

Laboratory practice No. 3: Backtracking

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3) Practice for final project defense presentation

3.1 The other techniques that are used are Dijkstra and A*.

3.2 The amount of roads in a complete directed graph is the total amount of vertexs.

3.3

Valor de N	Tiempo ejecución BF	Tiempo ejecución BT
4	24	16
...
32	2.6×10^{35}	4.2×10^9
N	$O(n!)$	$O(2^n)$

3.4 It's better to use BFS if you want to get all the possible solutions on the shortest way problem or so, but, if you only need the first solution, the DFS is the best option.

3.5 We used lists to represent the nodes that were already visited and another to keep track of the nodes we have visited already. What the program does is to find a path to node n , and then keeps traversing to see if it finds a better path. It keeps track of the current weight and compares it to the weight of the first answer, in case that is higher it skips and then continues with the next one.

3.6 From each vertex there are v vertices that can be visited from the current vertex so the complexity is (V^V) .

3.7 V is the number of vertex.

3.8 We implemented backtracking on this code, we saved all the possible total weights of the paths between two vertexs in a list and then we called the min function to return the minimum weight.

4) Practice for midterms

4.1 Wilkenson and Sofronio Algorithm

4.1.1 Line number 4: `int res = solucionar(n-a,a,b,c)+1;`

4.1.2 Number 5: `res = Math.max(solucionar(n-b,a,b,c)+1,res);`

4.1.3 Number 6: `res = Math.max(solucionar(n-c,a,b,c)+1,res);`

4.2 Hamiltonian Cycle

4.2.1 Line number 02: `if(pos == graph.length)`

4.2.2 Line number 09: `if(sePuede(v, graph, path, pos))`

4.2.3 Line number 11: `if(cicloHamilAux(graph, path, pos+1))`

4.3 Optional

4.4 Optional

4.5 Longest subsequence

4.5.1 Line number 7: `return 1 + lcs(i-1, j-1, s1, s2);`

4.5.2 Line number 11: `return Math.max(ni,nj)`, Complexity: $O(n)$.

4.5.3 $T(n) = n$ instructions.

4.6 DFS and BFS

4.6.1 c) 0,1,4,3,2

4.6.2 a) 0,1,2,3,4

4.7 N-Queens

4.7.1 Line number 3: `if(r == N)`

4.7.2 Line number 8: `a[r] = i`

4.7.3 Line number 9: `sol(a,r+1)`

5) Recommended reading (optional)

Summary

Search Tree Strategies

The solution to many problems becomes search tree problems. There are several problems that can be described by search trees, for example: given a set of logical clauses we have to determine if the set is satisfactory by trying all combinations. Also, the puzzle problem with 9 spaces and 8 pieces, where one is empty. The objective is to organize the pieces

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from 1-8 in order around the square. This problem can turn into a search tree problem because the solution tree can expand too.

There are some ways in which we can solve search tree problems:

- **BFS:** is a direct way in which we check the first level of nodes before analyzing the next one.
- **DFS:** the deepest node is used to expand to the others.
- **Hill Climbing:** it's a variant of the DFS algorithm, it uses the greedy method to decide in which way is better to move.
- **Best-First Search:** a combination of both BFS and DFS algorithms. It selects the node with the lower cost from the ones that have been expanded at the moment.
- **Branch and Bound:** it focuses on optimization. It's efficient in solving large combinatorial problems with many solutions.

