PROJECT REPORT

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Pseudocode

Algorithm 1:

```
a) sum←0, result← -INF
   for i=0 to (size of array A-1)
      for j=i+1 to (size of  array A-1)
         for k=i to j
            sum←sum+a[k]
            if sum>result
               result←sum
            sum←0
```

In this algorithm, we do "add two numbers together" for about $\sum_{i=1}^{n}\sum_{j=i+1}^{n}\sum_{k=i}^{j} 1$ times, "takes the max of two numbers" for about$\sum_{i=1}^{n}\sum_{j=i+1}^{n}\sum_{k=i}^{j} 1$ times.

Algorithm 2:

```
b) sum←0, result← -INF
   for i=0 to (size of array A-1)
      b[i]=a[i]
      for j=i+1 to (size of array A-1)
         b[j]←b[j-1]+a[j]
      for k=i to (size of array A-1)
         if b[k]>result
            result=b[k]
```

In this algorithm, we do "add two numbers together" for about $\sum_{i=1}^{n}(\sum_{j=i+1}^{n} + \sum_{k=i}^{n})$ 1 times, "take the max of two numbers" for about $\sum_{i=1}^{n}(\sum_{j=i+1}^{n} + \sum_{k=i}^{n})$ 1 times.

Algorithm 3:

```
c) All[110]={-INF}, END[110]={-INF}
   All[0]=End[0]=a[0]
   for i=0 to (size of array A)
      End[i]=max of End[i-1]+a[i] and a[i]
      All[i]=max of End[i] and All[i-1]
```

In this algorithm, we do “add two numbers together” for about $\sum_{i=1}^{n} 1$ times, “take the max of two numbers” for about $\sum_{i=1}^{n} 1$ times.

Run-time Analysis

a)$\sum_{i=1}^{n} \sum_{j=i+1}^{n} \sum_{k=i}^{j} 1$

so algorithm a’s bounds is $\theta(n^3)$

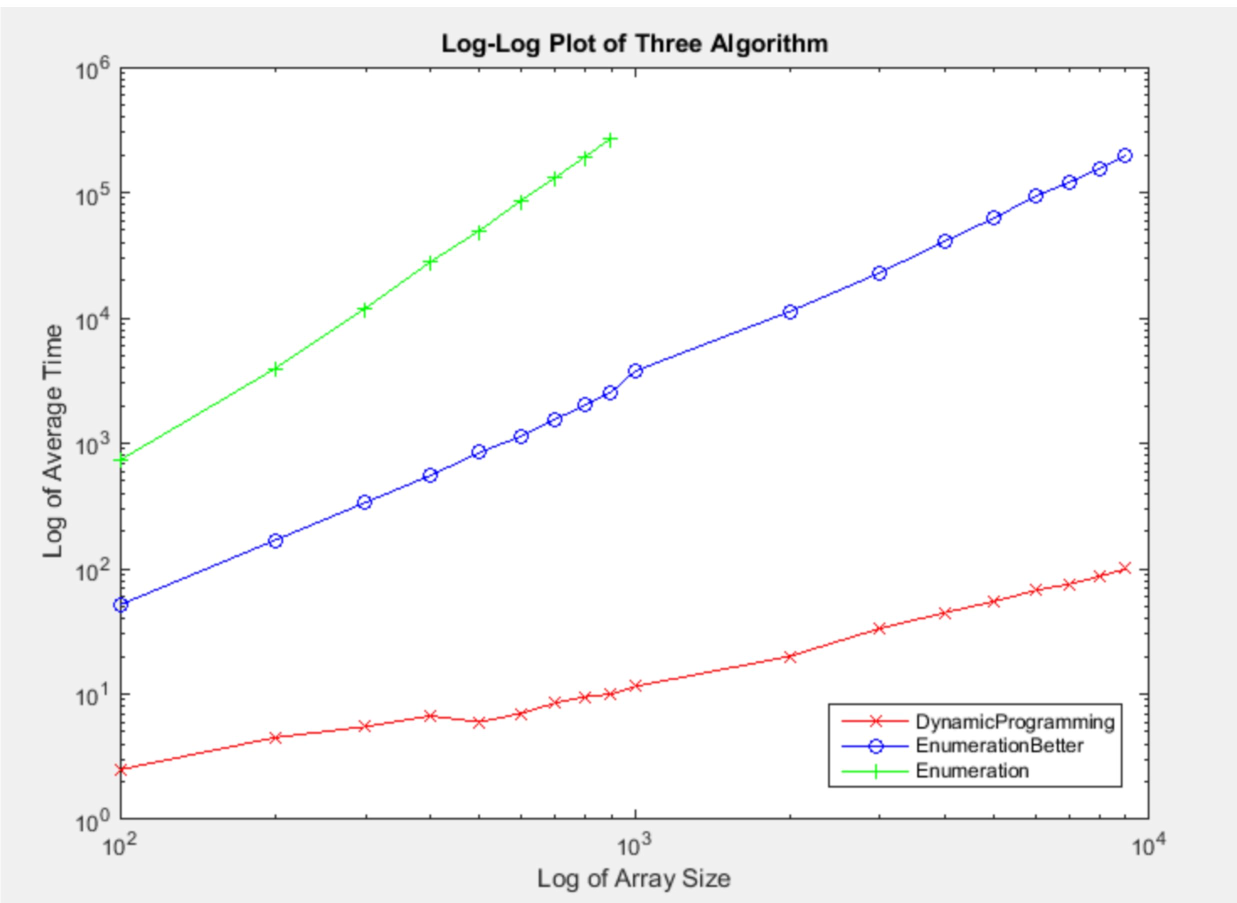
b) $\sum_{i=1}^{n}(\sum_{j=i+1}^{n} + \sum_{k=i}^{n}) 1$

so algorithm b’s bounds is $\theta(n^2)$

c) $\sum_{i=1}^{n} 1$

so algorithm c’s bounds is θ(n)

Experimental run-time analysis



```
>> polyfit(log(x1),log(y1),1)

ans =

    0.8449   -3.2427

>> polyfit(log(x1),log(y2),1)

ans =

    1.8534   -4.7305

>> polyfit(log(x2), log(y3),1)

ans =

    2.7156   -6.0217
```

All three algorithm's experimental running time will be less than theoretical running time.

As for the first algorithm Enumeration plot, the theoretical running time is n^3, the experimental running time: first loop is from i to n, second loop is from j=i+1 to n, third loop is from i to j, so the total time will be less than n^3

As for the second algorithm Enumeration better plot, the theoretical running time is n^2, the experimental running time: first loop is from i to n, second loop is from j=i+1 to n, so the total time will be less than n^2

As for the third algorithm Dynamic Programming plot, the theoretical running time is n, the experimental running time: although the loop is from i to n, the computer's calculating speed is faster than the expectation, so the time will be less than n.