

Laboratory practice No. 3: Linked list and dynamic vectors.

Maria Isabel Arango Palacio
Universidad Eafit
Medellín, Colombia
miarangop@eafit.edu.co

Isabella Montoya Henao
Universidad Eafit
Medellín, Colombia
imontoyah@eafit.edu.co

3) Practice for final project defense presentation

3.1 Complexity of the algorithms

1. Medellin map

First of all, in this exercise, we had to clean up the database because the data format was latin-1 and it was presenting many problems when we were reading the data, so we actualice the data format to UTF-8 (a csv file) which helps to read the data easily because it is the codification format that actually Python3 works with.

Worst Case:

$$T(n, m) = C + C_8 * n + C_{10} * m$$

$$T(n, m) = C_8 * n + C_{10} * m \quad \rightarrow \text{Sum law and common factor}$$

$$T(n, m) = n + m \quad \rightarrow \text{Product law}$$

$O(n, m)$ where n is the number of vertices and m is the number of arcos.

2. Student notes

$C_1 = 1$	$C_7 = 1$
$C_2 = 1$	$C_8 = 1$
$C_3 = 1$	$C_9 = 1$
$C_4 = 1$	$C_{10} = 1$
$C_5 = 1$	$C_{11} = 1$
$C_6 = 1$	$C_{12} = 1$

Worst Case:

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

$$T(n) = C_1 + C_2 + C_3 + C_{3.0} * n + C_4 + C_5 + C_6 + C_{6.0} * n + C_7 + C_8 + C_9 + C_{10} + C_{11} + C_{12}$$

$$T(n) = (C_{3.0} + C_{6.0}) * n \quad \rightarrow \text{Sum law and common factor}$$

$$T(n) = n \quad \rightarrow \text{Product law}$$

$O(n)$ where n is the csv length

3. Pivote

Worst Case:

$$T(n) = C + C_5 * n + C_7 * (n - 1)$$

$$T(n) = C_5 * n + C_7 * (n - 1) \quad \rightarrow \text{Sum law}$$

$$T(n) = n + (n - 1) \quad \rightarrow \text{Product law}$$

$$T(n) = n \quad \rightarrow \text{Sum law}$$

$O(n)$ where n is the array's length

4. Store of fridges

Worst Case:

$$T(n, m) = C + C_{7.1} * n + C_{8.1} * m + C_{9.1} * m + C_{9.3} * m * n + C_{10.3} * m + C_{10.6} * m * n$$

$$T(n) = C_{7.1} * n + (C_{8.1} + C_{9.1} + C_{10.3}) * m + (C_{9.3} + C_{10.6}) * m * n \quad \rightarrow \text{Sum law and common factor}$$

$$T(n) = n + m + n * m \quad \rightarrow \text{Product law}$$

$$T(n) = n * m \quad \rightarrow \text{Sum law}$$

$O(n * m)$ where m is the queue's length with the number of requests and n is the stack's length with the number of refrigerators.

5. DoublyLinkedList

Complexity of get an element:

$$T(n) = C + C_{0.4} * n + C_{0.5} * n$$

$$T(n) = (C_{0.4} + C_{0.5}) * n \quad \rightarrow \text{Sum law and common factor}$$

$$T(n) = n \quad \rightarrow \text{Product law}$$

$O(n)$ where n is the linked list length

Complexity of add data in a index:

$$T(n) = C + C_{2.5} * n + C_{2.12} * n$$

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

$$T(n) = (C_{2.5} + C_{2.12}) * n \quad \rightarrow \text{Sum law and common factor}$$

$$T(n) = n \underline{\hspace{2cm}} \rightarrow \text{Product law}$$

$O(n)$ where n is the linked list length

Complexity of search an element:

$$T(n) = C + C_6 * n$$

$$T(n) = C_6 * n \quad \rightarrow \text{Sum law}$$

$$T(n) = n \underline{\hspace{2cm}} \rightarrow \text{Product law}$$

$O(n)$ where n is the linked list length

Complexity of delete an element:

$$T(n) = C + C_{3.13} * n + C_{3.20} * n + C_{3.26} * n$$

$$T(n) = (C_{3.13} + C_{3.20} + C_{3.26}) * n \quad \rightarrow \text{Sum law and common factor}$$

$$T(n) = n \underline{\hspace{2cm}} \rightarrow \text{Product law}$$

$O(n)$ where n is the linked list length

6. Attention in a cashier

Worst Case:

$$T(n, m) = C + n + m$$

$$T(n, m) = n + m \quad \rightarrow \text{Sum law}$$

$O(p)$ where p is $n + m$, m is the queue's length and n is the most large file's length

