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CS325 – Analysis of Algorithms – Group Assignment 1

Pseudocode

Algorithm 1 – Enumeration:
```
sum is an integer
maxsum is an integer
a is an array with n+1 entries

maxsum = 0
for i from 0 to (n-1) do
        for j from 1 to n do
                sum = 0
                for k from i to j do
                        sum += a[k]
                if sum > maxsum
                        maxsum = sum
```

Algorithm 2 – Better Enumeration:
```
sum is an integer
maxsum is an integer
a is an array with n+1 entries

sum = 0
maxsum = 0
for j from 1 to length(a) do
        sum = 0
        for i from 0 to j do
                sum += a[i]
                if sum > maxsum
                        maxsum = sum
        for i from 0 to j
                sum -= a[i]
                if sum > maxsum
                        maxsum = sum
```

Algorithm 3 – Dynamic Programming
```
a is an array with n entries
maxsub is an integer
maxsuf is an integer

maxsub = 0
maxsuf = 0
for i from 1 to length(a) do
```

```
if maxsuf + a[i] > 0
        maxsuf += a[i]
else
        maxsuf = 0
if maxsub < maxsuf
        maxsub = maxsuf
```

Runtime Analysis

Algorithm 1 – Enumeration
sum from i=0 to n-1 of(sum from j=1 to n of(sum from k=i to j of (add) + comp))
O(n^3)

Algorithm 2 – Better Enumeration
sum from j=1 to n of(sum from i=0 to j of(1 add and 1 comp) + sum from i=0 to j of(1 sub and 1 comp))
O(nlogn)

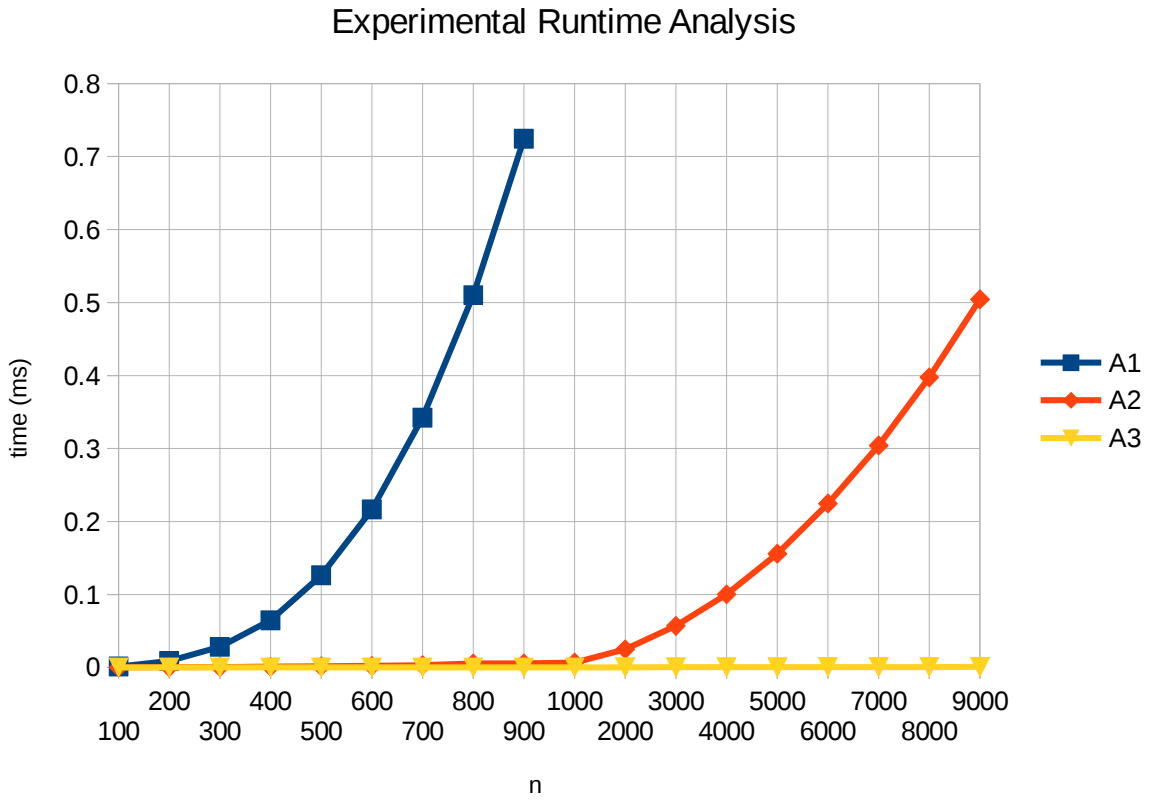
Algorithm 3 – Dynamic Programming
sum from i=0 to n of(2 add and 2 comp)
O(n)

