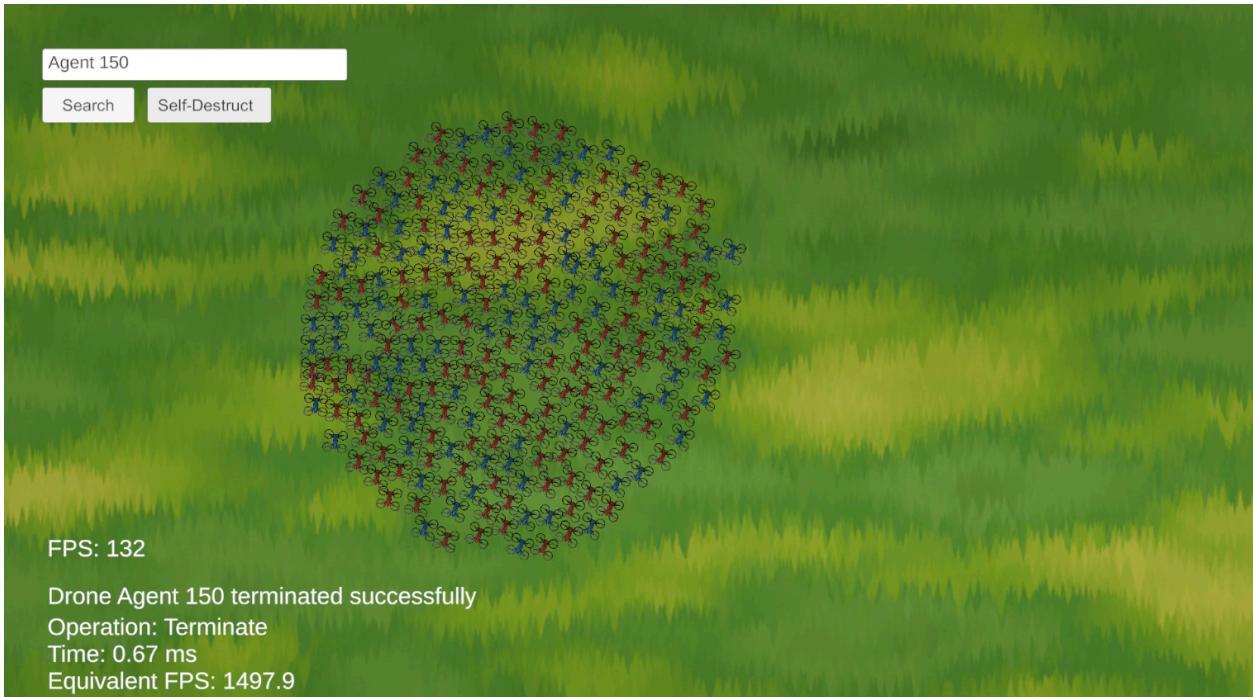
The application running on this PC achieves high frame rates (FPS), with values around 149–150 and reaching an equivalent FPS of up to 2667.4 during certain operations. The system's performance is efficient, with response times for search and terminate operations ranging from 0.37 ms to 0.67 ms, suggesting that the software operates smoothly without noticeable lag.

