SSN COLLEGE OF ENGINEERING, KALAVAKKAM
(An Autonomous Institution, Affiliated to Anna University, Chennai)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

UCS1411 - OPERATING SYSTEMS LAB

LAB EXERCISE 13

File Organization Techniques

Submission Date:30-05-2022

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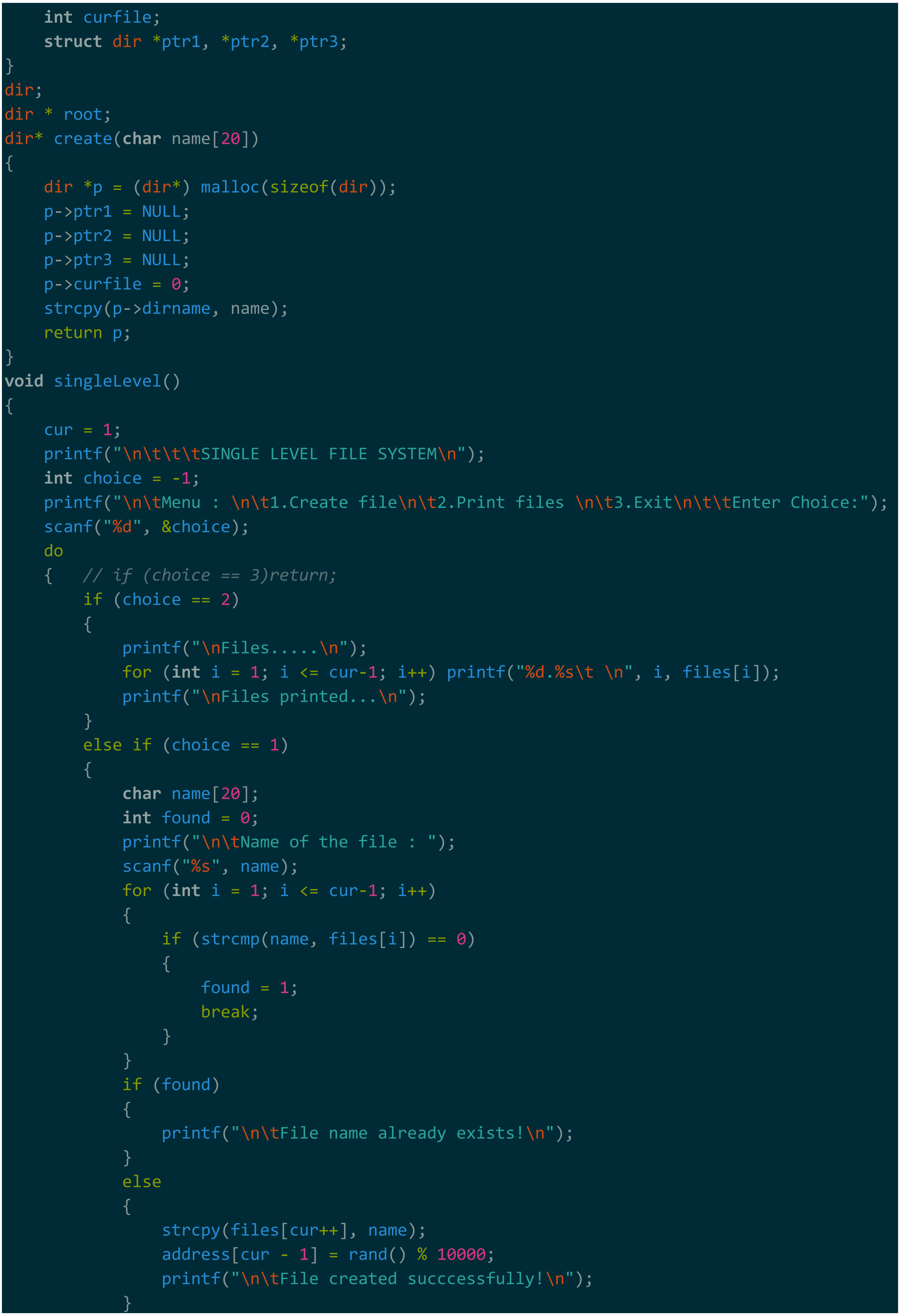
1. To develop a C program to implement the following file organization techniques
   a) Single level Directory
   b) Hierarchical Structure.

