Ex. No.: 18

Date:

FILE ORGANISATION TECHNIQUES

a. SINGLE LEVEL:

PROBLEM STATEMENT:

Design a file organization system that employs a single-level directory structure. The system should allow users to create, delete, search, display files, and display file content within a directory.

PROBLEM DESCRIPTION:

Implement a program that maintains a directory with a flat structure, where each file is stored directly within the directory. Users should be able to perform various operations on the files, such as creating, deleting, searching, and displaying files and their content.

ALGORITHM:

1. Initialize a directory with an empty list of files.
2. Display a menu to the user with options to:
    - Create a new file with content.
    - Delete an existing file.
    - Search for a file.
    - Display a list of files.
    - Display the content of a specific file.
    - Exit the program.
3. Implement corresponding functions for each menu option.
4. Use a loop to continuously prompt the user for input until they choose to exit.

CODE:

```
dir = {
   'dname': '',
   'files':{}
}

dir['fcnt'] = 0
```

```
dir['dname'] = input("Enter name of directory -- ")

while True:
    print("\n\n 1. Create File\t2. Delete File\t3. Search File \n 4. Display Files\t5. Display file
content\t6. Exit")
    ch = int(input("Enter your choice -- "))

    if ch == 1:
        fname = input("\n Enter the name of the file -- ")
        content=input("Enter file contents --")
        dir['files'][fname]=content

    elif ch == 2:
        f = input("\n Enter the name of the file -- ")
        if f in dir['files']:
            del dir['files'][f]
            print("File",f,"found and deleted")
        else:
            print("File", f, "not found")
            dir['fcnt'] -= 1

    elif ch == 3:
        f = input("\n Enter the name of the file -- ")
        if f in dir['files']:
            print("File",f,"found")
        else:
            print("File", f, "not found")

    elif ch == 4:
        if len(dir['files'])==0:
            print("\n Directory Empty")
        else:
            print("\n The Files are -- ")
            for i in dir['files']:
                print(i,end="\n")

    elif ch == 5:
        f = input("\n Enter the name of the file -- ")
        if f in dir['files']:
            print("Content:")
            print(dir['files'][f])
        else:
            print("File not found")
    else:
        print("Invalid option!!")
        break
```

OUTPUT:

```
 Enter name of directory -- D1


  1. Create File 2. Delete File  3. Search File
  4. Display Files       5. Display file content 6. Exit
 Enter your choice -- 1

  Enter the name of the file -- F1
 Enter file contents --HI


  1. Create File 2. Delete File  3. Search File
  4. Display Files       5. Display file content 6. Exit
 Enter your choice -- 1

  Enter the name of the file -- F2
 Enter file contents --HELLO


  1. Create File 2. Delete File  3. Search File
  4. Display Files       5. Display file content 6. Exit
 Enter your choice -- 1

  Enter the name of the file -- F3
 Enter file contents --BRO


  1. Create File 2. Delete File  3. Search File
  4. Display Files       5. Display file content 6. Exit
 Enter your choice -- 2

  Enter the name of the file -- F3
 File F3 found and deleted



 1. Create File 2. Delete File  3. Search File
 4. Display Files       5. Display file content 6. Exit
Enter your choice -- 3

 Enter the name of the file -- F3
File F3 not found


 1. Create File 2. Delete File  3. Search File
 4. Display Files       5. Display file content 6. Exit
Enter your choice -- 3

 Enter the name of the file -- F2
File F2 found


 1. Create File 2. Delete File  3. Search File
 4. Display Files       5. Display file content 6. Exit
Enter your choice -- 4

 The Files are --
F1
F2


 1. Create File 2. Delete File  3. Search File
 4. Display Files       5. Display file content 6. Exit
Enter your choice -- 5

 Enter the name of the file -- F2
Content:
HELLO


 1. Create File 2. Delete File  3. Search File
 4. Display Files       5. Display file content 6. Exit
Enter your choice -- 6
Invalid option!!
```

RESULT:

Thus, the single level file organisation technique has been successfully implemented.