Conceptual Map

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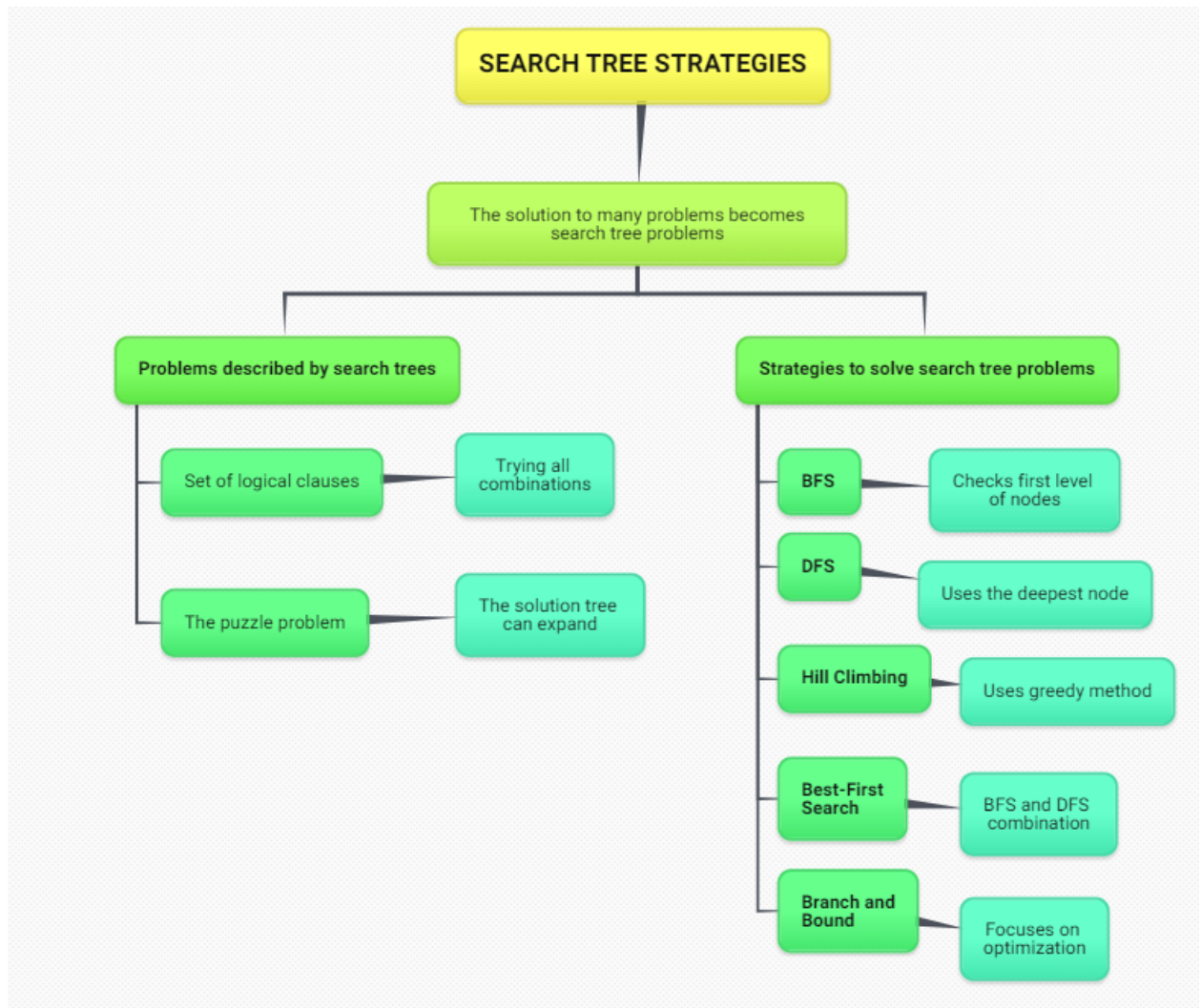
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6) Teamwork and gradual progress (optional)