Algorithm:

1. Single Level Directory
   a. Maintain a table containing the filename and the starting address location of that file.
   b. Give options for creating a new file.
   c. When creating the file, check for name collision.
   d. Update the table accordingly.
2. Tree Structured Directory
   a. Maintain tables for each directory starting from root.
   b. Create a structure for a node in tree which contains an array to hold directories and an array to hold files.
   c. Limit each directory to have a maximum of three sub-directories and files.
   d. For each sub-directory follow the same table structure as described above

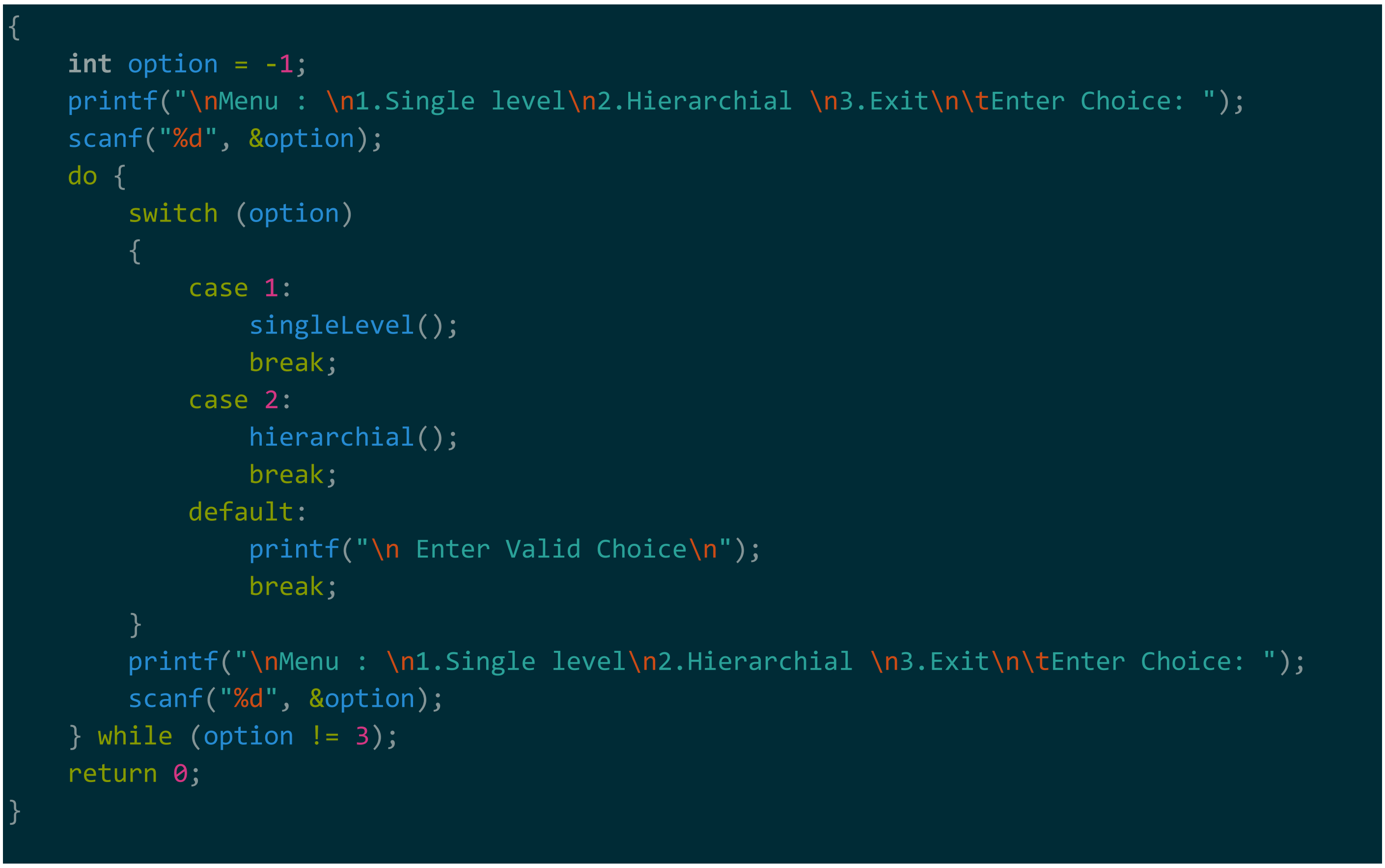
Code:

