**SUMMARY**

## USC ID/s: 2143749103, 4727109268, 4371197245

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| --- | --- | --- | --- | --- |
| M+N | Time in MS (Basic) | Time in MS (Efficient) | Memory in KB (Basic) | Memory in KB (Efficient) |
| 16 | 0 | 0 | 14172 | 14532 |
| 64 | 1.997232 | 1.997709 | 14176 | 14396 |
| 128 | 2.997637 | 8.998394 | 14196 | 14412 |
| 256 | 19.0022 | 29.97828 | 14620 | 14444 |
| 384 | 33.00333 | 236.9974 | 15500 | 14564 |
| 512 | 166.9965 | 143.0094 | 16892 | 15016 |
| 768 | 168.0019 | 387.995 | 20296 | 15420 |
| 1024 | 299.0015 | 599.0002 | 24844 | 15692 |
| 1280 | 566.9997 | 1035.977 | 30940 | 15612 |
| 1536 | 1076.993 | 1415.993 | 38280 | 15780 |
| 2048 | 1292.026 | 2401.023 | 57204 | 15344 |
| 2560 | 1947.02 | 4241.996 | 81940 | 15764 |
| 3072 | 3743.002 | 5636.973 | 109924 | 16184 |
| 3584 | 4435.03 | 6697.997 | 143408 | 16688 |
| 3968 | 4987.977 | 12795.978 | 172488 | 16368 |

## Datapoints

## Insights

### Graph1 – Memory vs Problem Size (M+N)

Chart, line chart

Description automatically generated

#### Nature of the Graph (Logarithmic/ Linear/ Exponential)

Basic: Exponential

Efficient: Linear

#### Explanation:

As we can see from the graph, the basic dynamic programming algorithm takes exponentially more memory as the problem size is increased because it requires to create a memorization table of size m\*n whereas the efficient algorithm which uses a divide and conquer approach with dynamic programming, we will use only 2 \* max(m,n) space which explains the linear memory growth.

### Graph2 – Time vs Problem Size (M+N)

Chart, line chart

Description automatically generated

#### Nature of the Graph (Logarithmic/ Linear/ Exponential)

Basic: Polynomial

Efficient: Polynomial

#### Explanation:

We can see from the graph that the time taken for the both the basic and space efficient algorithms show an polynomial exponential increasing time as the input size is increased. Both algorithms take O(mn) time but the divide and conquer approach actually takes 2\*mn time whereas the basic implementation takes mn time. Therefore, the space efficient implementation should twice the time taken by the basic implementation. This can be seen in the graph above.

## Contribution

(Please mention what each member did if you think everyone in the group does not have an equal contribution, otherwise, write “Equal Contribution”)

<USC ID/s>: <Equal Contribution>

2143749103 : Equal Contribution

4727109268 : Equal Contribution

4371197245 : Equal Contribution