CSCE.5210.004

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Assignment-2.

Q1) "One of the main goals of AI should be to build general heuristics applicable to any graph searching problem"

The main goal mentioned above is a bold and ambitous goal.

First we need to understand what heuristic search is

→ In heuristic method, we find the solution to a problem by a faster way than the original way.

→ Solving the problem in a reasonable amount of time requires heuristics.

Now coming to the quote:

→ Graph searching problems are often used to solve real world problems like GPS.

→ In graph searching, paths or solutions are sought within these structures.

→ The goal is a complex one. There should be big advances in problem solving techniques, reasearch in Artifical Intelligence and many more.

→ Understanding that one-size-fits all solutions cannot solve all problem is important. Depending on the problems, unique solutions may be required.

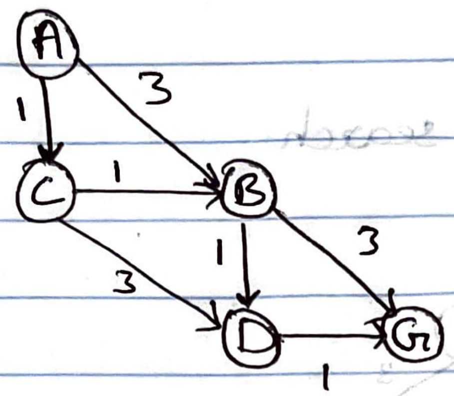
→ The main goal mentioned in the quote can guide the direction of Artificial Intelligence research.

→ Heuristic approch is not always to find a solution and even if it did, it might not be the right one in a few instances.

→ These heuristic functions can be used to choose border paths with very low heuristic values.

In summary, the quote mentioned is highly ambitious and if done proper research can advance the field of AI is a positive way.

Q2)



a) Depth first search

First, we need to consider [<A>] as frontier

[<A>]

then we will extend [<A>] which makes the frontier

[<AB>, <AC>]

Now we need to extend [<AB>] because it is at the top.

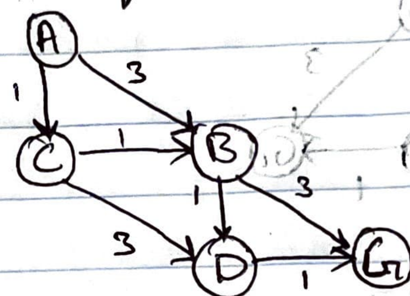
[<ABD>, <ABG>, <AC>]

The next frontiers after expansion are

[<ABDG>, <ABG>, <AC>]

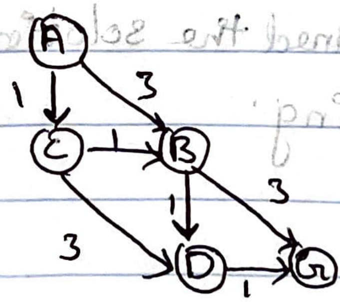
∴ [<ABDG>] is the path for depth for search because it has returned the solution and ~~return~~ follows alphabetical ordering.

(b) Breadth first search.



First, our frontier is [<A>]
We need to extend [<A>] to its neighbours
Then, the frontier becomes
[<AB>, <AC>]
Now these paths should be further expanded which makes the frontier,
[<ABD>, <ABG>, <ACD>, <ACB>]
∴ The breadth first search path is [<A B G>] as it displayed the solution

(c)



Lowest-cost first search

Initially the frontier is [<A>]
Now we will expand the frontier.
[$<AC>_1$, $<AB>_3$]
As [$<AC>_1$] is the lowest we will extent it
[$<ACB>_2$ $<AB>_3$, $<ACD>_4$]

As $\langle ACB \rangle$ has the weight '3' we need to extend it further. Then, the frontier becomes,

$[\langle ACBD \rangle_3, \langle AB \rangle_3, \langle ACD \rangle_4]$

We need to extend $\langle ACBD \rangle_3$ further. Now the frontier is,

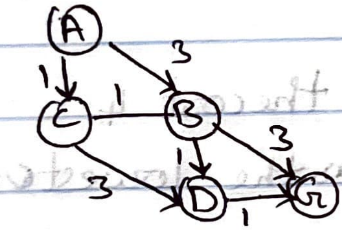
$[\langle AB \rangle_3, \langle ACBDG \rangle_4, \langle ACD \rangle_4]$

Now we need to $[\langle AB \rangle]$ as it is the lowest. The frontier is

$[\langle ACBDG \rangle_4, \langle ACD \rangle_4, \langle ABG \rangle_6]$

$\therefore$ $[\langle ACBDG \rangle]$ is the path for lowest-cost-first search as it costs 4.

