**Susmita Rani Saha**

**Compiler lab ( lex programming)**

1. **Recognized and count identifiers in given input :**

%Susmita Rani Saha B180305047

%{

#include<stdio.h>

int keyword=0;

int id=0;

%}

%%

"int"|"double"|"float"|"char"|"do"|"while"|"for"|"break"|"if"|"else"|"void"|"switch"|"printf"|"scanf"|"main" {keyword++; printf("\n%s is keyword",yytext);}

[a-zA-Z][a-zA-Z0-9]\* {id++; printf("\n%s is identifier",yytext);}

%%

int main()

{

yylex();

printf("identifier is %d\n", id);

return 0;

}

int yywrap(){

return 1;

}

1. **Count character, word, space, line in given input:**

%Susmita Rani Saha B180305047

%{

#include<stdio.h>

int ch=0;

int word=0;

int space=0;

int line=0;

%}

%%

[a-zA-Z] {ch++; printf("\n%s is char",yytext);}

[a-zA-Z][a-zA-Z]\* {word++; printf("\n%s is word",yytext);}

" " {space++; printf("\n%s space",yytext);}

"\n" {line++; printf("%s new line\n",yytext);}

%%

int main()

{

yylex();

printf("\nchar is %d,word is %d,space is %d,line is %d",ch,word,space,line);

return 0;

}

int yywrap(){

return 1;

}

**3.count the number of comments line in a c/c++/java program :**

%Susmita Rani Saha B180305047

%{

#include<stdio.h>

int sc=0;

int mlc=0;

%}

%%

[/][/].\* {sc++; printf("\n%s is singleline comment",yytext);}

"/\*".\*"\*/" {mlc++; printf("\n%s is multiline comment",yytext);}

%%

int main()

{

yyin = fopen("comments.c","r");

yylex();

printf("%d single line,%d multiple line",sc,mlc);

return 0;

}

int yywrap(){

return 1;

}

**4.Identify integer, float, exponential, complex number :**

%Susmita Rani Saha B180305047

%{

#include<stdio.h>

int in=0;

int flt=0;

int expp=0;

int cmplx=0;

%}

%%

[+-]?[0-9]+ {in++; printf("\n%s is integer",yytext);}

[+-]?[0-9]\*"."[0-9]+ {flt++; printf("\n%s is float",yytext);}

[+-]?[0-9]+[Ee][-+]?[0-9]+ {expp++; printf("\n%s is exponentital",yytext);}

[+-]?[0-9]\*[-+]?[0-9]\*"i" {cmplx++; printf("\n%s is complex",yytext);}

%%

int main()

{

yylex();

return 0;

}

int yywrap(){

return 1;

}

**4.Identify the operator of telephone:**

%Susmita Rani Saha B180305047

%{

#include<stdio.h>

%}

%%

[0-9] {printf(""); }

^"+8801"[1]? { printf("\nCitycell\n"); }

^"+8801"[37]? { printf("\nGrameenphone\n"); }

^"+8801"[49]? { printf("\nBanglalink\n"); }

^"+8801"[5]? { printf("\nTeletalk\n"); }

^"+8801"[68]? { printf("\nRobi\n"); }

%%

int main()

{

printf("Enter Phone number:\n");

yylex();

return 0;

}

int yywrap(){

return 1;

}

**6. Identify “ to be” verb:**

%Susmita Rani Saha B180305047

%{

#include<stdio.h>

int to=0;

%}

%%

"am"|"is"|"are"|"was"|"were"|"have"|"has"|"had" { printf("\n %s is to be verb\n",yytext);}

%%

int main()

{

yylex();

return 0;

}

int yywrap(){

return 1;

}

**7. Whether a given sentence is simple/complex/compound:**

%Susmita Rani Saha B180305047

%{

#include<stdio.h>

int sen=0;

%}

%%

(""[aA][nN][dD]"")|(""[oO][rR]"")|(""[bB][uU][tT]"")|(""[yY][eE][tT]"") { printf("\n%s is used as compound word\n",yytext); sen=1; }

(""[tT][hH][oO][uU][gG][hH]"")|(""[aA][sS]"")|(""[sS][iI][nN][cC][eE]"")|(""[bB][eE][cC][aA][uU][sS][eE]"")|(""[tT][hH][aA][tT]"")|(""[iI][fF]"") { printf("\n%s is used as complex word\n",yytext);sen=2;}

%%

int main()

{

printf("Enter the sentence ");

yylex();

if(sen==1)

printf("\nCompound Sentence\n");

else if(sen==2)

printf("\nComplex Sentence\n");

else

printf("\nSimple Sentence\n");

return 0;