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <time.h>

char files[100][20];
int address[100];
int cur = 1;
typedef struct dir
{
    char dirname[20];
    char filename[100][10];
    int address[100];
```



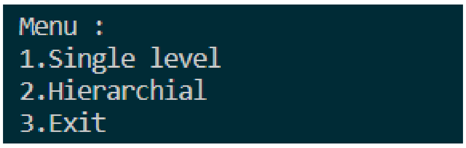
```
    int curfile;
    struct dir *ptr1, *ptr2, *ptr3;
}
dir;
dir * root;
dir* create(char name[20])
{
    dir *p = (dir*) malloc(sizeof(dir));
    p->ptr1 = NULL;
    p->ptr2 = NULL;
    p->ptr3 = NULL;
    p->curfile = 0;
    strcpy(p->dirname, name);
    return p;
}
void singleLevel()
{
    cur = 1;
    printf("\n\t\t\tSINGLE LEVEL FILE SYSTEM\n");
    int choice = -1;
    printf("\n\tMenu : \n\t1.Create file\n\t2.Print files \n\t3.Exit\n\t\tEnter Choice:");
    scanf("%d", &choice);
    do
    {   // if (choice == 3)return;
        if (choice == 2)
        {
            printf("\nFiles.....\n");
            for (int i = 1; i <= cur-1; i++) printf("%d.%s\t \n", i, files[i]);
            printf("\nFiles printed...\n");
        }
        else if (choice == 1)
        {
            char name[20];
            int found = 0;
            printf("\n\tName of the file : ");
            scanf("%s", name);
            for (int i = 1; i <= cur-1; i++)
            {
                if (strcmp(name, files[i]) == 0)
                {
                    found = 1;
                    break;
                }
            }
            if (found)
            {
                printf("\n\tFile name already exists!\n");
            }
            else
            {
                strcpy(files[cur++], name);
                address[cur - 1] = rand() % 10000;
                printf("\n\tFile created succcessfully!\n");
            }
        }

        printf("\n\tMenu : \n\t1.Create file\n\t2.Print files \n\t3.Exit\n\t\tEnter Choice: ");
        scanf("%d", &choice);
    } while (choice != 3);
}
dir* find(dir *p, char name[20])
{
    if (p == NULL) return NULL;
    if (strcmp(p->dirname, name) == 0) return p;
    dir *p1 = find(p->ptr1, name);
    if (p1 != NULL) return p1;
    dir *p2 = find(p->ptr2, name);
    if (p2) return p2;
    dir *p3 = find(p->ptr3, name);
    if (p3) return p3;
    return NULL;
}
void print(dir *p)
{
    printf("\nDirectory Name : %s\n", p->dirname);
    if (p->curfile == 0)
    {
        printf("\n\tNO FILES IN DIRECTORY!\n");
    }
    else
    {
        printf("Files in Directory :");
        for (int i = 1; i <= p->curfile; i++)
        {
            printf("\n\t%s", p->filename[i]);
        }
    }
    if (p->ptr1 == NULL) return;
    printf("\n\tSubdirectories :");
    if (p->ptr1 != NULL)
    {
        printf("\n\t\t%s", p->ptr1->dirname);
    }
    if (p->ptr2 != NULL)
    {
        printf("\n\t\t%s", p->ptr2->dirname);
    }
    if (p->ptr3 != NULL)
    {
        printf("\n\t\t%s", p->ptr3->dirname);
    }
    printf("\n\n");
}