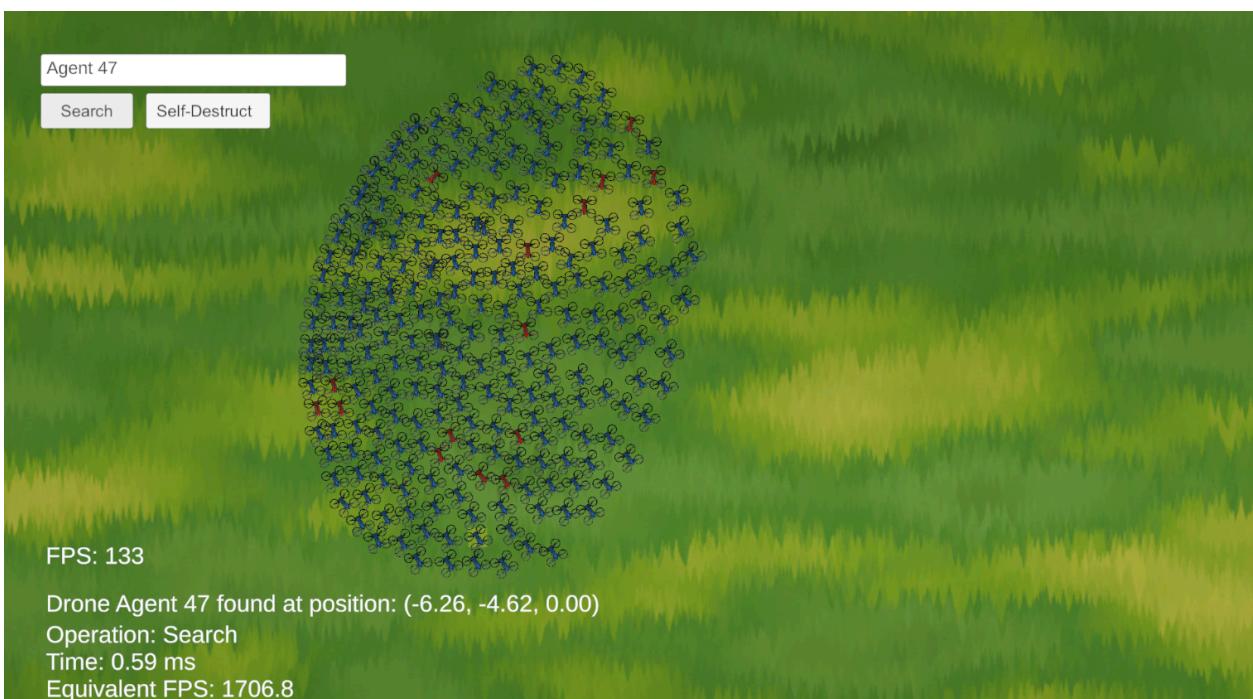
Given the Legion S7's specifications, including 32 GB of RAM, the powerful AMD Ryzen 9 5900HX CPU, and Radeon Graphics, it handles these operations effectively, likely due to both the high core count of the processor and sufficient memory. However, if the application demands higher graphic processing power for more complex visuals, the Radeon Graphics could become a limiting factor compared to dedicated GPUs like NVIDIA's RTX series. Overall, the Legion S7 performs well with this simulation, managing the workload with minimal delay and high responsiveness.

2.3 Screenshot(s)









2.4 Asset Images



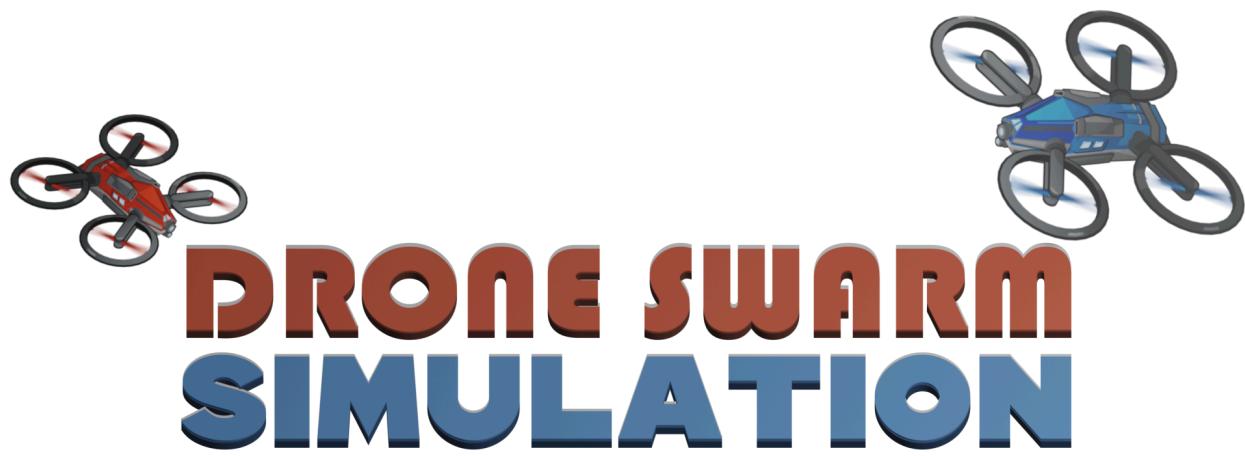
Drone Models (Isometric and Top View)



Background (Seamless Stylised Grass Texture)



Start Button (Unpressed and Pressed)



Title