6.1 Kanban Board

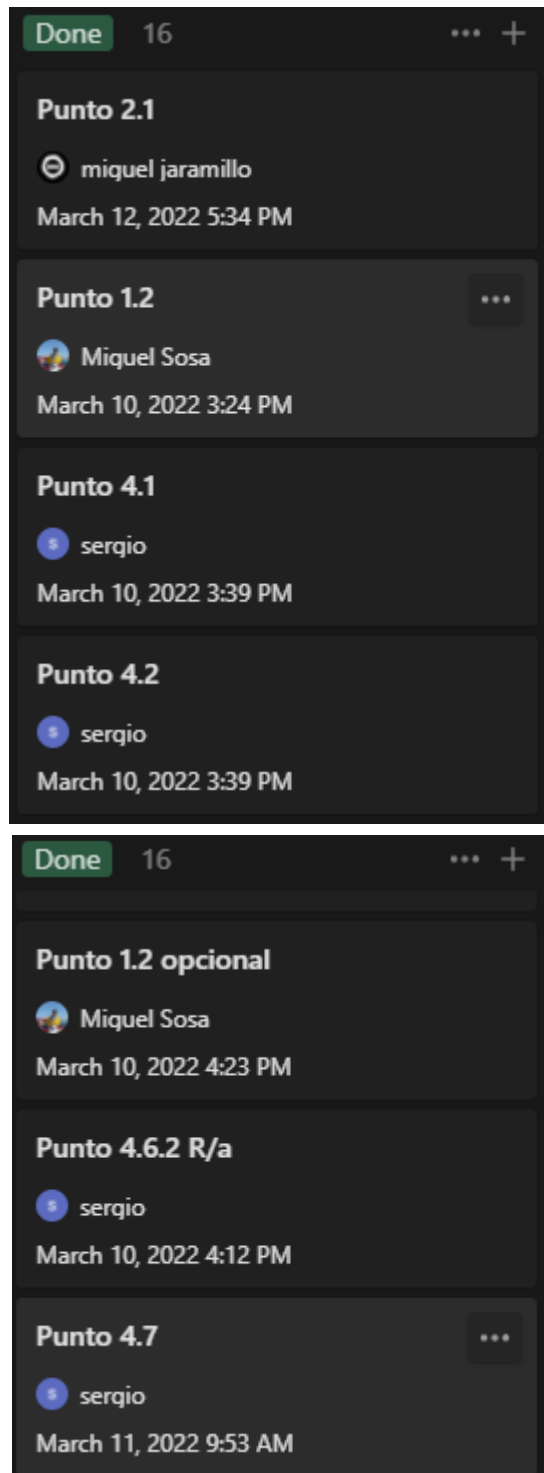
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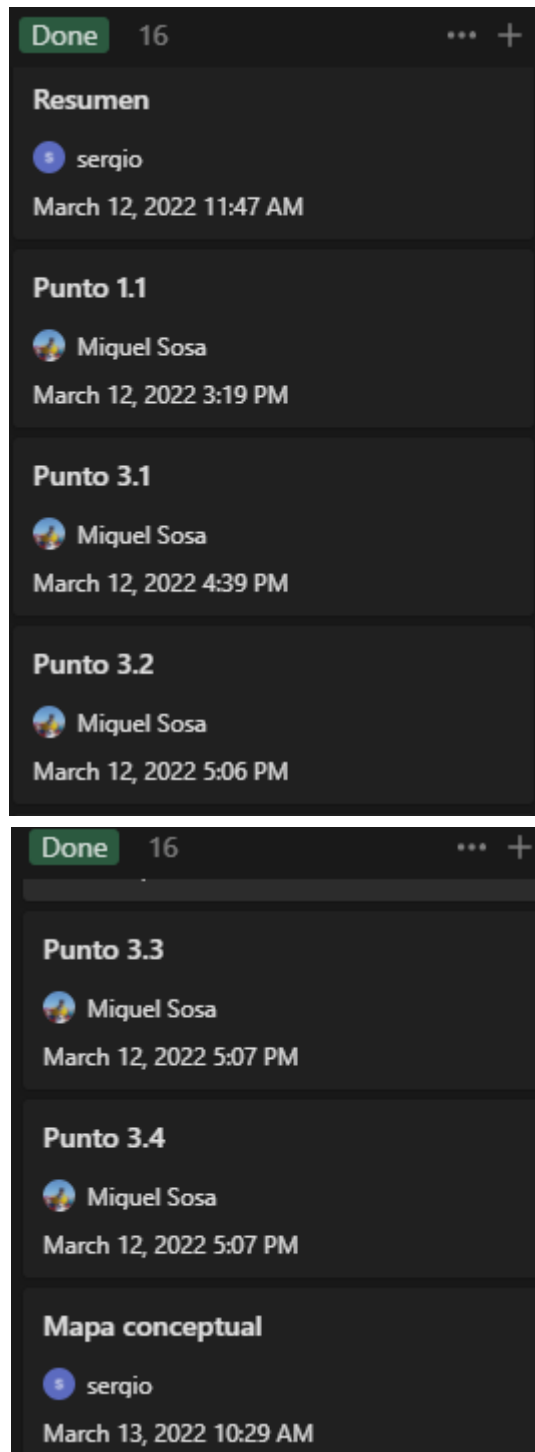
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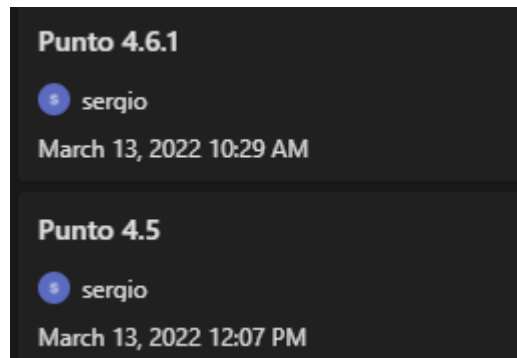
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6.2 History of changes of the code