(d)



A* with $h(n) = |x(n) - x(G)| + |y(n) - y(G)|$

we need to find out $h(A), h(B), h(C), h(D), h(G)$.

$h(A) = |x(A) - x(G)| + |y(A) - y(G)|$

$h(A) = |0-2| + |2-0|$

$h(A) = 2+2 = 4$

$h(B) = |x(B) - x(G)| + |y(A) - y(G)|$

$= |1-2| + |1-0|$

$h(B) = 2$

$h(C) = |x(C) - x(G)| + |y(C) - y(G)|$

$h(C) = |0-2| + |1-0| = 3$

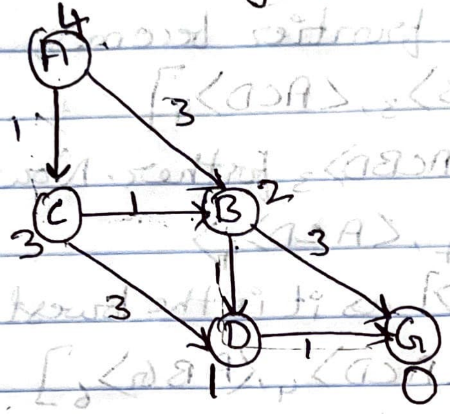
$h(D) = |x(D) - x(G)| + |y(D) - y(G)|$

$h(D) = |1-2| + |0-0| = 1$

$h(G) = |x(G) - x(G)| + |y(G) - y(G)|$

$h(G) = |2-2| + |0-0| = 0$

Now the new graph is



Firstly the frontier is [$\langle A \rangle_7$]

Now after placing the neighbours, the new frontier is

[$\langle AC \rangle_4$, $\langle AB \rangle_5$]

The first element AC has the cost 4

We need to expand it as it has the lowest cost.

The new frontier is

[$\langle ACB \rangle_4$, $\langle ACD \rangle_5$, $\langle AB \rangle_5$]

As $\langle ACB \rangle$ has the lowest cost i.e 4, we need to expand it. which makes the frontier.

[$\langle ACBD \rangle_4$, $\langle ACBG \rangle_5$, $\langle ACD \rangle 5$, $\langle AB \rangle_5$]

