BCSE307P – Compiler Design Lab

Winter Semester 2023-24

Assessment 3

Computation of FIRST and FOLLOW

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Slot: L7 + L8

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Task:

To determine the FIRST and FOLLOW of the given LL (1) grammar.

E = TR

R = +TR / $

T = FY

Y = *FY / $

F = (E) / i

Code:

```
#include <stdio.h>
#include <ctype.h>
#include <string.h>

void followFirst(char, int, int);
void follow(char c);
void findFirst(char, int, int);

int count, n=0;

char calc_first[10][100];
char calc_follow[10][100];

int m = 0;
char production[10][10];
char f[10], first[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;
        count = 8;

        strcpy(production[0], "E=TR");
        strcpy(production[1], "R=+TR");
        strcpy(production[2], "R=#");
        strcpy(production[3], "T=FY");
        strcpy(production[4], "Y=*FY");
        strcpy(production[5], "Y=#");
        strcpy(production[6], "F=(E)");
        strcpy(production[7], "F=i");

        int k, 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++;
        }
}

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')
                                {
```

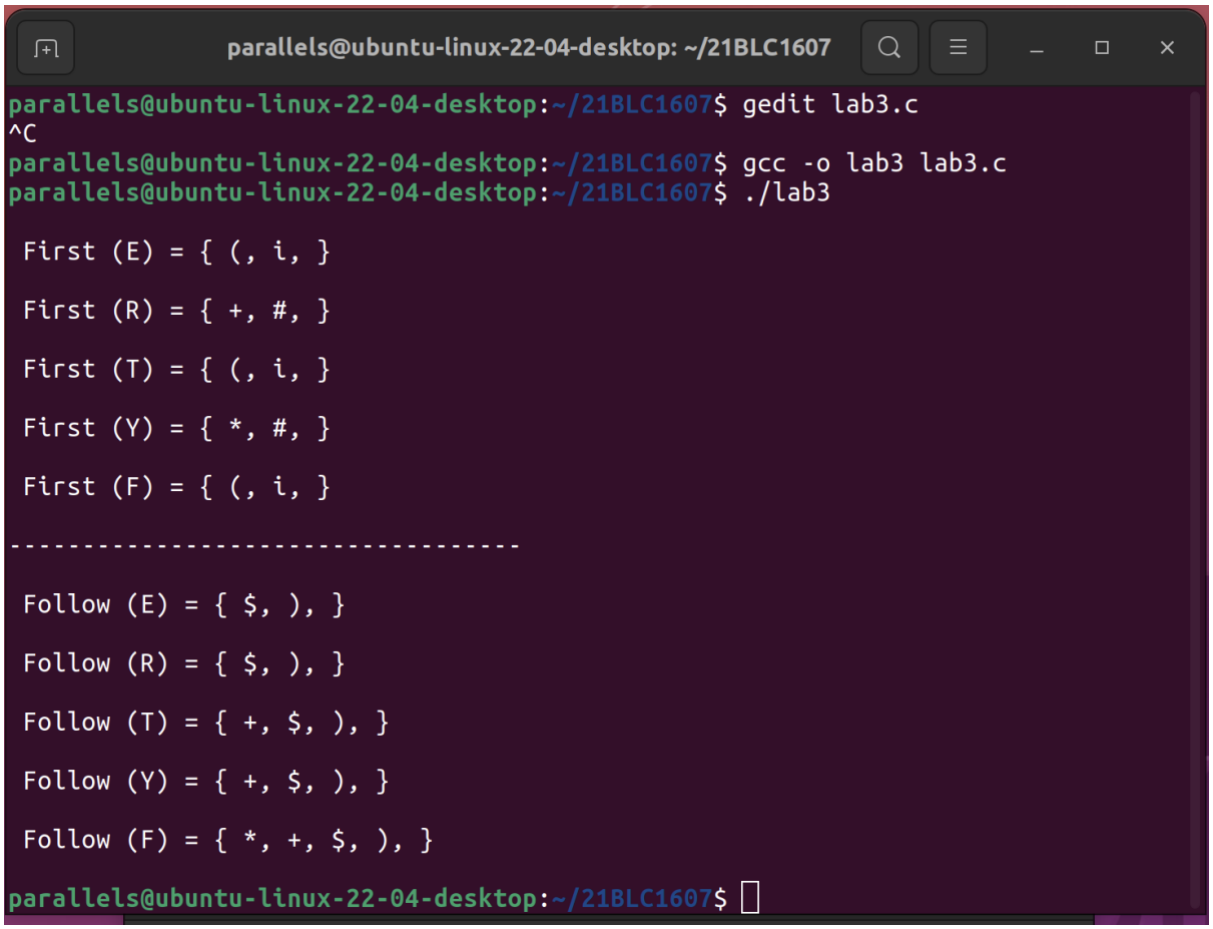
```
                                        followFirst(production[i][j+1], i,
(j+2));
                                }
                                if (production[i][j+1] == '\0' && c !=
production[i][0]) {
                                        follow(production[i][0]);
                                }
                        }
                }
        }
}

void findFirst(char c, int q1, int q2) {
        int k, 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++;
                }
        }
}
```

Output:



Result:

Thus, the experiment has been successfully executed and verified.