Ex. No.: 18
Date:

FILE ORGANISATION TECHNIQUES

b. Two-Level organization

Problem Statement:

Design a file organization system that employs a two-level directory structure. The system should allow users to insert directories and files, search for a file or directory, and display file content along with the path.

Problem Description:

In a two-level directory system, each user has a dedicated directory within a master directory. The master directory centrally manages individual user directories at the second level, containing the respective user's files. This hierarchical organization ensures clear user separation and efficient data management. Importantly, the system enforces strict access controls, preventing users from entering directories owned by others without proper authorization. This structure enhances data privacy and integrity by maintaining distinct user spaces within the overall file system.

Algorithm:

- Create `TwoLevelDirectorySystem` instance, prompt for master directory path.
- Display menu options until exit.
- Prompt for username, create user directory in master directory.
- Prompt for username, filename, and content. If user exists, create file in user directory.
- Prompt for username, display files in user directory.
- Prompt for username and filename. If user and file exist, display content.
- Break out of loop to end program.
- Define `File` and `UserDirectory` classes.
- Functions to create user directory and add new file.
- Functions to list user files and read file content.
- Handle user inputs and display outputs.
- End program after exit choice.
- Provide error messages for user or file not found.

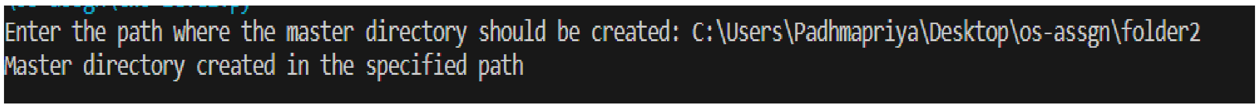
CODE:

```
import os


class File:
    def __init__(self, filename, content):
        self.filename = filename
        self.content = content


class UserDirectory:
    def __init__(self, path):
        self.path = path
        self.files = {}


def create_user_directory(system, master_directory, username):
    # Create a new user directory for the given username.
    if username not in system.master_directory:
        user_path = os.path.join(master_directory, username)
        os.makedirs(user_path, exist_ok=True)
        system.master_directory[username] = UserDirectory(user_path)


def create_new_file_in_user_directory(system, username, filename, content):
    # Create a new file with content in the user's directory.
    if username in system.master_directory:
        user_directory = system.master_directory[username]
        file_path = os.path.join(user_directory.path, filename)
        with open(file_path, 'w') as file:
            file.write(content)
        user_directory.files[filename] = File(filename, content)
    else:
        print(f"User '{username}' not found. Create the user directory first.")


def list_user_files(system, username):
    # List the files in the user's directory.
    if username in system.master_directory:
        user_directory = system.master_directory[username]
        print(f"Files in User '{username}' Directory:")
        for filename in user_directory.files:
            print(filename)


def read_file(system, username, filename):
    # Read the content of a file in the user's directory.
    if username in system.master_directory:
        user_directory = system.master_directory[username]
        if filename in user_directory.files:
            file = user_directory.files[filename]
            return file.content
        else:
            return f"File '{filename}' not found in User '{username}' Directory."
    else:
        return f"User '{username}' not found."
```

```
# Interactive driver code class TwoLevelDirectorySystem:

class TwoLevelDirectorySystem:

    def __init__(self):

        # The master directory, a dictionary with usernames as keys and user directories as values.

        self.master_directory = {}


master_directory_path = input("Enter the path where the master directory should be created:")


if not os.path.exists(master_directory_path):

    os.makedirs(master_directory_path)


system = TwoLevelDirectorySystem()


while True:

    print("\nOptions:")

    print("1. Create User Directory")

    print("2. Create New File in User Directory")

    print("3. List User Files")

    print("4. Read File Content")

    print("5. Exit")

    choice = input("Enter your choice:")


    if choice == '1':

        username = input("Enter the username:")
        create_user_directory(system, master_directory_path, username)

    elif choice == '2':
        username = input("Enter the username:")
        filename = input("Enter the filename:")
        content = input("Enter the content for the new file:")
        create_new_file_in_user_directory(system, username, filename, content)

    elif choice == '3':
        username = input("Enter the username:")
        list_user_files(system, username)

    elif choice == '4':
        username = input("Enter the username:")
        filename = input("Enter the filename:")
        content = read_file(system, username, filename)
        print(content)

    elif choice == '5':
        break

    else:
            print("Invalid choice. Please enter a valid option.")
```