void display(dir *p)
{
    if (p == NULL)
```

```
        return;;
    print(p);
    display(p->ptr1);
    display(p->ptr2);
    display(p->ptr3);
}
void hierarchial()
{
    cur = 1;
    root = create("root");
    printf("\n\t\t\tTREE LEVEL FILE SYSTEM\n");
    int choice = -1;
    printf("\n\tMenu : \n\t1.Create directory\n\t2.Create file\n\t3.Print files
\n\t4.Exit\n\t\tEnter Choice: ");
    scanf("%d", &choice);
    do
    {
        if (choice == 1)
        {
            char name[20];
            printf("\n\tName of directory to be created :");
            scanf("%s", name);
            char parent[20];
            printf("\n\tParent name : ");
            scanf("%s", parent);
            dir *p = find(root, parent);
            if (p == NULL) printf("\n\tDirectory not found!");
            else
            {
                if (p->ptr1 == NULL)
                {
                    dir *temp = create(name);
                    p->ptr1 = temp;
                    printf("\n\tDirectory succcessfully created!\n");
                }
                else if (p->ptr2 == NULL)
                {
                    if (strcmp(p->ptr1->dirname, name) == 0) printf("\n\t Name already
exists!\n");
                    else
                    {
                        dir *temp = create(name);
                        p->ptr2 = temp;
                        printf("\n\tDirectory succcessfully created!\n");
                    }
                }
                else if (p->ptr3 == NULL)
                {
                    if (strcmp(p->ptr1->dirname, name) == 0 || strcmp(p->ptr2->dirname,
name) == 0) printf("\n\tDirectory Name already exists!\n");
                    else
                    {
                        dir *temp = create(name);
                        p->ptr3 = temp;
                        printf("\n\tDirectory succcessfully created!\n");
                    }
                }
                else printf("\nCannot create directory. Space exceeded!\n");
            }
        }
        else if (choice == 2)
        {
            char file[20];
            printf("\n\tEnter file name : ");
            scanf("%s", file);
            printf("\n\tEnter directory under which you want to create the file : ");
            char direc[20];
            scanf("%s", direc);
            dir *p = find(root, direc);
            if (p == NULL)
            {
                printf("\n\tDirectory does not exist!");
            }
            else
            {
                int found = 0;
                for (int i = 1; i <= p->curfile; i++)
                {
                    if (strcmp(p->filename[i], file) == 0)
                    {
                        found = 1;
                        break;
                    }
                }
                if (found) printf("\n\tFilename already exists!");
                else
                {
                    strcpy(p->filename[++p->curfile], file);
                    p->address[p->curfile] = rand() % 10000;
                    printf("\n\tFile succcessfully created!");
                }
            }
        }
        else if (choice == 3)
        {
            printf("\nDisplaying directory structure.....\n");
            display(root);
        }
        else
        {
            printf("\n Enter Valid Choice\n");
        }
        printf("\n\tMenu : \n\t1.Create directory\n\t2.Create file\n\t3.Print files
\n\t4.Exit\n\t\tEnter Choice: ");
        scanf("%d", &choice);
    } while (choice != 4);
}
int main()
```

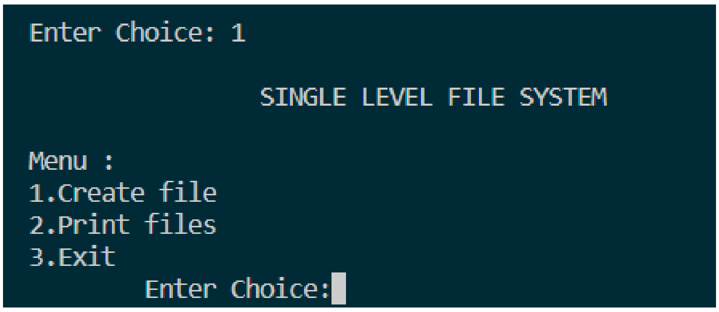