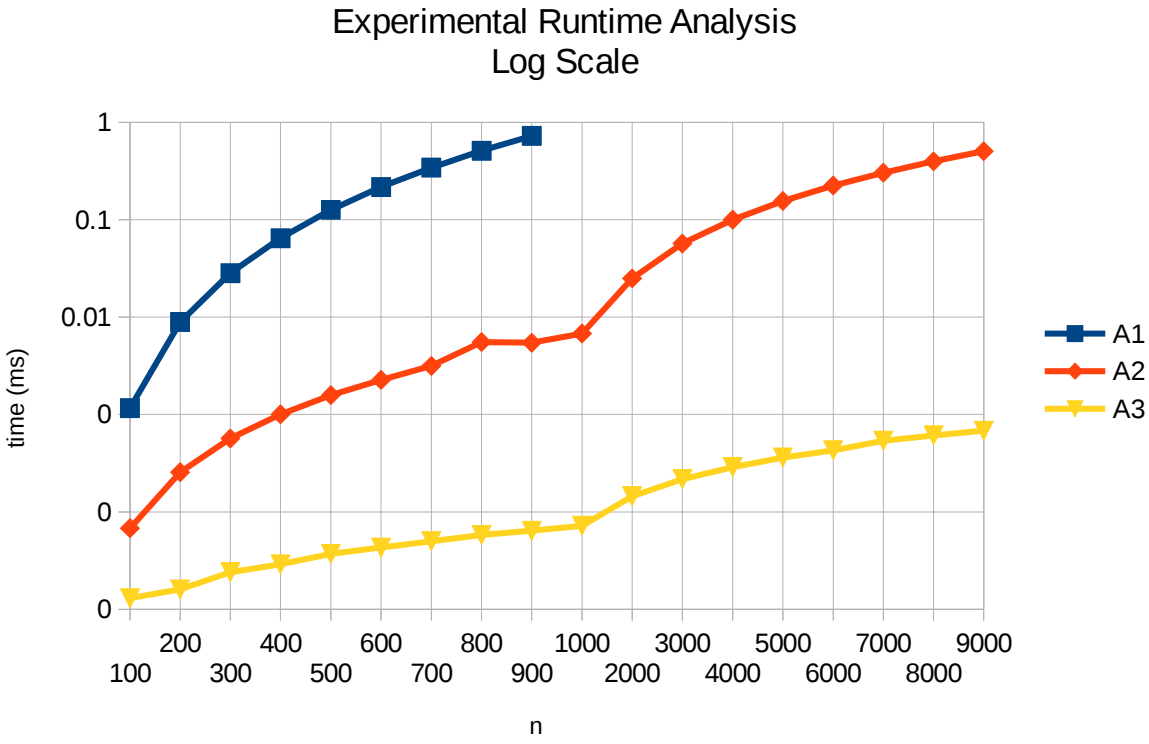
Experimental Runtime Analysis

N	**100**	**200**	**300**	**400**	**500**	**600**	**700**	**800**	**900**
A1	0.001163	0.008885	0.028255	0.064608	0.126310	0.216502	0.342391	0.510172	0.724427
A2	0.000068	0.000256	0.000567	0.001003	0.001580	0.002266	0.003147	0.005534	0.005450
A3	0.000013	0.000016	0.000024	0.000029	0.000037	0.000043	0.000050	0.000058	0.000064

N	**1000**	**2000**	**3000**	**4000**	**5000**	**6000**	**7000**	**8000**	**9000**
A1	/	/	/	/	/	/	/	/	/
A2	0.006772	0.024944	0.056858	0.100243	0.155825	0.224466	0.304192	0.397548	0.504493
A3	0.000072	0.000145	0.000217	0.000288	0.000361	0.000429	0.000538	0.000611	0.000681

See next page for graphs


Experimental Runtime Analysis
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
time (ms)
100
200
300
400
500
600
700
800
900
1000
2000
3000
4000
5000
6000
7000
8000
9000
n
A1
A2
A3


Experimental Runtime Analysis
Log Scale
1
0.1
0.01
0
0
0
time (ms)
100
200
300
400
500
600
700
800
900
1000
2000
3000
4000
5000
6000
7000
8000
9000
n
A1
A2
A3