DAA432C ASSIGNMENT 02

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PROBLEM STATEMENT

Use divide and conquer to find stain in a cloth image. Take assumption for cloth image by your own.

ALGORITHM (DIVIDE AND CONQUER)

- The divide and conquer is a classic algorithm that has been used to implement a variety of useful algorithms.
- We will be using the binary search algorithm which also uses the divide and conquer algorithm.
- The basic steps include:
    - Divide: Break the given problem into subproblems of same type.
    - Conquer: Recursively or iteratively solve these problems.
    - Combine: Appropriately combine the answers.

ALGORITHM IMPLEMENTATION

- Following are the cases that we consider in our algorithm Every time we go to the middle element and decide our next move based on the following cases :
    - Case 1: If the middle element is smaller than the element on the left side and also smaller than the element on the right side then it is the least element in that row.
    - Case 2: If the middle element is not the least element, then check if the element on the left side is greater than the middle element then we will search on the right side of the middle element.
    - Case 3: If the element on the right side is greater than the middle element then we will search on the left side of the middle element. Until the case 1 is satisfied and lo is lesser or equal to hi the above cycle is repeated.

TIME COMPLEXITY ANALYSIS

Time Complexity:

- Time complexity is the number of operations an algorithm performs to complete its task (considering that each operation takes the same amount of time). The algorithm that performs the task in the smallest number of operations is considered the most efficient one in terms of the time complexity.
- We are iterating each row and then using binary search we are finding out the minimum element in the row so the overall time complexity would be O(mlogn) where m = number of rows, n = number of columns.

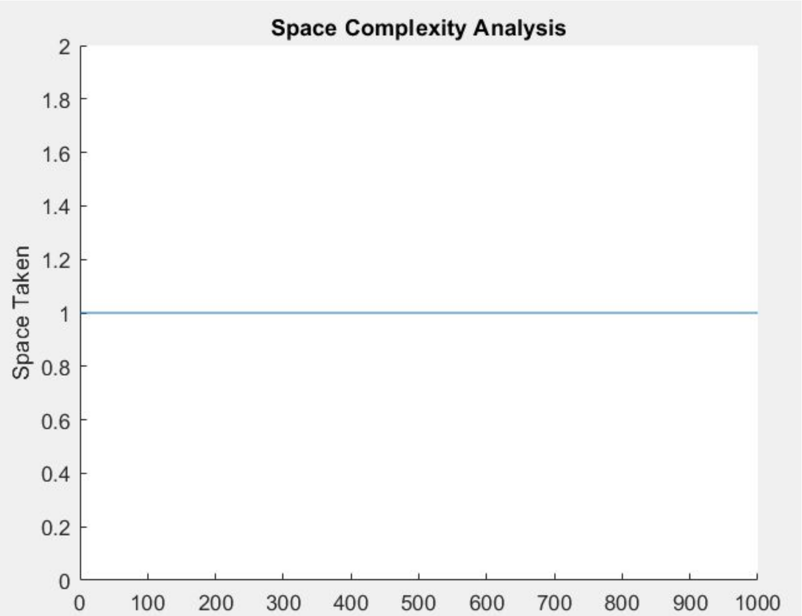
SPACE COMPLEXITY ANALYSIS

Space Complexity:

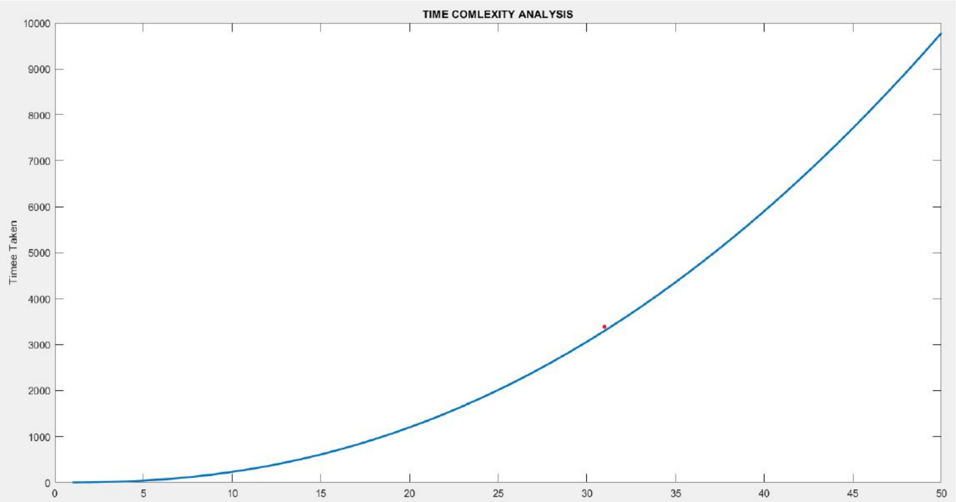
- The space complexity of an algorithm is the amount of memory space required to solve an instance of the computational problem as a function of characteristics of the input. It is the memory required by an algorithm until it executes completely.
- Since we have not used any extra data structure in our algorithm so the space complexity would be O(1).

