Compiler Design
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Lecture – 35
Parser (Contd.)

So, next we will be looking into another example of this SLR parsing table construction.

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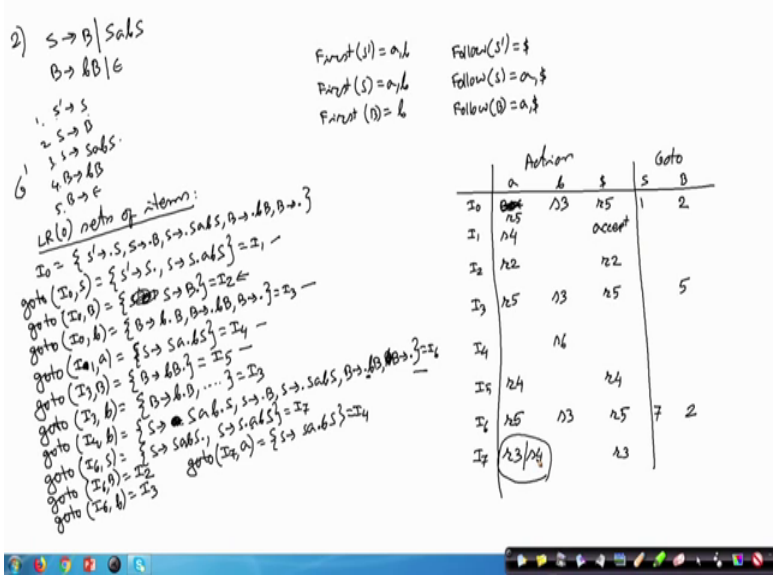

So, the grammar given is like this; so, S producing B or SabS, and B producing small b capital B or epsilon. And, as you know the first step is to frame the augmented grammar. So, I have got this augmented grammar constructed S dash producing S, then S producing B, S producing SabS, B producing bB and B producing epsilon. So, this is rule number 1, 2, 3, 4 and 5 of my grammar.

So, after you have constructed this rules now that the augmented grammar G dash now the next step is to frame the set of items sets of items. So, this LR 0 items; LR 0 sets of items so, if you try to construct then we can do it like this I 0 is given by the set that S dash producing dot S and then I have to look for productions with left hand side S. So, I will get this S producing dot B then S producing dot SabS, ok, then B producing dot bB and B producing dot ok. So, this will be the; so the so this will be the set of items that we have now.

Now so, this is the so, this S dash producing dot S and from there we have got the remaining items. So, as this S producing dot S is again coming so, that will give me again this S producing dot B and this rule. So, that way it will continue. Now, from this set so, if I try to construct this go to I 0 and S. So, go to I 0, S will have S dash producing S dot, and then this S producing S dot abS. So, this is a new set I 1 that we get ok. Now, go to I 0 B. So, that will give you S producing B dot sorry S producing B dot only this item. So, this is the set I 2.

Now, go to I 0 on S we have done. So, small b I 0 small b; so, this will give me B producing b dot B, and now since dot B is coming so, I will get all these rules like B producing dot small b capital B and B producing dot. So, they will come and that will be my set I 3. Now, go to I 0, b we have done now comes go to. So, there is nothing more capital B we have done, small b we have done, that is fine; go to I 1 from I 1 we can go on small a to S to a item Sa dot bS. So, that is I 4.

Now, go to I 1 I cannot go any more in the there is no other dot, so, that is I 2 also nothing now I 3; I 3, b. So, that will give me B producing bB dot, ok. So, that is only one set so, one that we have that is a new item I 5. Now, I 3 capital B we have done I 3 small b. So, go to I 3 small b. So, that will give us B producing b dot B and then as soon as I get this item. So, this rest of the items will follow. So, this will give me I 3 only.

Now, I 3 is done now I 4 go to I 4 on b. So, that will give us S producing a sorry S producing Sab dot S and since this dot S is coming so, all these rules will come again that S producing dot B then S producing dot B, then I will get this one S producing dot SabS and since I have got this one S producing dot SabS so, this see dot B S producing dot B is there so, this B producing dot small b capital B will come and B B producing this dot so, that will also come. So, that will be our I 6 that will be the item I 6.

Now, go to so, I 4, b is done; I 5 there is nothing I then the I 6. So, I 6, S. So, this will have S producing SabS dot, then I will have this S producing S dot abS, ok. So, these two will be I 6, S. So, that is our I 7 and then go to I 6 from I 6 on capital B. So, there that will give us S producing B dot. So, it will give us S producing B dot that is equal to I 2. So, this gives us equal to I 2 and then S we have done capital B we have done small b. So, go to I 6, small b. So, that is equal to B producing b dot B. So, that is I 3 go to I 6, b

is also done. Now, I have this I 7 go to I 7 a. So, that will give us S producing Sa dot bS. So, Sa dot bS that is equal to I 4. So, this is equal to I 4.

