CAPSTONE PROJECT REPORT

File Explorer Application in C++ for Linux OS

This report presents a terminal-based File Explorer application built using C++ on Linux.

It demonstrates system-level file and directory management features, such as navigation, file operations,

search functionality, and permission handling, in a structured and interactive way.

Abstract / Objective

The File Explorer Application in C++ for Linux OS is a console-based project that enables users to manage files
and directories directly from the terminal. It provides fundamental operations like creating, deleting, moving,
copying, searching files, viewing permissions, and modifying permissions - all using system-level C++ functions.

Technologies Used

1. Programming Language: C++
2. Libraries: <iostream>, <dirent.h>, <sys/stat.h>, <unistd.h>, <fstream>, <iomanip>, <vector>, <cstring>
3. Tools & Environment: GCC Compiler, Linux Terminal, Visual Studio Code / WSL

Functional Description

The application offers the following features:

1. Change directory and navigate through the file system.
2. Create, delete, move, and copy files.
3. Search for files or folders by name.
4. View and modify file permissions.
5. Display file types and permission attributes clearly in a terminal interface.

Implementation and Source Code

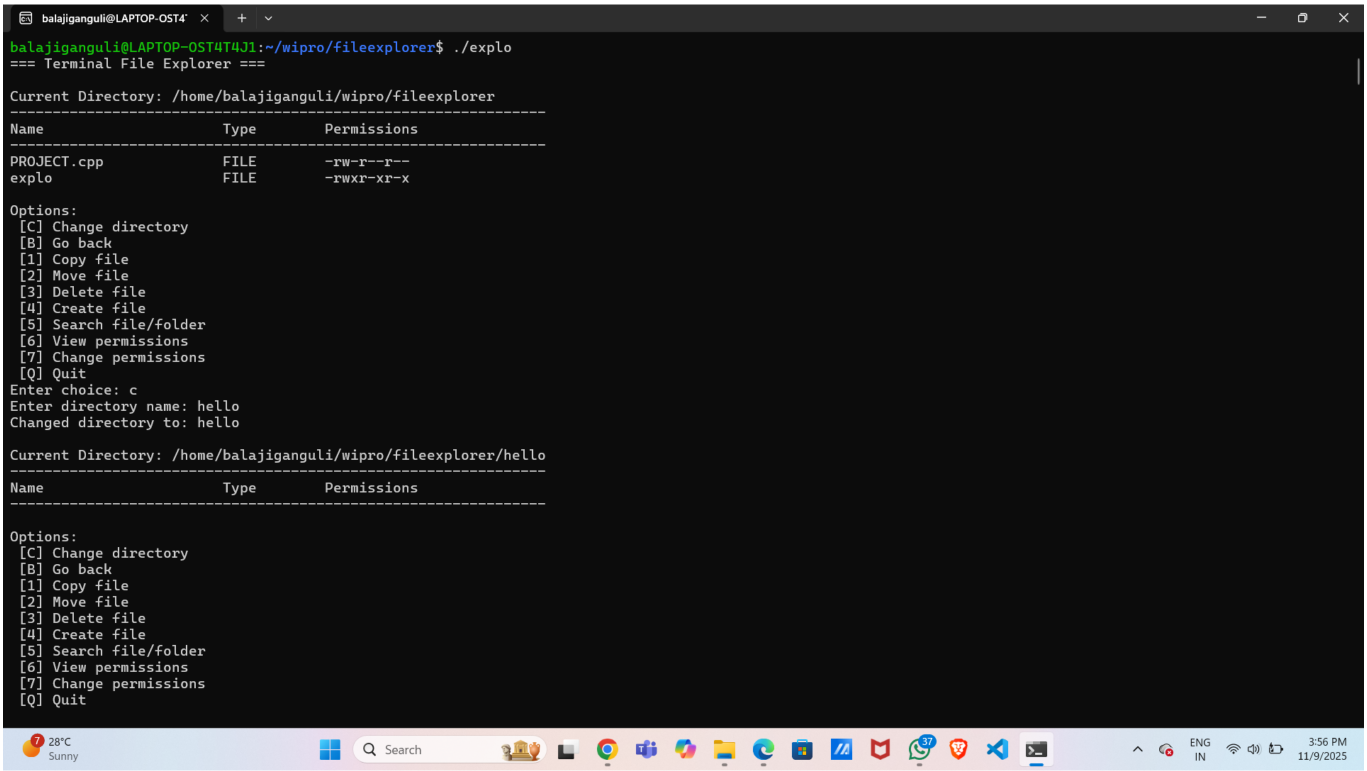
Below is the complete implementation of the File Explorer Application written in C++.

```
#include <iostream>
#include <dirent.h>
#include <sys/stat.h>
#include <unistd.h>
#include <cstring>
#include <iomanip>
```

