Advanced Business Decision Support Systems
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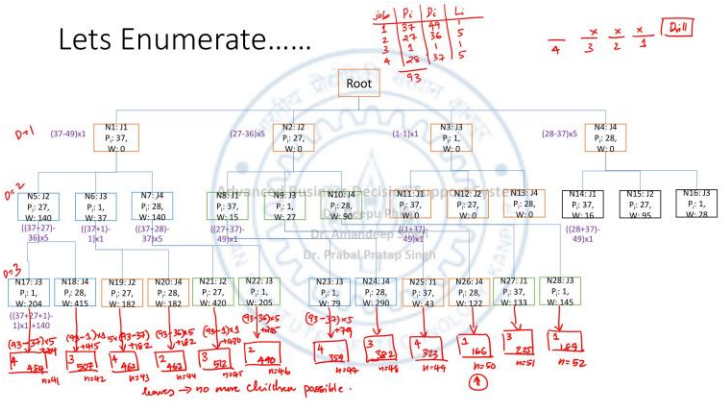
Lecture 11
Tree Search and Alternatives in Decision Making Using Single Machine Sequencing Problem (Part 3 of 4)

Good afternoon everyone, welcome to yet another lecture of Business Decision Support System which is the advanced course of Web-Based Decision Support System that was plotted in the NPTEL MOOC's program. I am Dr. Deepu Philip from IIT Kanpur and along with me this course is Dr. Amandeep Singh Oberoi and Dr. Prabal Pratap Singh. So, without any further delay, let us get into the topic.



Okay, so we are back to the problem again and we have completed all the problems for the depth equal to 1, depth equal to 2 and depth equal to 3. We have completed all the enumeration. I am only showing this much because there is not enough. So, we will use the next slide, which is also the depth equal to 1, depth equal to 2 and here is the depth equal to 3.

So, I have already elaborated both of them divided into two parts so that, we can use the white space beneath this. And, now our headache is to move to depth equal to 4. And, now if you look into this, this says that the first sequence position, as we said, this is the drilling machine sequence position 1, 2, 3. So, now at the fourth depth is the only thing that is available and at this point, we can only assign one job. There is only one job left

out.

So, that way, we will have exactly one box beneath this. And, so if you see this 1, 2 and 3 is already assigned. So, we can only assign 4 here. In this one, you can see that we have assigned 1, 2 and 4. So, all thing you can assign is 3 right here.

So, same way, if you look into this one, you are assigned 1, 3 and 2. So, all you can do is you can assign 4. In this case you have assigned 1, 3 and 4. So, all you can do is assign 2. Same way, here you have assigned 1, 4 and 2.

So, all you can do is assign 3 right here. And, this one is you have assigned 1, 4 and 3. So, all you can do is assign 2. So, you can think about these are the leaves. No more children possible at this point.

These are all leaves. So, there is no more leaves children possible. So, now, how do we calculate this? This what is the W value here. So, we know that this total time as we said earlier, our job the processing time due date and Li 1, 2, 3 and 4. The processing time is 37, 27, 1 and 28 and the due date is 49, 36, 1 and 37, 15, was the lateness that is the case.

You add all this due dates, processing time, it is 93 plus 7, 14, 15. So, it plus 93. 93 is the total processing time. So, in this, if you assign job 4. So, the time it will be completing is 93, which is 37 plus 27 plus 1 plus job 4 is 28.

So, 93 and minus, what is the due date of this one? Due date is 37 whatever be that. Then, you multiply that by the value of 5 plus, the previous one 204 gets added to it. So, you get a value of 484 as the lateness. Same way, if you look at here, it is again you are assigning job 3, it is 93 minus the delay of the job 3, the lateness is 1 and then multiplied by 1 plus 415. So, we get a value of 507.

