

Laboratory practice No. 1: Recursion

Kevin Daniel Torres Parra
Universidad Eafit
Medellín, Colombia
Ktorres2@eafit.edu.co

Vladlen Shatunov
Universidad Eafit
Medellín, Colombia
Vshatunov@eafit.edu.co

3) Practice for final project defense presentation

3.1

3.2 We used the following code made it in python:

```
from time import time
```

```
def lcsDNA(s1,s2):
    r = lcsDNAaux(s1, s2, len(s1), len(s2))
    return r
```

```
def lcsDNAaux(string1, string2, m, n):
    if (m == 0 or n == 0):
        return 0
    if(string1[m-1] == string2[n-1]):
        return lcsDNAaux(string1, string2,m-1,n-1) + 1
    return max(lcsDNAaux(string1, string2,m-1,n), lcsDNAaux(string1, string2,m,n-1))
```

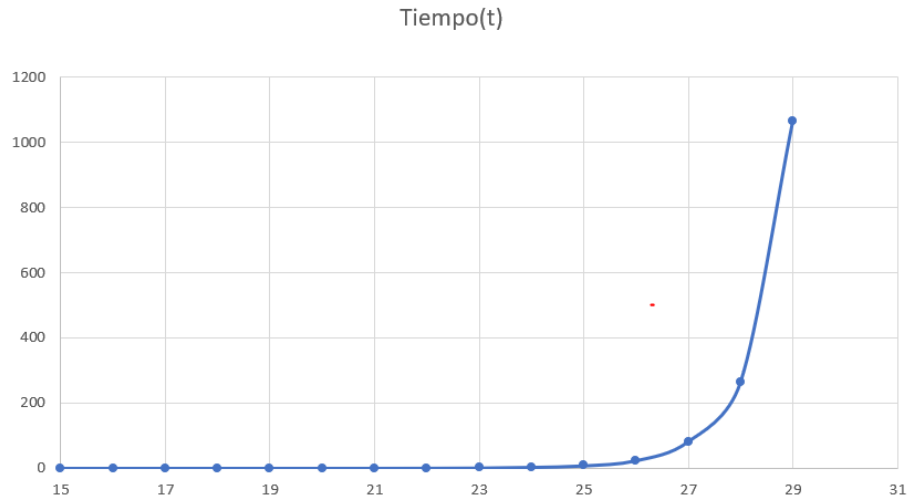
```
s1 = "ctagtgrisadceasvwaasgpscdcfab"
s2 = "gccctsrwgedcsswawafdgpscdcfab"
print(len(s1))
start_time = time()
lcsDNA(s1,s2)
elapsed_time = time() - start_time
print(elapsed_time)
```

ESTRUCTURA DE DATOS 1

Código ST0245

Data:

15	0
16	0,000836372
17	0,000911236
18	0,001834154
19	0,006981373
20	0,023983955
21	0,078701496
22	0,326843262
23	0,9345541
24	3,041999817
25	7,646824360
26	23,2876308
27	81,8104148
28	263,9522877
29	1.065,66390



It was not possible to calculate the time with a string of characters equal to 300,000 in length because when reaching a length of 29 characters the algorithm began to take a long time to complete

3.3 The algorithm is not valid for searches with character strings longer than 25 , since the time it takes to complete the solution with respect to the number of characters follows an exponential trend.

3.5

Recursion 1

```
i. public int bunnyEars(int bunnies) {
    if (bunnies == 0) return 0;
    return 2+ bunnyEars(bunnies-1);
}

ii. public int bunnyEars2(int bunnies) {
    if (bunnies == 0) return 0;
    if (bunnies % 2 == 0) return 3+ bunnyEars2(bunnies-1);
    return 2 +bunnyEars2(bunnies-1);
}

iii. public int fibonacci(int n) {
```

PhD. Mauricio Toro Bermúdez

Professor | School of Engineering | Informatics and Systems

Email: mtorobe@eafit.edu.co | Office: Building 19 – 627

Phone: (+57) (4) 261 95 00 Ext. 9473

ESTRUCTURA DE DATOS 1

Código ST0245

```

if (n== 0 ) return 0;
else if (n== 1) return 1;
return fibonacci(n-1) +fibonacci(n-2) ;
}

```

```

iv. public int triangle(int rows) {
if (rows == 0) return 0;
if (rows ==1) return 1;
return rows + triangle(rows-1);
}

```

```

v. public int sumDigits(int n) {
if (n <10) return n;
return n%10 + sumDigits(n/10);
}

```

Recursion 2

```

I. public boolean groupNoAdj(int start, int[] nums, int target) {
if(start >= nums.length){
return target==0;
}

```

```

if (groupNoAdj(start+2,nums,target-nums[start]))return true;
if(groupNoAdj(start+1,nums,target)) return true;
return false;
}

```

```

II. public boolean groupSum6(int start, int[] nums, int target) {
if (start>= nums.length)
return (target == 0);

```

```

if (groupSum6(start+1, nums, target - nums[start])) return true;
if (nums[start] != 6 && groupSum6(start+1, nums, target)) return true;

```

```

return false;
}

```

```

III. public boolean groupSum5(int start, int[] nums, int target) {
if(start==nums.length) return target==0;
if(nums[start]%5==0 && start < nums.length-1 && nums[start+1]==1) nums[start+1]=0;
if(groupSum5(start+1,nums,target-nums[start])) return true;
if(nums[start]%5!=0 && groupSum5(start+1,nums,target)) return true;
return false;
}

```

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ESTRUCTURA DE DATOS 1

Código ST0245

```

IV. public boolean splitArray(int[] nums) {

    return groupSum(0,nums,0,0);
}
private boolean groupSum(int start,int[] nums,int sum1,int sum2) {
    if (start >= nums.length) return sum1==sum2;
    if (groupSum(start+1,nums,sum1+nums[start],sum2)) return true;
    if (groupSum(start+1,nums,sum1,sum2+nums[start])) return true;
    return false;
}

```

```

V. public boolean splitArray(int[] nums) {
    return splitArrayAux(nums, 0, 0, 0);
}
public boolean splitArrayAux(int [] nums, int start,
int first, int second) {
    if (start == nums.length) {
        return first == second;
    } else {
        return splitArrayAux(nums, start + 1,
first + nums[start], second)
|| splitArrayAux(nums, start + 1, first,
second + nums[start]);
    }
}

```

3.6

4) Practice for midterms

4.1

4.1 a

4.2 c

4.3 a

4.3

1) b

4.4

1)c

4.5

1)a

2)b

4.6

1)sumaAux(n,l+2);

2)sumaAux(n,l+1);

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