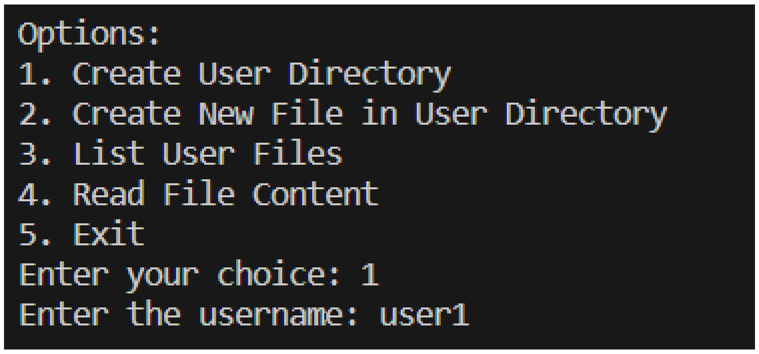
OUTPUT:

1. **Input path where master directory is to be created**



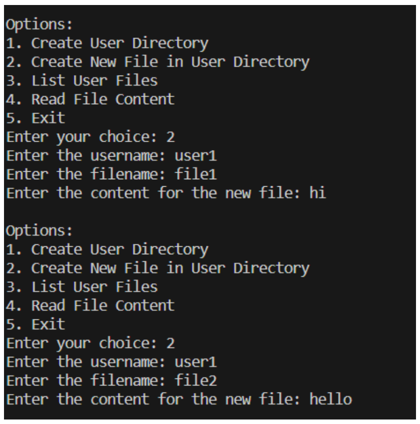
```
Enter the path where the master directory should be created: C:\Users\Padhmapriya\Desktop\os-assgn\folder2
Master directory created in the specified path
```

2. **Create user directory**



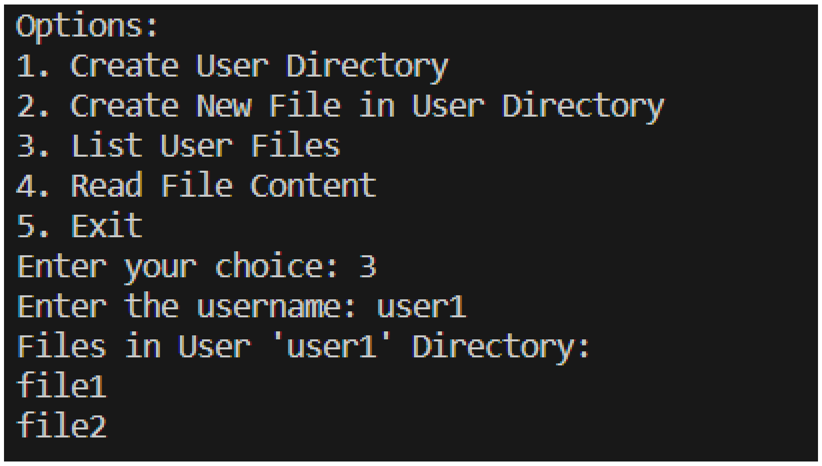
```
Options:
1. Create User Directory
2. Create New File in User Directory
3. List User Files
4. Read File Content
5. Exit
Enter your choice: 1
Enter the username: user1
```