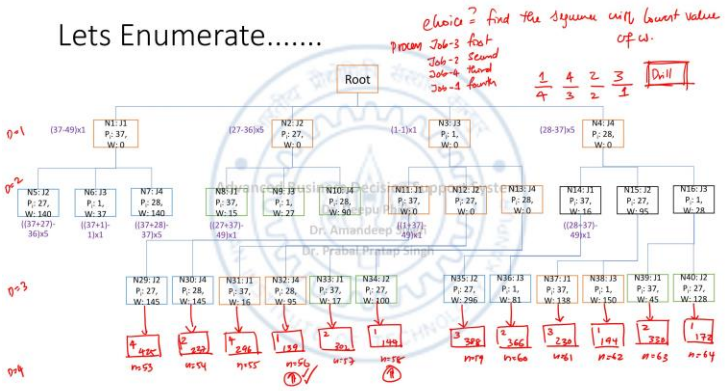
So, if we expand, I will give just this node only the rest of the things I will just draw and write the numbers in interest of time. So, for this second one, just to add that we have again 93 minus this is job 4, the due date is 37 multiplied by 5 plus 182. So, that will give you 462. Same way, if you calculate the rest of it, I calculated it is like 93 minus that is job 2 job 2 due date is 36 multiplied by 5 plus 182, that value will come to 467. This will be 93 minus due date of job 3 is 1 multiplied by 1 plus 420 and that value will come to 512 and then, the last one here is 93 minus the due date is 36 multiplied by 5 plus 205 that value will come to 490.

Now, similarly, these nodes will also have its own children. So, here you already assigned 2, 1, 3. Now, the one that left out for is 4 and you have 2, 1, 4, the left out is 3. Same way, this, if you look into the left out in this case will be 4 and if you look into

this, the left out in this case will be 1. The left out in this case will be 3 and this will be 1 and I have calculated the W's for this so that, will be 359 the same process.

So, it will be 93 minus and 4, the due date is 37 multiplied by 5 plus 79. So, you will get these values like this 359 then, I am getting 382, 323, 166 then 225 and 189. So, if you look into this previously, we had seen the last node as n equal to 40. So, we have n equal to 41, n equal to 42, n equal to 43, n equal to 44, n equal to 45, n equal to 46, n equal to 47, n equal to 48, n equal to 49, n equal to 50, n equal to 51, n equal to 52. So, you have 52 nodes so far and we have done just with the half of the tree, then the other half is also the second one.

But beyond this, you cannot expand the tree. All of the March child nodes no more expansion possible.



So, now let us do the rest of it, the remaining and now, we are looking at the d equal to 4 and we will just for the ease of the time and in interest of not wasting too much of time, I think, you might have already understood the process. So, we will just complete the nodes right here. So it will be like this.

So, this node, we already assigned 3, 1 and 2. The left out thing is 4 in this case same way, 3, 1 and 4 the left out thing is 2 and this is 4 this will be 1, this is 2 and this is 1 and in this case, when I calculated the W's, it came to be 425, 430, 296, 139, 302 and 144. Now, the other same way this is the last leaf nodes and in this case, you have assigned 4, 1 and 2. The left out one is 3. This is 2 and then this is 3 and this is 1, this is 2 and this is 1 and the W values that I calculated as part of it as 388, then 366, 230, 194, 330 and 172.

So, in this process previously, we had n equal to 52, so you have n equal to 53, n equal to 54, n equal to 55, n equal to 56, n equal to 57, n equal to 58, n equal to 59, n equal to 60, n equal to 61, n equal to 62, n equal to 63, n equal to 64. So, all the 64 nodes have been

expanded and we have enumerated the all possible options. Now, the choice is, find the sequence with lowest value of W, So, if you look into this, if you have values of 484, 507, 462, all these ones here you can see the lowest value of W is 166, one of them is this. The other ones are, you can see there is a 139, it is 144 and that this is 172 and like that. So, on this, the lowest value is this particular sequence 139, so that sequence is, if you look into it that, if you fill that sequence, this is the drilling machine sequence position is 1, 2, 3 and 4.

So, this sequence position will be second one. So, it will be 3, then it will be 2 and 32 and 4 and 1. So, the order in which you will be processing is you will process job 3 first, job 2 second, job 4 third and job 1 fourth. So, that way, you will end up getting the lowest value of W and that is decision, the thing is based on this. You have taken the decision to use the this particular sequence and this will return you the best possible value of readiness.

So, when if you have to pay penalty, the lowest you will pay as part of your process. Now, the next part of this is how to improve this total enumeration, but we will continue that in the next class. So, in the meantime, I really want you guys to go through all these calculations that we have done. It is a large number of calculations and considerations, expansions, etc. So, I want all of you to go through this clearly and before we discuss how to do improve this total enumeration in the next class, so get it familiarized with.

So, that otherwise, you will lose track of what we have discussed in the class. So, thank you for your patient hearing and we will continue in the next class. Thank you. .