```c
{
    int option = -1;
    printf("\nMenu : \n1.Single level\n2.Hierarchial \n3.Exit\n\tEnter Choice: ");
    scanf("%d", &option);
    do {
        switch (option)
        {
            case 1:
                singleLevel();
                break;
            case 2:
                hierarchial();
                break;
            default:
                printf("\n Enter Valid Choice\n");
                break;
        }
        printf("\nMenu : \n1.Single level\n2.Hierarchial \n3.Exit\n\tEnter Choice: ");
        scanf("%d", &option);
    } while (option != 3);
    return 0;
}
```

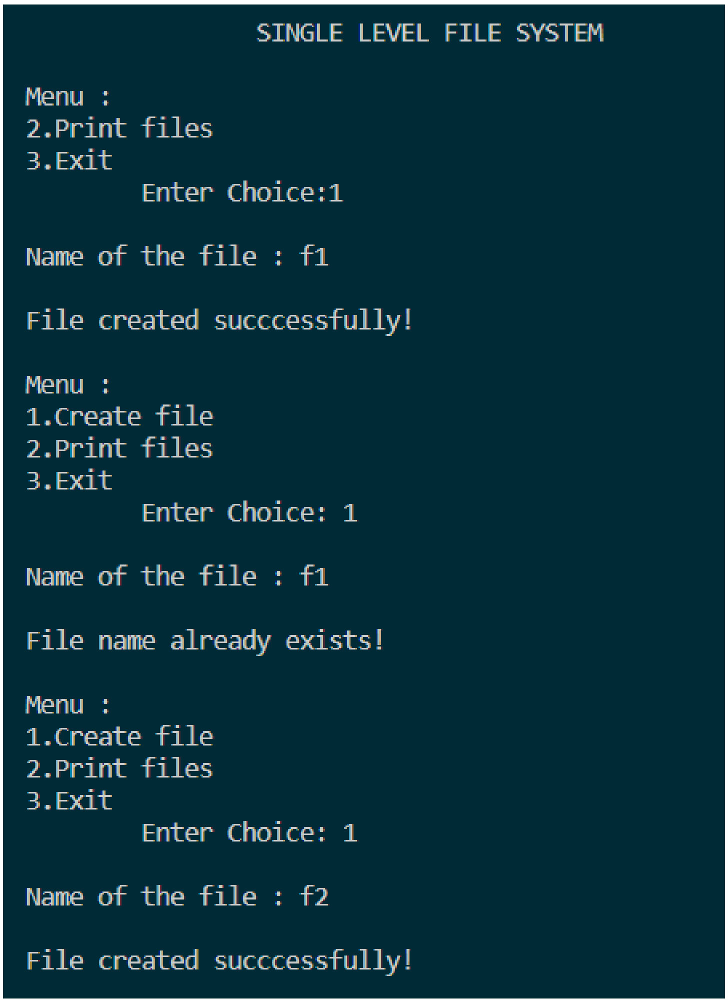
Output:



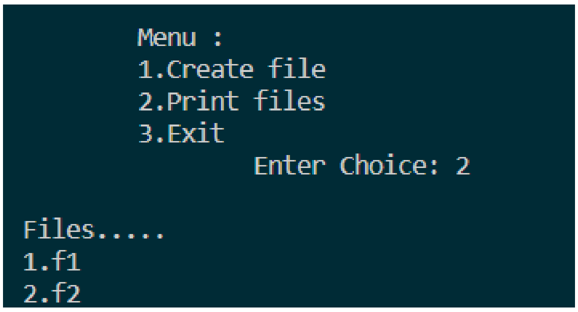
```
Menu :
1.Single level
2.Hierarchial
3.Exit
```



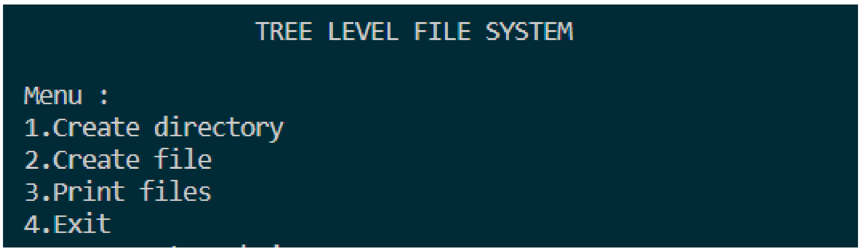
```
Enter Choice: 1