TIME AND SPACE COMPLEXITY GRAPHS

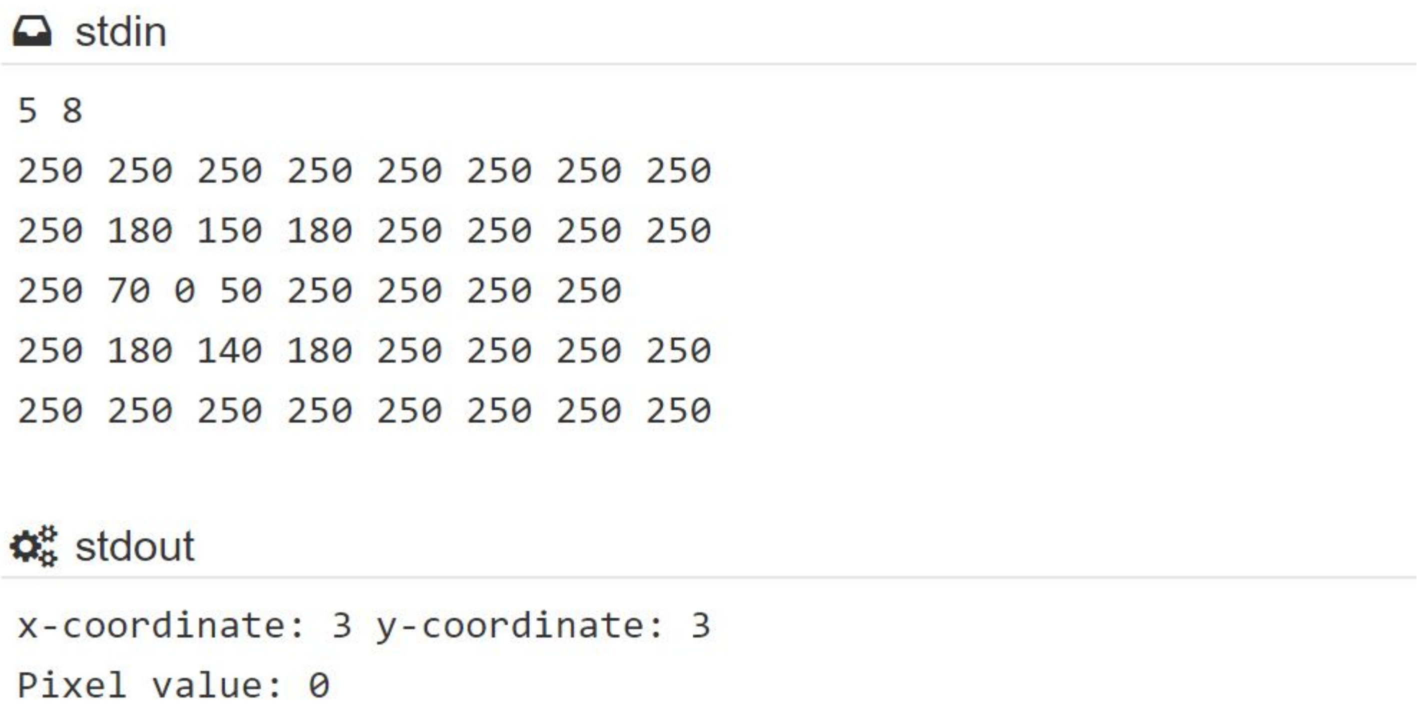
Space Complexity Graph:



Time Complexity Graph:



RESULTS



```
5 8
250 250 250 250 250 250 250 250
250 180 150 180 250 250 250 250
250 70 0 50 250 250 250 250
250 180 140 180 250 250 250 250
250 250 250 250 250 250 250 250
```

```
x-coordinate: 3 y-coordinate: 3
Pixel value: 0
```