3.2 Broken keyboard

To develop this exercise we implement a deque to store the characters of the string that we will return at the end. To store them we go through the string that is given to us and evaluate some cases. In the first place we evaluate if the character in a certain position is not the start key or end key and we add it to an auxiliary string. In the second place, we evaluate if the character is the start key and then if the acc variable (which indicates to us if we should add at the start or the end of the deque) is 0 we append the auxiliary string at the end, if not at the start and change it to 1. In the third place, we evaluate if the character is the end key and then if the acc variable is 1 we insert the auxiliary string at the start of the deque, if not we insert it at the end and change acc to be 0. In the end, we fill a string with the characters in the deque and we return it as they ask in the exercise.

3.3 1. Broken keyboard

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

Worst Case:

$$T(n) = C + C_{23} * m + C_{3.0} * n$$

$$T(n) = C_{23} * m + C_{3.0} * n \quad \rightarrow \text{Sum law, where } n = m$$

$\rightarrow n = m$ because the string's length will be as long as the LinkedList's length

$$T(n) = (C_{23} + C_{3.0}) * n \quad \rightarrow \text{Common factor law}$$

$$T(n) = n \quad \rightarrow \text{Product law}$$

$O(n)$ where n is the string's length and m is the List's length

4) Practice for midterms

4.1 Line 4 : `res += int(vector[i])*(2**(len(vector) - 1) - i)`

Complexity: $O(n)$

4.2 C

4.3 4.3.1. IV

4.3.2 i

4.4 Line 21: `output.append(token)`

Complexity in the worst case for `pop()` : $O(1)$

4.5 A

4.6 A

4.7 III

4.8 D

4.9 4.9.1 A 4.9.2 C 4.9.3 C

4.10 4.10.1 D 4.10.2 A 4.10.3 B

4.11 4.11.1 C 4.11.2 B

4.12 4.12.1 `while(!(s1.isEmpty()));` 4.12.2 `s2.push(s1.pop());` 4.12.3 `return s2.pop`

4.13 4.13.1 iii, $O(n^2)$ 4.13.2 iii, $O(n^2)$

6) Teamwork and gradual progress (optional)

6.1 Meeting minutes

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

IH 	Isabella Montoya Henao	 Entrante	1 h 2 min	viernes 3:12 p.m.	...
IH 	Isabella Montoya Henao	 Saliente		viernes 3:11 p.m.	...
IH 	Isabella Montoya Henao	 Saliente	2 s	viernes 3:10 p.m.	...
IH 	Isabella Montoya Henao	 Entrante	1 h 25 min	jueves 2:07 p.m.	...
IH 	Isabella Montoya Henao	 Entrante	23 min 43 s	lunes 8:03 p.m.	...
IH 	Isabella Montoya Henao	 Entrante	1 h 6 min	lunes 6:33 p.m.	...
IH 	Isabella Montoya Henao	 Entrante	22 min 5 s	lunes 10:07 a.m.	...
IH 	Isabella Montoya Henao	 Entrante	9 min 49 s	lunes 9:52 a.m.	...
IH 	Isabella Montoya Henao	 Saliente	1 h 23 min	19/03 9:52 a.m.	...
IH 	Isabella Montoya Henao	 Llamada perdida		19/03 9:50 a.m.	...
IH 	Isabella Montoya Henao	 Saliente	32 min 51 s	18/03 7:31 p.m.	...
IH 	Isabella Montoya Henao	 Entrante		18/03 7:30 p.m.	...