                SINGLE LEVEL FILE SYSTEM

Menu :
1.Create file
2.Print files
3.Exit
        Enter Choice:
```



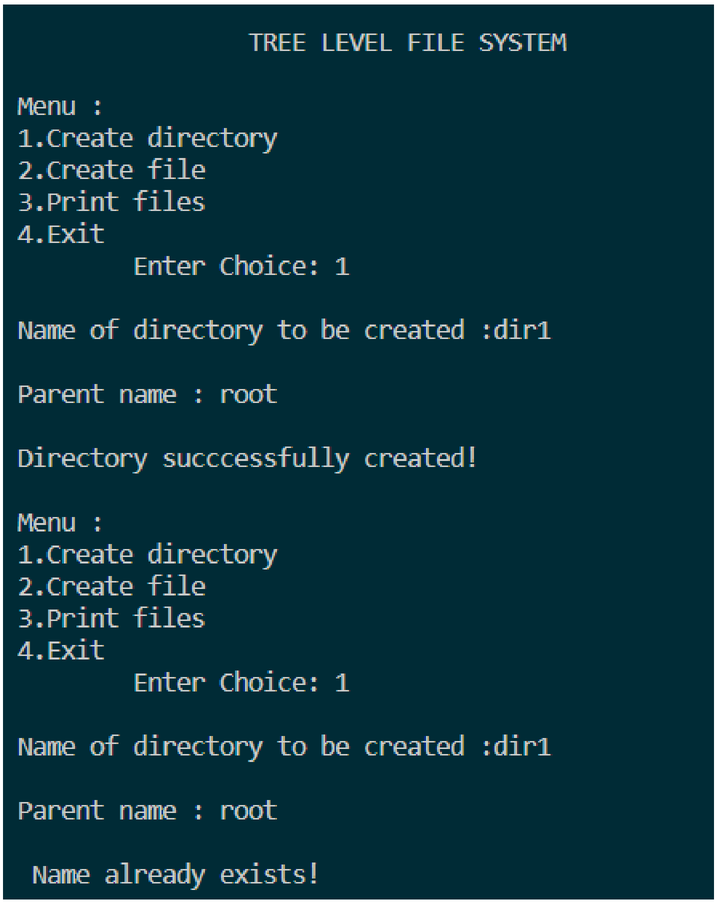
```
                 SINGLE LEVEL FILE SYSTEM

Menu :
2.Print files
3.Exit
        Enter Choice:1

Name of the file : f1

File created succcessfully!

Menu :
1.Create file
2.Print files
3.Exit
        Enter Choice: 1

Name of the file : f1

File name already exists!