3. **Create new files**



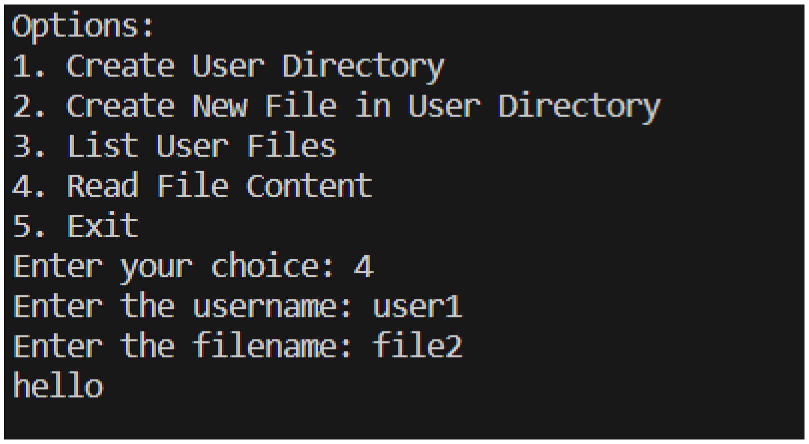
```
Options:
1. Create User Directory
2. Create New File in User Directory
3. List User Files
4. Read File Content
5. Exit
Enter your choice: 2
Enter the username: user1
Enter the filename: file1
Enter the content for the new file: hi

Options:
1. Create User Directory
2. Create New File in User Directory
3. List User Files
4. Read File Content
5. Exit
Enter your choice: 2
Enter the username: user1
Enter the filename: file2
Enter the content for the new file: hello
```

4. **List files in one user’s directory**



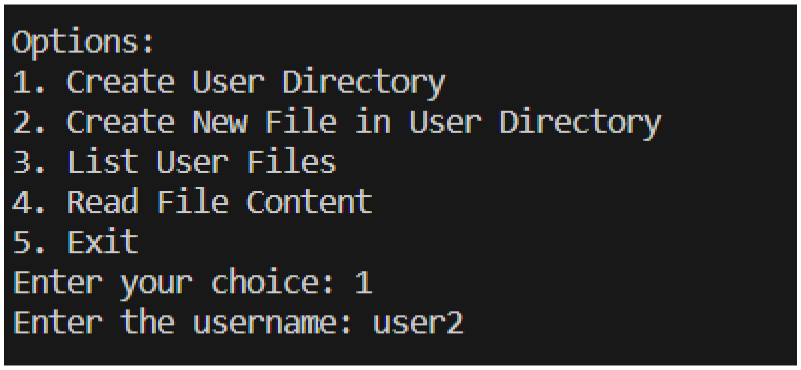
```
Options:
1. Create User Directory
2. Create New File in User Directory
3. List User Files
4. Read File Content
5. Exit
Enter your choice: 3
Enter the username: user1
Files in User 'user1' Directory:
file1
file2
```