6.2 History of changes of the code

Commits on Mar 26, 2021			
Add files via upload	Verified	 78dcad5	<>
Commits on Mar 27, 2021			
Update mapaMedellin.py	Verified	 416d14f	<>
Update mapaMedellin.py	Verified	 8b76c4b	<>
Delete hola	Verified	 56ba8bf	<>

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

Commits on Mar 24, 2021

Add files via upload miarango committed 4 days ago	Verified	c42e138	<>
Delete TecladoRoto.py miarango committed 4 days ago	Verified	81d2b81	<>
Update TecladoRoto.py miarango committed 4 days ago	Verified	18edbc6	<>
Add files via upload miarango committed 4 days ago	Verified	43a934c	<>
Update TecladoRoto.py miarango committed 4 days ago	Verified	1b0cf13	<>
Add files via upload miarango committed 4 days ago	Verified	f8b0d7f	<>
Update TecladoRoto.py miarango committed 4 days ago	Verified	3467a18	<>
Add files via upload miarango committed 4 days ago	Verified	dffa1c0	<>

Commits on Mar 21, 2021

Add files via upload imontoyah committed 7 days ago	Verified	4c7ce6e	<>
Delete ED1-Laboratorio 3 .docx.pdf imontoyah committed 7 days ago	Verified	f4810bd	<>

Commits on Mar 20, 2021

Add files via upload miarango committed 8 days ago	Verified	1cf1006	<>
Create MedellinMap imontoyah committed yesterday	Verified	276fe4a	<>
Update Neveras.py imontoyah committed yesterday	Verified	442dcf7	<>
Update Neveras.py imontoyah committed yesterday	Verified	0fb1e6f	<>
Update listasDoblementeEnlazadas2.py imontoyah committed yesterday	Verified	b0d8e3c	<>
Update listasDoblementeEnlazadas2.py imontoyah committed yesterday	Verified	cca763e	<>
Update TecladoRoto.py imontoyah committed yesterday	Verified	e09a75e	<>

Commits on Mar 26, 2021

Update TecladoRoto.py miarango committed 2 days ago	Verified	976da82	<>
Update NotasEstudiantes.py miarango committed 2 days ago	Verified	2119f9a	<>
Update TecladoRoto.py imontoyah committed 2 days ago	Verified	d4a42ca	<>
Add files via upload imontoyah committed 2 days ago	Verified	a0f1938	<>
Update Neveras.py imontoyah committed 3 days ago	Verified	60cd095	<>

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

6.3 History of changes of the report

LAST WEEK	YESTERDAY	TODAY
<ul style="list-style-type: none"> ▶ March 21, 3:22 PM <ul style="list-style-type: none"> ● All anonymous users 	<ul style="list-style-type: none"> ▶ March 27, 5:20 PM <ul style="list-style-type: none"> ● All anonymous users 	
<ul style="list-style-type: none"> ▶ March 20, 4:44 PM <ul style="list-style-type: none"> ● Maria Arango 	<ul style="list-style-type: none"> ▶ March 27, 2:39 PM <ul style="list-style-type: none"> ● All anonymous users 	
<ul style="list-style-type: none"> ▶ March 20, 7:28 AM <ul style="list-style-type: none"> ● All anonymous users 	<ul style="list-style-type: none"> ▶ March 27, 8:26 AM <ul style="list-style-type: none"> ● All anonymous users 	<ul style="list-style-type: none"> ▶ March 28, 7:37 PM <ul style="list-style-type: none"> Current version ● Maria Arango
	FRIDAY	
<ul style="list-style-type: none"> ▶ March 19, 5:56 PM <ul style="list-style-type: none"> ● Maria Arango ● All anonymous users 	<ul style="list-style-type: none"> ▶ March 26, 7:08 PM <ul style="list-style-type: none"> ● Maria Arango 	
<ul style="list-style-type: none"> ▶ March 19, 12:03 PM <ul style="list-style-type: none"> ● Maria Arango 	<ul style="list-style-type: none"> ▶ March 26, 6:18 PM <ul style="list-style-type: none"> ● Maria Arango 	<ul style="list-style-type: none"> ▶ March 28, 6:14 PM <ul style="list-style-type: none"> ● All anonymous users
	<ul style="list-style-type: none"> ▶ March 26, 3:17 PM <ul style="list-style-type: none"> ● All anonymous users 	<ul style="list-style-type: none"> ▶ March 28, 5:25 PM <ul style="list-style-type: none"> ● All anonymous users

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