Menu :
1.Create file
2.Print files
3.Exit
        Enter Choice: 1

Name of the file : f2

File created succcessfully!
```



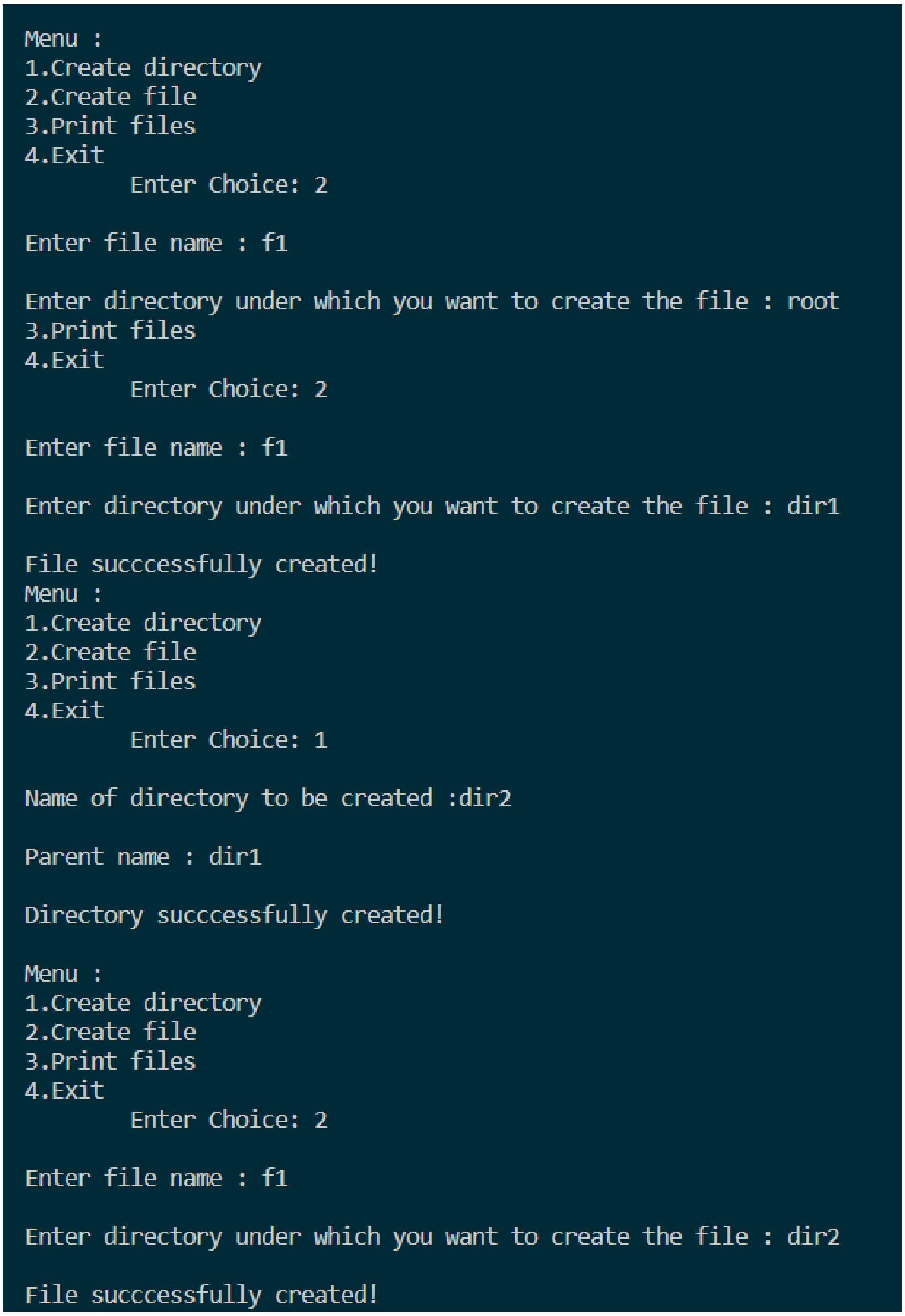
```
         Menu :
         1.Create file
         2.Print files
         3.Exit
                 Enter Choice: 2

Files.....
1.f1
2.f2
```



```
                 TREE LEVEL FILE SYSTEM

Menu :
1.Create directory
2.Create file
3.Print files
4.Exit
```



```
                TREE LEVEL FILE SYSTEM

Menu :
1.Create directory
2.Create file
3.Print files
4.Exit
        Enter Choice: 1

Name of directory to be created :dir1

Parent name : root

Directory succcessfully created!

Menu :
1.Create directory
2.Create file
3.Print files
4.Exit
        Enter Choice: 1

Name of directory to be created :dir1

Parent name : root

 Name already exists!
```



```
Menu :
1.Create directory
2.Create file
3.Print files
4.Exit
        Enter Choice: 2

Enter file name : f1

Enter directory under which you want to create the file : root
3.Print files
4.Exit
        Enter Choice: 2

Enter file name : f1

Enter directory under which you want to create the file : dir1

File succcessfully created!
Menu :
1.Create directory
2.Create file
3.Print files
4.Exit
        Enter Choice: 1

Name of directory to be created :dir2

Parent name : dir1

Directory succcessfully created!

Menu :
1.Create directory
2.Create file
3.Print files
4.Exit
        Enter Choice: 2

Enter file name : f1

Enter directory under which you want to create the file : dir2

File succcessfully created!
```

Learning Outcome:

- Learnt about the different directory structures
- Implemented single level directory and tree structured directory using c program