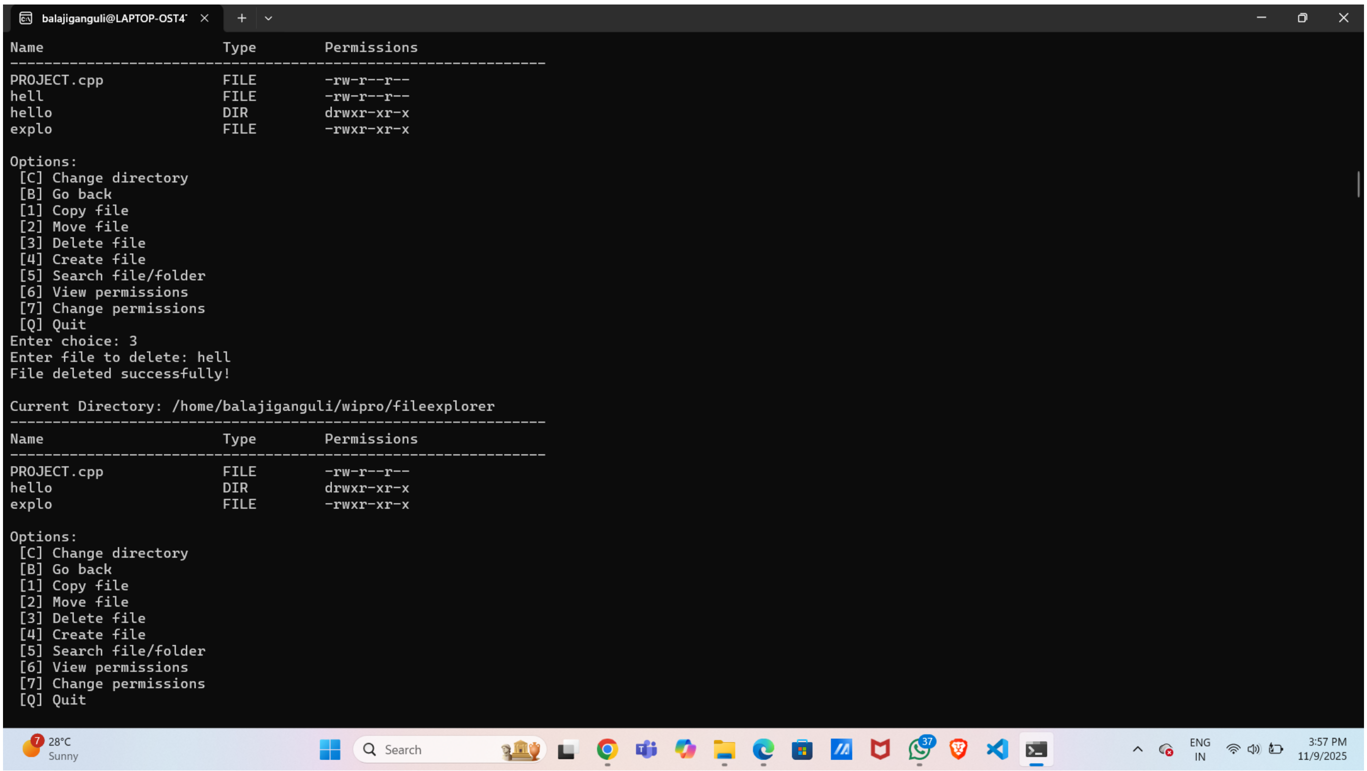
```
#include <vector>
#include <fstream>

using namespace std;

string getModeString(mode_t fileMode) {
    string modeString;
    modeString += (S_ISDIR(fileMode)) ? 'd' : '-';
    modeString += (fileMode & S_IRUSR) ? 'r' : '-';
    modeString += (fileMode & S_IWUSR) ? 'w' : '-';
    modeString += (fileMode & S_IXUSR) ? 'x' : '-';
    modeString += (fileMode & S_IRGRP) ? 'r' : '-';
    modeString += (fileMode & S_IWGRP) ? 'w' : '-';
    modeString += (fileMode & S_IXGRP) ? 'x' : '-';
    modeString += (fileMode & S_IROTH) ? 'r' : '-';
    modeString += (fileMode & S_IWOTH) ? 'w' : '-';
    modeString += (fileMode & S_IXOTH) ? 'x' : '-';
    return modeString;
}

void displayDirectory() {
    char pathBuffer[1024];
    getcwd(pathBuffer, sizeof(pathBuffer));

    DIR *directory;
    struct dirent *dirEntry;
    struct stat statInfo;

    directory = opendir(pathBuffer);
    if (!directory) {
        perror("Unable to open directory");
        return;
    }

    cout << "\nCurrent Directory: " << pathBuffer << endl;
    cout << "--------------------------------------------------------------\n";
    cout << setw(25) << left << "Name" << setw(12) << "Type" << "Permissions" << endl;
    cout << "--------------------------------------------------------------\n";

    while ((dirEntry = readdir(directory)) != nullptr) {
        if (strcmp(dirEntry->d_name, ".") == 0 || strcmp(dirEntry->d_name, "..") == 0)
            continue;

        string fullPath = string(pathBuffer) + "/" + dirEntry->d_name;
        stat(fullPath.c_str(), &statInfo);

        string fileType = (S_ISDIR(statInfo.st_mode)) ? "DIR" : "FILE";
        string filePerm = getModeString(statInfo.st_mode);

        cout << setw(25) << left << dirEntry->d_name << setw(12) << fileType << filePerm << endl;
    }

    closedir(directory);
}
```

```
void navigateTo(const string &dirName) {
    if (chdir(dirName.c_str()) == 0)
        cout << "Changed directory to: " << dirName << endl;
    else
        perror("Failed to change directory");
}

void copyData(const string &sourceFile, const string &targetFile) {
    ifstream srcStream(sourceFile, ios::binary);
    ofstream tgtStream(targetFile, ios::binary);

    if (!srcStream) {
        cout << "Source file not found!\n";
        return;
    }
    if (!tgtStream) {
        cout << "Failed to create target file!\n";
        return;
    }