So, we so, all the items have been constructed I 0 to I 7. Now, I have to go for the first and follow computations and then we can make the table. So, the first of S dash, then first of S, first of B. So, first of b contains small b first of S, ok. So, first of S can be so, if you start with S so, you can go on replacing this S we can replace this S by B and then this B by epsilon. So, as a result you can say that a can be there in the first of S and from this rule S producing B so, you can see whatever is in first of B is in first of S. So, this is the first of S is a, b and first of S dash is whatever is in first of S is in first of S dash. So, this a and b are there in the first of S dash.

Now, the follow sets. So, follow of S dash then follow of S and follow of B, ok. So, follow of B we have to see like what can we do, but follow of S has got this small a in it so, this has got small a from this rule you can say that S may be followed by small a, so, it is there and follow of S dash will definitely have dollar. And, because S dash is the start symbol and by this rule so, whatever is in follow of S dash will be in follow of S, so, the dollar will also come here. And, follow of b is by this rule S producing B whatever is in follow of S is in follow of B by this rule. So, follow of S has got a and dollar; so, a and dollar will be there in the follow of B also.

Now, you can try that no more item can no more this terminal can be added to this follow set and then I have to construct the table and while constructing the table. So, there will be action part and go to part. So, this is the action part and this is the go to part. In the action part I have got terminals like a, b and dollar small a small b and dollar and in the go to part I will have the non terminals S and B. Now, the items I 0, I 1, I 2, I 3, I 4, I 5, I 6, so, and I 7 so, there are eight items like that. Now, I have to look into I 0; I 0 is so, there is a rule like B producing dot B dot B so, this says that I have to go by shift and I 0 small b is I 3.

So, this is should be shift 3. And, this B producing dot is there so, whatever is in follow of dot so, they are whatever is in follow of B I have to add this is add this particular rule. So, follow of B is a and dollar. So, there I should add this B producing epsilon B producing sorry. So, this is written as reduce by rule number B producing dollar is rule number 5. So, reduce by 5 and here it is written by reduce by 5.

And, go to I 0 S is I 1. So, this is 1, go to I 0 b is I 2. So, this is 2. Now, come to so, I 0 is done now come to I 1. So, I 1 has got this rule S dash producing S dot. So, there I have to add the accept for the follow set, so, follow set of S dash is dollar. So, there I have to say accept. So, this is accept and this rule says that I have to see I 1, a. I 1 a is the I 4. So, this should be shift and 4. So, this is shift and 4. Now, come to I 2. So, come to I 2. So, this is the set S producing B dot. So, I have to look into the follow of S and this is rule number 2. So, follow of S is a dollar. So, there I have to reduce by rule number 2, fine.

Then comes this I 3. In I 3 I have got this one B producing dot b so, I have to do a shift for b. So, I 3 B should be a shift and this I 3 go to I 3 is small b is I 3. So, this is shift 3 and this one B producing dot is there so, follow of B is a and dollar there I have to do reduce by rule number 5 and it is reduced by rule number 5. So, they are done. Now, I 3 I 3, B is I 5. So, this is 5 and I 3 there is no other I 3 on the non terminal symbols. So, the I 3 that is done.

Now, come to I 4. In I 4, so, this should be a shift operation and I 4, b is a shift operation and the new state is I 4, b is I 6. So, this is shift 6. Now, come to this one I 5, so, b B dot. So, b B dot is rule number 4. So, I have to look into the follow set of capital B so, a and dollar. So, there I should do a reduce by rule number 4 and here I should do a reduce by rule number 4, fine. Now, come to this I now, come to I 6, ok. So, in I 6 I have got this rule say before non-terminal so, this terminal so, this one bB. So, this B is. So, this so, this should be a shift I 6, B is a shift and I 6 small b is 3. So, this is shift 3 and by this B producing dot so, B producing dot I have to go for this follow of b which is a and dollar that should be reduced by rule number 5. So, this is reduced by rule number 5. This is also reduce by rule number 5.

Now, come to I 7. So, I 7 says that sorry before that I 6 there will be some go to part. So, I 6, B is I 6, S is 7. So, this is I 6, S is 7 and I 6, B is 2. So, this is 2 this I 6, capital B is 2. So, that is I 2. Now, I 7; in I 7 I have this one S producing S ab S dash. So, I have to that will be a reduction rule for follow of S. So, follow of S is a and dollar and this is rule number 3. So, this is rule number 3 and this is also rule number 3 reduce by rule number 3.

And, then I 7, a says that I should do a shift and I 7, a is again telling me a shift. So, and the new state, so, this I 7, a should be a shift operation and S a is I 4. So, this is shift 4 or

reduce by rule number 3. So, at this point so, that that ends the formation of this particular table and you see at the end at this point there is shift reduce conflict. So, that is coming here. So, that is so, that that give rise to shift reduce conflict. So, this particular grammar is not a not an SLR grammar. So, this is maybe it is LR 1 or so, but it is not and it is not SLR. So, this way you can construct the SLR parsing table for this particular grammar. So, next we will be looking into another example.

