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Experiment 6 - Predictive Parsing Table

Dhawal Patil
RA1911003010575
CSE A2

Experiment 6

Aim:
To write a program to show predictive parsing table using Python language.

Algorithm:
1. Start the program
2. Initialize the required variables
3. Get the number of coordinates and productions from the user
4. Perform the following:
   For (each production A → α in G)
   For (each terminal a in FIRST(α))
   Add A → α to M[A,a];
   If (ε is in FIRST(α))
   For (each symbol b in FOLLOW(A))
   Add A → α to M[A,b]
5. Print the resulting stack
6. Print if the grammar is accepted or not
7. Exit the program

Code:

```
gram = {"E":["E+T","T"],"T":["T*F","F"],"F":["(E)","i"],"S":["CC"],"C":["eC","d"],}

def removeDirectLR(gramA, A):
	temp,tempCr,tempInCr = gramA[A],[],[]
	for i in temp:
		if i[0] == A:
			tempInCr.append(i[1:]+[A+"'"])
		else:
			tempCr.append(i+[A+"'"])
	tempInCr.append(["e"])
	gramA[A],gramA[A+"'"] = tempCr,tempInCr
	return gramA

def checkForIndirect(gramA, a, ai):
	if ai not in gramA:
		return False
```

```
        if a == ai:
                return True
        for i in gramA[ai]:
                if i[0] == ai:
                        return False
                if i[0] in gramA:
                        return checkForIndirect(gramA, a, i[0])
        return False

def rep(gramA, A):
        temp,newTemp = gramA[A],[]
        for i in temp:
                if checkForIndirect(gramA, A, i[0]):
                        t = []
                        for k in gramA[i[0]]:
                                t=[]
                                t+=k
                                t+=i[1:]
                                newTemp.append(t)
                else:
                        newTemp.append(i)
        gramA[A] = newTemp
        return gramA

def rem(gram):
        c,conv,gramA,revconv = 1,{},{},{}
        for j in gram:
                conv[j] = "A"+str(c)
                gramA["A"+str(c)] = []
                c+=1
        for i in gram:
                for j in gram[i]:
                        temp = []
                        for k in j:
                                if k in conv:
                                        temp.append(conv[k])
                                else:
                                        temp.append(k)
                        gramA[conv[i]].append(temp)
        for i in range(c-1,0,-1):
                ai = "A"+str(i)
                for j in range(0,i):
                        aj = gramA[ai][0][0]
```

```
                        if ai!=aj :
                                if aj in gramA and checkForIndirect(gramA,ai,aj):
                                        gramA = rep(gramA, ai)
        for i in range(1,c):
                ai = "A"+str(i)
                for j in gramA[ai]:
                        if ai==j[0]:
                                gramA = removeDirectLR(gramA, ai)
                                break
        op = {}
        for i in gramA:
                a = str(i)
                for j in conv:
                        a = a.replace(conv[j],j)
                revconv[i] = a
        for i in gramA:
                l = []
                for j in gramA[i]:
                        k = []
                        for m in j:
                                if m in revconv:
                                        k.append(m.replace(m,revconv[m]))
                                else:
                                        k.append(m)
                        l.append(k)
                op[revconv[i]] = l
        return op

result,terminals = rem(gram),[]
for i in result:
        for j in result[i]:
                for k in j:
                        if k not in result:
                                terminals+=[k]
terminals = list(set(terminals))

def first(gram, term):
        a = []
        if term not in gram:
                return [term]
        for i in gram[term]:
                if i[0] not in gram:
                        a.append(i[0])
```