5. **Read file content**



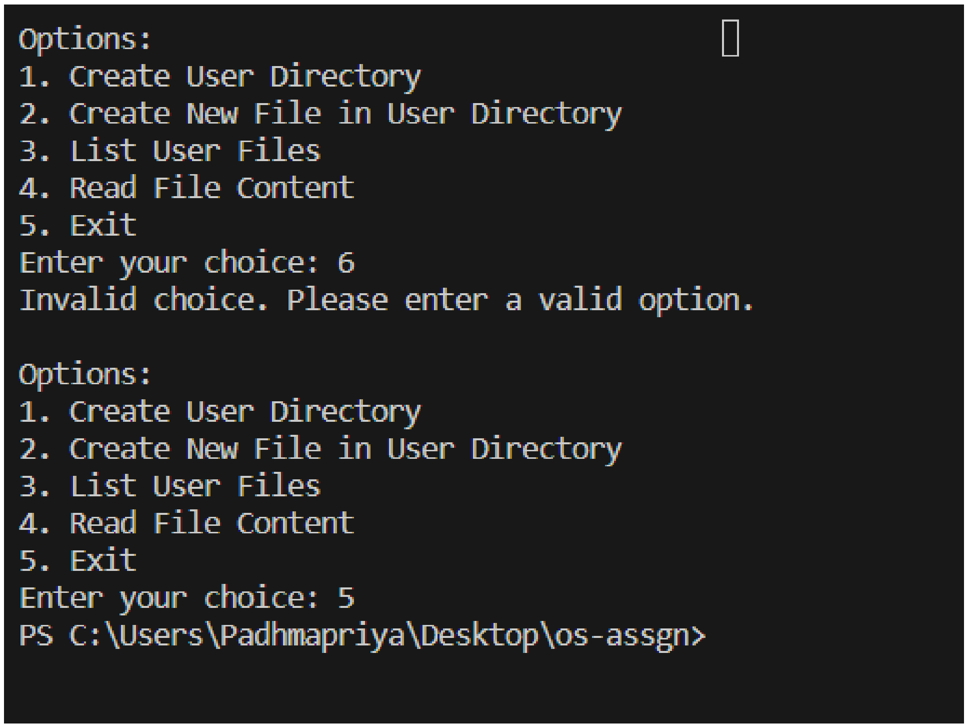
```
Options:
1. Create User Directory
2. Create New File in User Directory
3. List User Files
4. Read File Content
5. Exit
Enter your choice: 4
Enter the username: user1
Enter the filename: file2
hello
```

6. **Create another user directory**



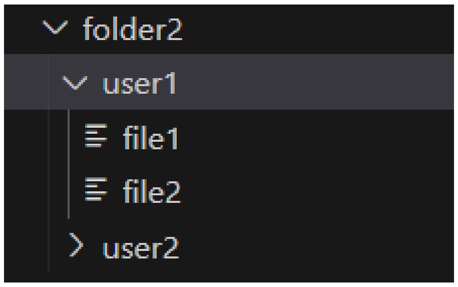
```
Options:
1. Create User Directory
2. Create New File in User Directory
3. List User Files
4. Read File Content
5. Exit
Enter your choice: 1
Enter the username: user2
```

7. **Invalid input and exit**



```
Options:
1. Create User Directory
2. Create New File in User Directory
3. List User Files
4. Read File Content
5. Exit
Enter your choice: 6
Invalid choice. Please enter a valid option.

Options:
1. Create User Directory
2. Create New File in User Directory
3. List User Files
4. Read File Content
5. Exit
Enter your choice: 5
PS C:\Users\Padhmapriya\Desktop\os-assgn>
```

TWO LEVEL STRUCTURE



```
folder2
  user1
    file1
    file2
  user2
```

NOTE: Every time the user name is taken as input to prevent other users' access to one user's directory.

Result:

Thus, two level file organization technique was implemented.

Ex. No.: 18

Date:

FILE ORGANISATION TECHNIQUES

c. TREE LEVEL:

PROBLEM STATEMENT:

Design a file organization system that employs a tree-level directory structure. The system should allow users to insert directories and files, search for a file or directory, and display file content along with the path.

PROBLEM DESCRIPTION:

Implement a program that manages a hierarchical directory structure using a tree. Directories can contain subdirectories and files. Users should be able to insert new directories and files, search for a specific file or directory, and display the content of a file along with its path.