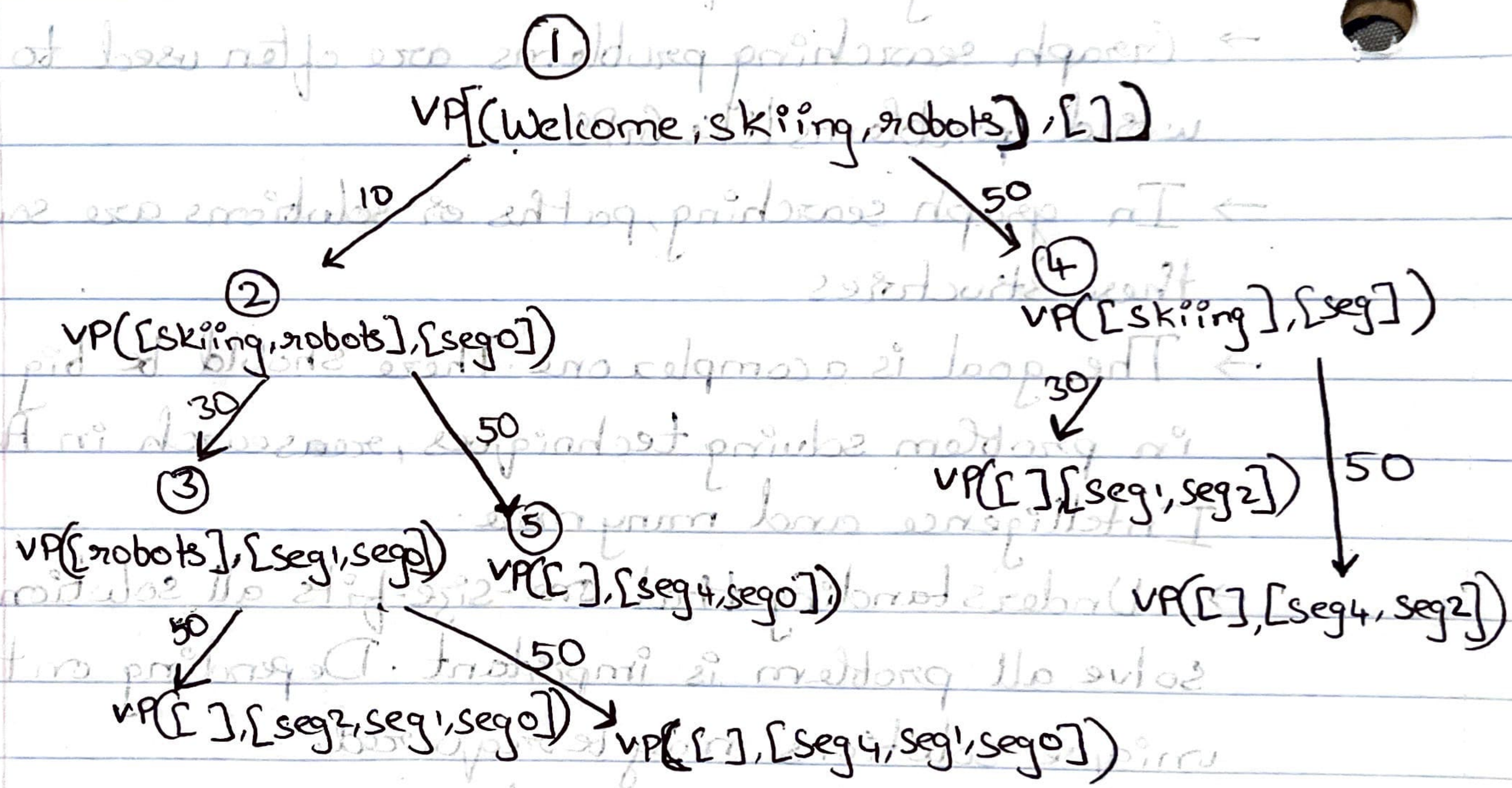
Again expanding ACBD

[$\langle ACBDG \rangle_4$, $\langle ACBG \rangle_5$, $\langle ACD \rangle_5$, $\langle AB \rangle_5$]

$\langle ACBDG \rangle$ has made it to destination with the shortest path and cheapest path with a cost of 4.

Q3)

(a) Circled numbers indicate the nodes, that should be expanded. This is the shortest way to cover all the topics. The circled (5) is the first goal node found.



b) For each subject denoted as 't', we determine the minimum segment length required to ecompass that subject and call it "s(t)". Then, we define a function "h(vp(TC, Segs))" as the maximum value of "s(t)" for all subjects in TC. In other words, we identify the subject "t" where the segment length "s(t)" is the greatest.

Indeed, this complies with monotone requirement. We can say this because of the original or main distance between any two nodes.

The difference in the hvalues of the 2 nodes will have to be ~~in~~ less than the duration of the segment added to achieve the objective.

For each topic, we need to establish a function h(vP(TC, segs))", as the sum of these smallest contributions. S(t) for all topics 't' within TC.

This approach satisfies the monotone restriction.

Once this function is made, computing heuristic functions can be made in time proportional to the TO-coner list.

c) Yes, the topic selected does affect the result found in the designing video preparations.

Some of the reasons for that are,

→ Sequence of topics covered:-

If welcome is the first topic searched, the presentation may start with initial ~~stuff~~ material.

→ Topics covered:- Every segment that has been added will be covered in subsequent steps. If a segment has multiple topics, those are removed from the lists of topics to address.

Finally we can say that every topic has equal importance on overall structure. Diverse choices can lead to variations which can potentially result in diff presentations concerning content and duration.