}

int yywrap(){

return 1;

}

others

. {fault++;}

C program

1.firstfollow

/\*P=i

P=c

P=nTS

Q=P

Q=aS

Q=bScST

R=b

R=#

S=c

S=Rn

S=#

T=RSq\*/

#include<stdio.h>

#include<ctype.h>

#include<string.h>

#include<math.h>

#include<stdlib.h>

char production[20][20];

char f[100];

char done[100];

int count,n=0,m=0,flag=0;

void findfirst(char c);

void findfollow(char c);

int main()

{

char c;

printf("Enter the number of production rules:\n");

scanf("%d",&count);

printf("Enter the production rules (E=T+R) :\n");

//input the grammer

for(int i=0;i<count;i++){

scanf("%s",&production[i]);

}

for(int i=0;i<count;i++){

done[i]=production[i][0];

}

for(int i=0;i<count;i++){

for(int j=0;j<count;j++){

if(done[i]==done[j]&&i!=j)

{

done[j]='!';

}

}

}

//for(int i=0;i<count;i++){

// printf("%c",done[i]);

//}

// first function call

for(int i=0;i<count;i++){

n=0;

c=done[i];

if(isalpha(c))

{

findfirst(c);

printf("First (%c) = {",c);

for(int j=0;j<n;j++){

printf(" %c ",f[j]);

}

printf("}\n");

strcpy(f," ");

n=0;

findfollow(c);

printf("Follow (%c) = {",c);

for(int j=0;j<n;j++){

printf(" %c ",f[j]);

}

printf("}\n");

}

}

}

void findfirst(char c){

// lower letter hole direct first e jabe

if(islower(c)){

f[n++]=c; //string hisebe chinta korche

}

//nahole jotogula same nonterminal thkbe sob gular first ber korbo

for(int i=0;i<count;i++){

if(production[i][0]==c)

{

if(production[i][2]=='#'){ // # mane epsilon. = erpr elsilon pele first e jabe

f[n++]='#';

findfollow(production[i][0]);

}

else if(islower(production[i][2])) //terminal pele first e jbe

f[n++]=production[i][2];

else

findfirst(production[i][2]); // Non-terminal pele call again

}

}

}

void findfollow(char c){

if(production[0][0]==c)

f[n++]='$';

for(int i=0;i<count;i++){

for(int j=2;j<strlen(production[i]);j++){

if(production[i][j]==c)

{

if(production[i][j+1]!='\0')

findfirst(production[i][j+1]);

if(production[i][j+1]=='\0'&& c!=production[i][0])

findfollow(production[i][0]);

}

}

}

}

1. LL1

#include<stdio.h>

#include<ctype.h>

#include<string.h>

#include<stdlib.h>

void followfirst(char , int , int);

void findfirst(char , int , int);

void follow(char c);

int count,n=0;

char calc\_first[10][100];

char calc\_follow[10][100];

int m=0;

char production[10][10], first[10];

char f[10];

int k;

char ck;

int e;

int main(int argc,char \*\*argv)

{

int jm=0;

int km=0;

int i,choice;

char c,ch;

printf("How many productions ? :");

scanf("%d",&count);

printf("\nEnter %d productions :\n\n",count);

for(i=0;i<count;i++)

{

scanf("%s%c",production[i],&ch);

}

int kay;

char done[count];

int ptr = -1;

for(k=0;k<count;k++){

for(kay=0;kay<100;kay++){

calc\_first[k][kay] = '!';

}

}

int point1 = 0,point2,xxx;

for(k=0;k<count;k++)

{

c=production[k][0];

point2 = 0;

xxx = 0;

for(kay = 0; kay <= ptr; kay++)

if(c == done[kay])

xxx = 1;

if (xxx == 1)

continue;

findfirst(c,0,0);

ptr+=1;

done[ptr] = c;

printf("\n First(%c)= { ",c);

calc\_first[point1][point2++] = c;

for(i=0+jm;i<n;i++){

int lark = 0,chk = 0;

for(lark=0;lark<point2;lark++){

if (first[i] == calc\_first[point1][lark]){

chk = 1;

break;

}

}

if(chk == 0){

printf("%c, ",first[i]);

calc\_first[point1][point2++] = first[i];

}

}

printf("}\n");

jm=n;

point1++;

}

printf("\n");

printf("-----------------------------------------------\n\n");

char donee[count];

ptr = -1;

for(k=0;k<count;k++){

for(kay=0;kay<100;kay++){

calc\_follow[k][kay] = '!';

}

}

point1 = 0;

int land = 0;

for(e=0;e<count;e++)