ALGORITHM:

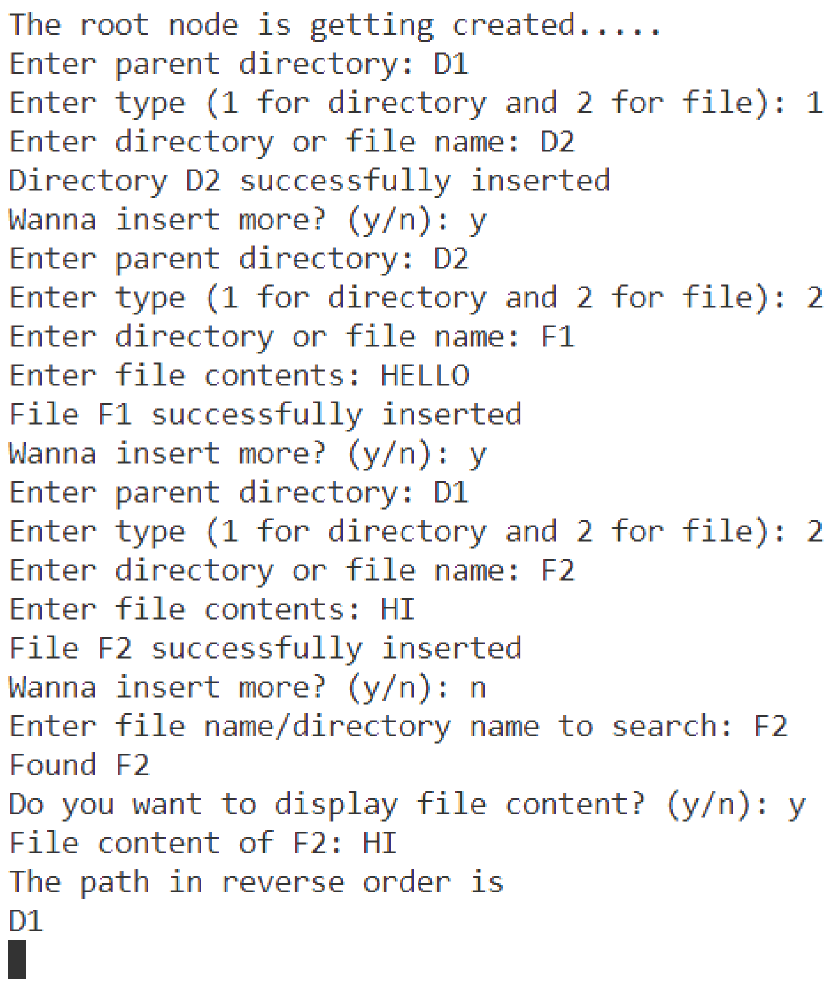
1. Define a tree structure with nodes representing directories and files.
2. Implement functions for inserting new nodes (directories and files) into the tree.
3. Implement a search function to find a specific file or directory within the tree.
4. Allow users to input directory and file names along with their types.
5. Display the content of a file along with its path, and indicate if it's a directory.
6. Use a loop to prompt the user for input to insert more directories and files.
7. Provide an option to search for a file or directory within the tree.