`commit c5b345bb605187f25a720d40247745b03fba173e (HEAD -> master, origin/master, origin/HEAD)`

`Author: mstermigol <85334763+mstermigol@users.noreply.github.com>`

`Date: Sat Mar 12 18:03:09 2022 -0500`

Add files via upload

`commit 4be3b7de981614d71e6b7c49952e7f88f293b99a`

`Author: Miguel S <85181687+msosav@users.noreply.github.com>`

`Date: Sat Mar 12 15:19:41 2022 -0500`

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`commit 82da2b9744da671e33220c1ca58e84f72367fb54`

`Author: Miguel S <85181687+msosav@users.noreply.github.com>`

`Date: Thu Mar 10 17:30:43 2022 -0500`

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`commit 8cc49cda2a12110a8906f16bcc883808f8248d13`

`Author: Miguel S <85181687+msosav@users.noreply.github.com>`

`Date: Thu Mar 10 16:24:13 2022 -0500`

Add files via upload

`commit a876096aa79e11284d7bbf29fd757ec91c027fbb`

`Author: Miguel S <85181687+msosav@users.noreply.github.com>`

`Date: Thu Mar 10 16:23:59 2022 -0500`

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Delete archivo.txt

commit c753f7ba775629fdec6820940d59dd62faa551e4
 Author: Miguel S <85181687+msosav@users.noreply.github.com>
 Date: Thu Mar 10 15:24:19 2022 -0500

Add files via upload

commit 9815b597e6e43a990331093cf1f3b8814f9aaaf9
 Author: mstermigol <85334763+mstermigol@users.noreply.github.com>
 Date: Tue Mar 8 00:07:03 2022 -0500

Add files via upload

commit 5b83c16bb82fcab72a7f6e26eb1623e894e5f620
 Author: mstermigol <85334763+mstermigol@users.noreply.github.com>
 Date: Mon Mar 7 17:58:33 2022 -0500

Add files via upload

commit 3ddf3aceb8d6aea99ea6e904fc500f1e18bc61b1
 Author: Sergio Córdoba <89363748+sergiocordoba13@users.noreply.github.com>
 Date: Mon Mar 7 11:49:32 2022 -0500

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6.3 History of changes of the report

VIERNES

▶ 11 de marzo, 13:06
 ● sergio cordoba

▶ 11 de marzo, 11:50
 ● sergio cordoba

MIÉRCOLES

▶ 9 de marzo, 17:27
 ● sergio cordoba

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AYER

12 de marzo, 17:57

● miguel jaramillo

▶ 12 de marzo, 17:06

● Miguel Sosa

▶ 12 de marzo, 15:45

● Miguel Sosa

▶ 12 de marzo, 12:51

● sergio cordoba

▶ 12 de marzo, 11:03

● sergio cordoba

HOY

▶ **13 de marzo, 13:57**



Versión actual

● sergio cordoba

▶ 13 de marzo, 12:07

● sergio cordoba

▶ 13 de marzo, 10:30

● sergio cordoba

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