

Report for assignment 8

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1. Pseudo Code

$temp = heap.hp[1]$

If time in temp is higher than given time, break

If invalid, goto beginning

$heap = deletemin(heap)$

Loop for updating positions

$fsave(STATE, temp, prep)$ Saving to File

$vcol(STATE, temp.a, temp.b)$ Collision Velocity Calculation if a and b are colliding

Using $heap = insert(heap, col)$ for adding new collisions into heap

goto beginning

2. Key Operations and the heap structure

The key operations are :

$heap = insert(heap, col)$

$heap = deletemin(heap)$

$insert$ inserts an element into the heap

$deletemin$ deletes the minimum element in the heap

The data structure for the variable $heap$ contains :

$heapnode * hp$

$int n$

n corresponds to the size of the heap

$*hp$ corresponds to an array which is dynamically allocated later

The heap is essentially an array

The data structure for the variable hp contains :

Details of 2 colliding particles

Time of collision

3. Time Complexities of Heap Operations

$insert$ is done by simply placing the element at end and percolating upwards

Time Complexity = $O(\log(n))$

deletemin removes the top node, replaces it with last node and percolates down

Time Complexity = $O(\log(n))$

4. **Time Complexity of Complete Simulation Run**

deletemin happens only once

insert happens at most 8 times for each of the colliding balls with remaining three balls and with a wall

Time Complexity = $O(\log(n))$