{

ck=production[e][0];

point2 = 0;

xxx = 0;

for(kay = 0; kay <= ptr; kay++)

if(ck == donee[kay])

xxx = 1;

if (xxx == 1)

continue;

land += 1;

follow(ck);

ptr+=1;

donee[ptr] = ck;

printf(" Follow(%c) = { ",ck);

calc\_follow[point1][point2++] = ck;

for(i=0+km;i<m;i++){

int lark = 0,chk = 0;

for(lark=0;lark<point2;lark++){

if (f[i] == calc\_follow[point1][lark]){

chk = 1;

break;

}

}

if(chk == 0){

printf("%c, ",f[i]);

calc\_follow[point1][point2++] = f[i];

}

}

printf(" }\n\n");

km=m;

point1++;

}

char ter[10];

for(k=0;k<10;k++){

ter[k] = '!';

}

int ap,vp,sid = 0;

for(k=0;k<count;k++){

for(kay=0;kay<count;kay++){

if(!isupper(production[k][kay]) && production[k][kay]!= '#' && production[k][kay] != '=' && production[k][kay] != '\0'){

vp = 0;

for(ap = 0;ap < sid; ap++){

if(production[k][kay] == ter[ap]){

vp = 1;

break;

}

}

if(vp == 0){

ter[sid] = production[k][kay];

sid ++;

}

}

}

}

ter[sid] = '$';

sid++;

printf("\n\t\t\t\t\t\t\t The LL(1) Parsing Table for the above grammer :-");

printf("\n\t\t\t\t\t\t\t^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^\n");

printf("\n\t\t\t=====================================================================================================================\n");

printf("\t\t\t\t|\t");

for(ap = 0;ap < sid; ap++){

printf("%c\t\t",ter[ap]);

}

printf("\n\t\t\t=====================================================================================================================\n");

char first\_prod[count][sid];

for(ap=0;ap<count;ap++){

int destiny = 0;

k = 2;

int ct = 0;

char tem[100];

while(production[ap][k] != '\0'){

if(!isupper(production[ap][k])){

tem[ct++] = production[ap][k];

tem[ct++] = '\_';

tem[ct++] = '\0';

k++;

break;

}

else{

int zap=0;

int tuna = 0;

for(zap=0;zap<count;zap++){

if(calc\_first[zap][0] == production[ap][k]){

for(tuna=1;tuna<100;tuna++){

if(calc\_first[zap][tuna] != '!'){

tem[ct++] = calc\_first[zap][tuna];

}

else

break;

}

break;

}

}

tem[ct++] = '\_';

}

k++;

}

int zap = 0,tuna;

for(tuna = 0;tuna<ct;tuna++){

if(tem[tuna] == '#'){

zap = 1;

}

else if(tem[tuna] == '\_'){

if(zap == 1){

zap = 0;

}

else

break;

}

else{

first\_prod[ap][destiny++] = tem[tuna];

}

}

}

char table[land][sid+1];

ptr = -1;

for(ap = 0; ap < land ; ap++){

for(kay = 0; kay < (sid + 1) ; kay++){

table[ap][kay] = '!';

}

}

for(ap = 0; ap < count ; ap++){

ck = production[ap][0];

xxx = 0;

for(kay = 0; kay <= ptr; kay++)

if(ck == table[kay][0])

xxx = 1;

if (xxx == 1)

continue;

else{

ptr = ptr + 1;

table[ptr][0] = ck;

}

}

for(ap = 0; ap < count ; ap++){

int tuna = 0;

while(first\_prod[ap][tuna] != '\0'){

int to,ni=0;

for(to=0;to<sid;to++){

if(first\_prod[ap][tuna] == ter[to]){

ni = 1;

}

}

if(ni == 1){

char xz = production[ap][0];

int cz=0;

while(table[cz][0] != xz){

cz = cz + 1;

}

int vz=0;

while(ter[vz] != first\_prod[ap][tuna]){

vz = vz + 1;

}

table[cz][vz+1] = (char)(ap + 65);

}

tuna++;

}

}

for(k=0;k<sid;k++){

for(kay=0;kay<100;kay++){

if(calc\_first[k][kay] == '!'){

break;

}

else if(calc\_first[k][kay] == '#'){

int fz = 1;

while(calc\_follow[k][fz] != '!'){

char xz = production[k][0];

int cz=0;

while(table[cz][0] != xz){

cz = cz + 1;

}

int vz=0;

while(ter[vz] != calc\_follow[k][fz]){

vz = vz + 1;

}

table[k][vz+1] = '#';

fz++;

}

break;