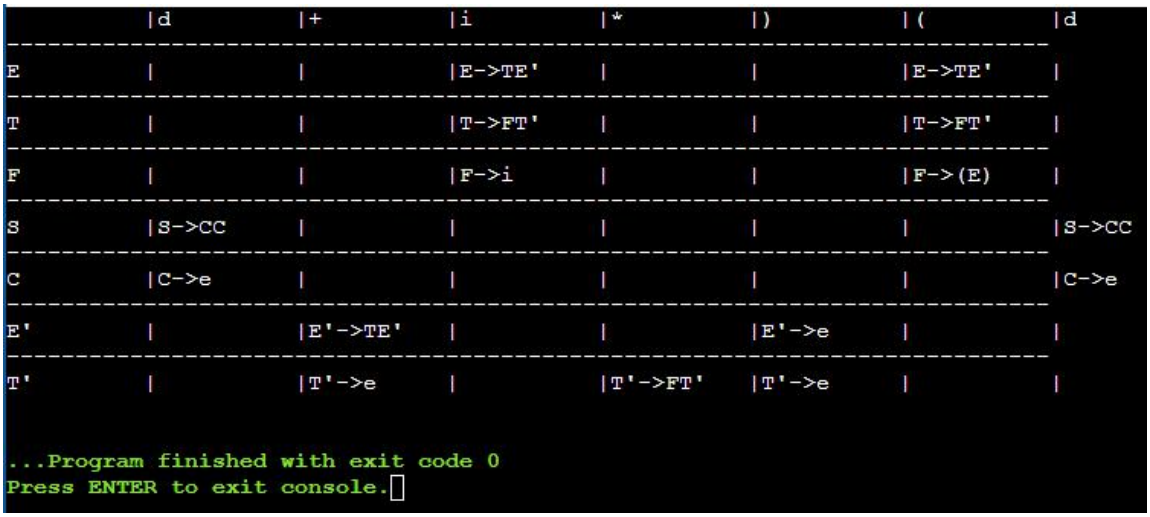
```
                elif i[0] in gram:
                        a += first(gram, i[0])
        return a

firsts = {}
for i in result:
        firsts[i] = first(result,i)

def follow(gram, term):
        a = []
        for rule in gram:
                for i in gram[rule]:
                        if term in i:
                                temp,indx = i,i.index(term)
                                if indx+1!=len(i):
                                        if i[-1] in firsts:
                                                a+=firsts[i[-1]]
                                        else:
                                                a+=[i[-1]]
                                else:
                                        a+=["e"]
                                if rule != term and "e" in a:
                                        a+= follow(gram,rule)
        return a

follows = {}
for i in result:
        follows[i] = list(set(follow(result,i)))
        if "e" in follows[i]:
                follows[i].pop(follows[i].index("e"))
        follows[i]+=["$"]

resMod = {}
for i in result:
        l = []
        for j in result[i]:
                temp = ""
                for k in j:
                        temp+=k
                l.append(temp)
        resMod[i] = l
tterm = list(terminals)
tterm.pop(tterm.index("e"))
```

```
tterm+=["d"]
pptable = {}
for i in result:
	for j in tterm:
		if j in firsts[i]:
			pptable[(i,j)]=resMod[i[0]][0]
		else:
			pptable[(i,j)]=""
	if "e" in firsts[i]:
		for j in tterm:
			if j in follows[i]:
				pptable[(i,j)]="e"
pptable[("F","i")] = "i"
toprint = f'{"": <10}'
for i in tterm:
	toprint+= f'|{i: <10}'
print(toprint)
for i in result:
	toprint = f'{i: <10}'
	for j in tterm:
		if pptable[(i,j)]!="":
			toprint+=f'|{i+"->"+pptable[(i,j)]: <10}'
		else:
			toprint+=f'|{pptable[(i,j)]: <10}'
	print(f'{"-":-<76}')
	print(toprint)
```

```
gram = {"E":["E+T","T"],"T":["T*F","F"],"F":["(E)","i"],"S":["CC"],"C":["eC","d"],}

def removeDirectLR(gramA, A):
    temp,tempCr,tempInCr = gramA[A],[],[]
    for i in temp:
        if i[0] == A:
            tempInCr.append(i[1:]+[A+"'"])
        else:
            tempCr.append(i+[A+"'"])
    tempInCr.append(["e"])
    gramA[A],gramA[A+"'"] = tempCr,tempInCr
    return gramA

def checkForIndirect(gramA, a, ai):
    if ai not in gramA:
        return False
    if a == ai:
        return True
    for i in gramA[ai]:
        if i[0] == ai:
            return False
        if i[0] in gramA:
            return checkForIndirect(gramA, a, i[0])
    return False

def rep(gramA, A):
    temp,newTemp = gramA[A],[]
    for i in temp:
        if checkForIndirect(gramA, A, i[0]):
            t = []
            for k in gramA[i[0]]:
                t=[]
                t+=k
                t+=i[1:]
                newTemp.append(t)
        else:
            newTemp.append(i)
    gramA[A] = newTemp
    return gramA

def rem(gram):
    c,conv,gramA,revconv = 1,{},{},{}
    for j in gram:
        conv[j] = "A"+str(c)
        gramA["A"+str(c)] = []
        c+=1
    for i in gram:
        for j in gram[i]:
            temp = []
            for k in j:
                if k in conv:
                    temp.append(conv[k])
                else:
                    temp.append(k)
            gramA[conv[i]].append(temp)
    for i in range(c-1,0,-1):
        ai = "A"+str(i)
        for j in range(0,i):
            aj = gramA[ai][0][0]
            if ai!=aj :
                if aj in gramA and checkForIndirect(gramA,ai,aj):
                    gramA = rep(gramA, ai)
    for i in range(1,c):
        ai = "A"+str(i)
        for j in gramA[ai]:
            if ai==j[0]:
                gramA = removeDirectLR(gramA, ai)
                break
    op = {}
    for i in gramA:
        a = str(i)
        for j in conv:
```

```
            a = a.replace(conv[j],j)
        revconv[i] = a
    for i in gramA:
        l = []
        for j in gramA[i]:
            k = []
            for m in j:
                if m in revconv:
                    k.append(m.replace(m,revconv[m]))
                else:
                    k.append(m)
            l.append(k)
        op[revconv[i]] = l
    return op

result,terminals = rem(gram),[]
for i in result:
    for j in result[i]:
        for k in j:
            if k not in result:
                terminals+=[k]
terminals = list(set(terminals))

def first(gram, term):
    a = []
    if term not in gram:
        return [term]
    for i in gram[term]:
        if i[0] not in gram:
            a.append(i[0])
        elif i[0] in gram:
            a += first(gram, i[0])
    return a

firsts = {}
for i in result:
    firsts[i] = first(result,i)

def follow(gram, term):
    a = []
    for rule in gram:
        for i in gram[rule]:
            if term in i:
                temp,indx = i,i.index(term)
                if indx+1!=len(i):
                    if i[-1] in firsts:
                        a+=firsts[i[-1]]
                    else:
                        a+=[i[-1]]
                else:
                    a+=["e"]
                if rule != term and "e" in a:
                    a+= follow(gram,rule)
    return a

follows = {}
for i in result:
    follows[i] = list(set(follow(result,i)))
    if "e" in follows[i]:
        follows[i].pop(follows[i].index("e"))
    follows[i]+=["$"]

resMod = {}
for i in result:
    l = []
    for j in result[i]:
        temp = ""
        for k in j:
            temp+=k
        l.append(temp)
    resMod[i] = l
tterm = list(terminals)
tterm.pop(tterm.index("e"))
tterm+=["d"]
pptable = {}
for i in result:
    for j in tterm:
        if j in firsts[i]:
            pptable[(i,j)]=resMod[i[0]][0]
        else:
            pptable[(i,j)]=""
    if "e" in firsts[i]:
        for j in tterm:
            if j in follows[i]:
                pptable[(i,j)]="e"
pptable[("F","i")] = "i"
toprint = f'{"": <10}'
for i in tterm:
    toprint+= f'|{i: <10}'
print(toprint)
for i in result:
    toprint = f'{i: <10}'
    for j in tterm:
        if pptable[(i,j)]!="":
            toprint+=f'|{i+"->"+pptable[(i,j)]: <10}'
        else:
            toprint+=f'|{pptable[(i,j)]: <10}'
    print(f'{"-":-<76}')
    print(toprint)
```

Output:



```
          |d          |+          |i          |*          |)          |(          |d
-------------------------------------------------------------------------------------
E         |           |           |E->TE'     |           |           |E->TE'     |
-------------------------------------------------------------------------------------
T         |           |           |T->FT'     |           |           |T->FT'     |
-------------------------------------------------------------------------------------
F         |           |           |F->i       |           |           |F->(E)     |
-------------------------------------------------------------------------------------
S         |S->CC      |           |           |           |           |           |S->CC
-------------------------------------------------------------------------------------
C         |C->e       |           |           |           |           |           |C->e
-------------------------------------------------------------------------------------
E'        |           |E'->TE'    |           |           |E'->e      |           |
-------------------------------------------------------------------------------------
T'        |           |T'->e      |           |T'->FT'    |T'->e      |           |


...Program finished with exit code 0
Press ENTER to exit console.
```

Result:

A program for Predictive parsing table was run successfully.