CODE:

```
class Node:
    def __init__(self, name, type):
        self.name = name
        self.type = type
        self.next = None
        self.down = None
        self.content = None

def new_node(item, type1, content=None):
    temp = Node(item, type1)
    temp.next = None
    temp.down = None
    temp.content = content
    return temp


def inorder(root, p):
    if root.next != None and root.name != p:
        inorder(root.next, p)
        print(root.name)
        if root.type == 1:
            inorder(root.down, p)
    return root

def find(node, key):
    if node is not None:
        if node.name == key:
            print(f"Found {node.name}")
            return node
        else:
            found_node = find(node.down, key)
            if found_node is None:
                found_node = find(node.next, key)
            return found_node
    return None


def insert(node, key, par, mode, content=None):
    if node is None:
        print("The root node is getting created.....")
        return new_node(key, mode, content)
    else:
        temp = None
        temp = inorder(node, par)
        temp1 = new_node(key, mode, content)  # Pass content parameter here
        if temp.down is None and temp.type == 1:
            temp.down = temp1
            if temp1.type == 2:
                print(f"File {temp1.name} successfully inserted")
            else:
                print(f"Directory {temp1.name} successfully inserted")
        else:
            temp = temp.down
            while temp.next is not None:
                temp = temp.next
            temp.next = temp1
            if temp1.type == 2:
                print(f"File {temp1.name} successfully inserted")
            else:
                print(f"Directory {temp1.name} successfully inserted")
    return node
```

```
root = None
c = 0
p = 0
parent = [None] * 50
child = [None] * 50
cont = 'y'
root = insert(root, "root", "", 1)
while cont == 'y':
    par_dir = input("Enter parent directory: ")
    t = int(input("Enter type (1 for directory and 2 for file): "))
    file_or_dir = input("Enter directory or file name: ")


    # Ask for file contents if it's a file
    content = None
    if t == 2:
        content = input("Enter file contents: ")

    insert(root, file_or_dir, par_dir, t, content)

    child[c] = file_or_dir
    parent[p] = par_dir
    c += 1
    p += 1
    cont = input("Wanna insert more? (y/n): ")

finder = input("Enter file name/directory name to search: ")
found_node = find(root, finder)

if found_node:
    option = input("Do you want to display file content? (y/n): ")
    if found_node.content==None:
        print("It's a directory")

    elif option.lower() == 'y' and found_node.type == 2 and found_node.content:
        print(f"File content of {found_node.name}: {found_node.content}")

        par = ""
        chi = found_node.name
        print("The path in reverse order is")
        while par != "root":
            for i in range(c):
                if child[i] == chi:
                    par = parent[i]
                    chi = parent[i]
                    print(par)
                    break
```

OUTPUT:



```
The root node is getting created.....
Enter parent directory: D1
Enter type (1 for directory and 2 for file): 1
Enter directory or file name: D2
Directory D2 successfully inserted
Wanna insert more? (y/n): y
Enter parent directory: D2
Enter type (1 for directory and 2 for file): 2
Enter directory or file name: F1
Enter file contents: HELLO
File F1 successfully inserted
Wanna insert more? (y/n): y
Enter parent directory: D1
Enter type (1 for directory and 2 for file): 2
Enter directory or file name: F2
Enter file contents: HI
File F2 successfully inserted
Wanna insert more? (y/n): n
Enter file name/directory name to search: F2
Found F2
Do you want to display file content? (y/n): y
File content of F2: HI
The path in reverse order is
D1
```

RESULT:

Thus, the tree level file organisation technique has been successfully implemented.

Ex. No.: 18

Date:

FILE ORGANISATION TECHNIQUES

d. Acyclic-Graph

Problem Statement:

Design a file organization system that employs a acyclic directory structure. The system should allow users to insert directories and files, search for a file or directory, and display file content along with the path.

Problem Description:

In a tree-structured directory system, the inability to have the same file in multiple directories hinders effective sharing. To address this, a solution involves transforming the directory structure into an acyclic graph. In this modified system, multiple directory entries can point to the same file or subdirectory, allowing for efficient resource sharing. This acyclic graph structure enhances collaboration and resource utilization, overcoming the limitations of the traditional tree structure and providing a more flexible and dynamic approach to directory organization.

Algorithm:

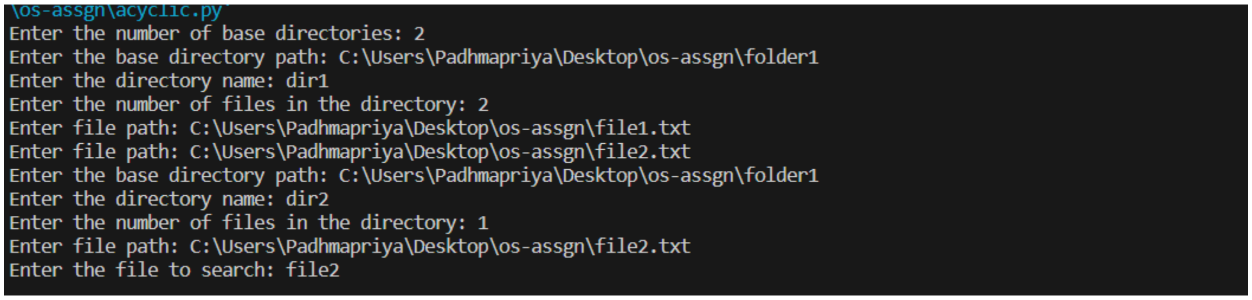
- Initialize `File` and `Directory` classes.
- Create a function to create a directory, including a list of files.
- Implement a file search function, storing matches in a list.
- Prompt the user for the number of base directories.
- For each base directory, gather information on path, name, and files.
- Search for a specified file in the created directory structure.

CODE:

```
import os

class File:
    def __init__(self, path):
        self.path = path

class Directory:
    def __init__(self, dname):
        self.dname = dname
        self.files = []
```

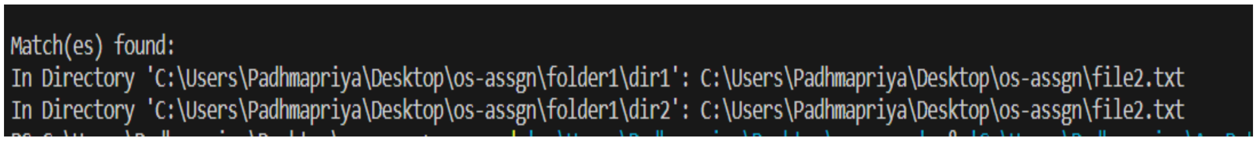
```python
def create_directory(path, dname, files):
    directory_path = os.path.join(path, dname)
    os.makedirs(directory_path, exist_ok=True)

    directory = Directory(directory_path)
    for file in files:
        directory.files.append(file)

    return directory

def search_file(fname):
    matches = []
    for directory in directories:
        for file in directory.files:
            if fname in file.path:
                matches.append((directory.dname, file.path))

    if matches:
        print("\nMatch(es) found:")
        for directory_name, match in matches:
            print(f"In Directory '{directory_name}': {match}")

count = int(input("Enter the number of base directories: "))
directories = []

for _ in range(count):
    base_path = input("Enter the base directory path: ")
    dname = input("Enter the directory name: ")
    fcount = int(input("Enter the number of files in the directory: "))
    files = []
    for _ in range(fcount):
        path = input("Enter file path: ")
        files.append(File(path))
    directories.append(create_directory(base_path, dname, files))

search_key = input("Enter the file to search: ")
search_file(search_key)
```

Sample input and output:



```
\os-assgn\acyclic.py
Enter the number of base directories: 2
Enter the base directory path: C:\Users\Padhmapriya\Desktop\os-assgn\folder1
Enter the directory name: dir1
Enter the number of files in the directory: 2
Enter file path: C:\Users\Padhmapriya\Desktop\os-assgn\file1.txt
Enter file path: C:\Users\Padhmapriya\Desktop\os-assgn\file2.txt
Enter the base directory path: C:\Users\Padhmapriya\Desktop\os-assgn\folder1
Enter the directory name: dir2
Enter the number of files in the directory: 1
Enter file path: C:\Users\Padhmapriya\Desktop\os-assgn\file2.txt
Enter the file to search: file2
```

Searching: (The same ‘file2’ is found in both dir1 and dir2)



```
Match(es) found:
In Directory 'C:\Users\Padhmapriya\Desktop\os-assgn\folder1\dir1': C:\Users\Padhmapriya\Desktop\os-assgn\file2.txt
In Directory 'C:\Users\Padhmapriya\Desktop\os-assgn\folder1\dir2': C:\Users\Padhmapriya\Desktop\os-assgn\file2.txt
```

Result:

Thus, acyclic graph structure was implemented and executed successfully.