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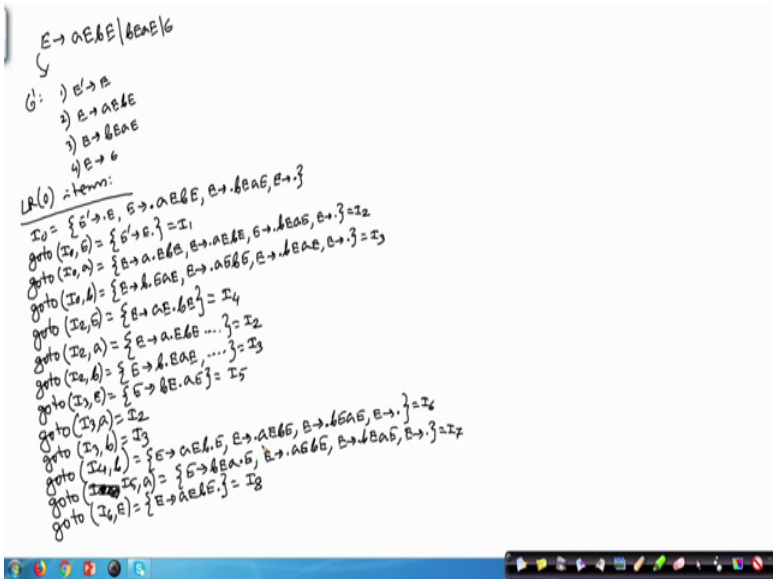

Next, we will be looking into another example which is like this. So, we have a grammar given like this. So, E producing aEbE or bEaE or epsilon; so, this is the grammar given and we have to construct the corresponding SLR parsing table. So, for doing that first we make the augmented grammar G dash and forming the augmented grammar G dash. So, we have to add one extra production E dash producing E and from there I have to the rest of the rules will be there E producing aEbE then E producing bEaE and E producing epsilon, fine.

Now, next we have to make the LR 0 items we have to make the LR 0 items. Now, how do we do this? like first of all the I 0 set I 0 has got this E dash producing dot E and then E producing dot aEbE, then E producing dot bEaE and E producing dot; this is the item I 0. Now, go to I 0, E go to I 0, E, so, that will give us E dash giving E dot that will give us E dot producing E dot and that is the set I 1.

Now, go to I 0, a; go to I 0, a is E producing a dot EbE, and then since this dot E is coming so, again all these rules will come E producing dot aEbE, E producing dot bEaE and E producing dot, ok. So, that is the set I 2. This set we call I 2. Now, go to from I 0, b has to be considered I 0, b. So, that will give us E producing b dot EaE, then since dot is coming before E. So, all those rules will come again E producing dot aEbE, E producing dot bEaE and E producing dot. So, that will be the set I 3.

Now, goto; so, I 0 we have finished now go to I 2, E go to I 2, E. So, that will give us E producing aE dot bE, it will give us aE dot bE. So, that is the set that is the item I 4 ok, I 2 E is done. Now, I 2, a go to I 2, a is E producing this rule from this rule I will get a dot EbE and as soon as this is there. So, all the items will be coming. So, they will come and this will give me the set I 2 only, this will give me the set I 2 only. Now, go to I 2, b go to I 2, b so, that will give us this E producing b dot EaE and as soon as this dot is there then again I will have this same set of rules coming. So, that will again give rise give me the set I 3 that will give me I 3.

Now, I 2 I have done a and b both are done. So, I 2 E is also done. So, I 2 is over now come to I 3. go to I 3, E; go to I 3, E will give me this I 3 go to I 3 I 3 E will give me bE dot aE. So, E producing bE dot aE that is that will be a new set E producing bE dot aE that is a new set I 5 now go to I 3, E we have done I 3 I 3 we have got I 3, a. So, go to I 3, a I 3, a is a dot EbE. So, that is equal to I 2 and go to I 3, a is I 2. Similarly go to I 3, b will be go to I 3, b will be be sorry I 3, b will give me b dot etcetera. So, that is equal to I 3. So, this will be equal to I 3.

Now, go to, I 4 b; go to I 4, b will give us E producing aEb dot E and as soon as it gives that. So, this will give us the remaining rules like dot E so, is coming. So, this E producing dot aEbE E producing dot bEaE and E producing dot. So, that is a new set I 6 and go to I 4 go to I 4, b we have done I 4 does not have anything else, then I 5 sorry go to I 5, a go to I 5, a that will give us E producing bEa dot E. And, then since this dot E is coming then all these rules will again come aEbE E producing dot bEaE and this E producing dot. So, that will be a new item I 7.

Now, go to I 6. So, I 5 is done. Now, I 6 go to I 6, E is E producing aEbE dot aEbE dot. So, that will be a new set E producing this I 6, E. So, this will give us aEbE dot. So, that

is a new set I 8 and then I can construct this I 7 from this from this I 7 from this I 6 I can make I 6, a, ok. So, those sets are to be constructed.

So, we will continue in the next class.