}

}

}

for(ap = 0; ap < land ; ap++){

printf("\t\t\t %c\t|\t",table[ap][0]);

for(kay = 1; kay < (sid + 1) ; kay++){

if(table[ap][kay] == '!')

printf("\t\t");

else if(table[ap][kay] == '#')

printf("%c=#\t\t",table[ap][0]);

else{

int mum = (int)(table[ap][kay]);

mum -= 65;

printf("%s\t\t",production[mum]);

}

}

printf("\n");

printf("\t\t\t---------------------------------------------------------------------------------------------------------------------");

printf("\n");

}

int j;

printf("\n\nPlease enter the desired INPUT STRING = ");

char input[100];

scanf("%s%c",input,&ch);

printf("\n\t\t\t\t\t===========================================================================\n");

printf("\t\t\t\t\t\tStack\t\t\tInput\t\t\tAction");

printf("\n\t\t\t\t\t===========================================================================\n");

int i\_ptr = 0,s\_ptr = 1;

char stack[100];

stack[0] = '$';

stack[1] = table[0][0];

while(s\_ptr != -1){

printf("\t\t\t\t\t\t");

int vamp = 0;

for(vamp=0;vamp<=s\_ptr;vamp++){

printf("%c",stack[vamp]);

}

printf("\t\t\t");

vamp = i\_ptr;

while(input[vamp] != '\0'){

printf("%c",input[vamp]);

vamp++;

}

printf("\t\t\t");

char her = input[i\_ptr];

char him = stack[s\_ptr];

s\_ptr--;

if(!isupper(him)){

if(her == him){

i\_ptr++;

printf("POP ACTION\n");

}

else{

printf("\nString Not Accepted by LL(1) Parser !!\n");

exit(0);

}

}

else{

for(i=0;i<sid;i++){

if(ter[i] == her)

break;

}

char produ[100];

for(j=0;j<land;j++){

if(him == table[j][0]){

if (table[j][i+1] == '#'){

printf("%c=#\n",table[j][0]);

produ[0] = '#';

produ[1] = '\0';

}

else if(table[j][i+1] != '!'){

int mum = (int)(table[j][i+1]);

mum -= 65;

strcpy(produ,production[mum]);

printf("%s\n",produ);

}

else{

printf("\nString Not Accepted by LL(1) Parser !!\n");

exit(0);

}

}

}

int le = strlen(produ);

le = le - 1;

if(le == 0){

continue;

}

for(j=le;j>=2;j--){

s\_ptr++;

stack[s\_ptr] = produ[j];

}

}

}

//printf("\n\t\t\t=======================================================================================================================\n");

if (input[i\_ptr] == '\0'){

printf("\t\t\t\t\t\t\t\tYOUR STRING HAS BEEN ACCEPTED !!\n");

}

else

printf("\n\t\t\t\t\t\t\t\tYOUR STRING HAS BEEN REJECTED !!\n");

//printf("\t\t\t=======================================================================================================================\n");

}

void follow(char c)

{

int i ,j;

if(production[0][0]==c){

f[m++]='$';

}

for(i=0;i<10;i++)

{

for(j=2;j<10;j++)

{

if(production[i][j]==c)

{

if(production[i][j+1]!='\0'){

followfirst(production[i][j+1],i,(j+2));

}

if(production[i][j+1]=='\0'&&c!=production[i][0]){

follow(production[i][0]);

}

}

}

}

}

void findfirst(char c ,int q1 , int q2)

{

int j;

if(!(isupper(c))){

first[n++]=c;

}

for(j=0;j<count;j++)

{

if(production[j][0]==c)

{

if(production[j][2]=='#'){

if(production[q1][q2] == '\0')

first[n++]='#';

else if(production[q1][q2] != '\0' && (q1 != 0 || q2 != 0))

{

findfirst(production[q1][q2], q1, (q2+1));

}

else

first[n++]='#';

}

else if(!isupper(production[j][2])){

first[n++]=production[j][2];

}

else {

findfirst(production[j][2], j, 3);

}

}

}

}

void followfirst(char c, int c1 , int c2)

{

int k;

if(!(isupper(c)))

f[m++]=c;

else{

int i=0,j=1;

for(i=0;i<count;i++)

{

if(calc\_first[i][0] == c)

break;

}

while(calc\_first[i][j] != '!')

{

if(calc\_first[i][j] != '#'){

f[m++] = calc\_first[i][j];

}

else{

if(production[c1][c2] == '\0'){

follow(production[c1][0]);

}

else{

followfirst(production[c1][c2],c1,c2+1);

}

}

j++;

}

}

}