    tgtStream << srcStream.rdbuf();
    cout << "File copied successfully!\n";
}

void relocateFile(const string &oldFile, const string &newFile) {
    if (rename(oldFile.c_str(), newFile.c_str()) == 0)
        cout << "File moved successfully!\n";
    else
        perror("Failed to move file");
}

void removeFile(const string &filePath) {
    if (remove(filePath.c_str()) == 0)
        cout << "File deleted successfully!\n";
    else
        perror("Failed to delete file");
}

void generateFile(const string &filePath) {
    ofstream newFile(filePath);
    if (newFile)
        cout << "File created: " << filePath << endl;
    else
        cout << "Failed to create file!\n";
    newFile.close();
}

void findFile(const string &rootPath, const string &targetName) {
    DIR *dirStream;
    struct dirent *dirEntry;
    dirStream = opendir(rootPath.c_str());
    if (!dirStream) return;
    while ((dirEntry = readdir(dirStream)) != nullptr) {
        if (strcmp(dirEntry->d_name, ".") == 0 || strcmp(dirEntry->d_name, "..") == 0)
            continue;

        string currentPath = rootPath + "/" + dirEntry->d_name;
        if (strstr(dirEntry->d_name, targetName.c_str()) != nullptr)
            cout << "Found: " << currentPath << endl;

        if (dirEntry->d_type == DT_DIR)
            findFile(currentPath, targetName);
    }
    closedir(dirStream);
}

void showFilePermissions(const string &fileName) {
    struct stat statBuf;
    if (stat(fileName.c_str(), &statBuf) == 0)
        cout << "Permissions for " << fileName << ": " << getModeString(statBuf.st_mode) << endl;
    else
        perror("Unable to fetch file info");
}

void modifyFilePermissions(const string &fileName, const string &permCode) {
    mode_t modeBits = 0;

    if (permCode.size() != 9) {
        cout << "Invalid format! Use rwxr-xr-- style.\n";
        return;
    }

    if (permCode[0] == 'r') modeBits |= S_IRUSR;
    if (permCode[1] == 'w') modeBits |= S_IWUSR;
    if (permCode[2] == 'x') modeBits |= S_IXUSR;
    if (permCode[3] == 'r') modeBits |= S_IRGRP;
    if (permCode[4] == 'w') modeBits |= S_IWGRP;
    if (permCode[5] == 'x') modeBits |= S_IXGRP;
    if (permCode[6] == 'r') modeBits |= S_IROTH;
    if (permCode[7] == 'w') modeBits |= S_IWOTH;
    if (permCode[8] == 'x') modeBits |= S_IXOTH;

    if (chmod(fileName.c_str(), modeBits) == 0)
        cout << "Permissions changed successfully!\n";
    else
        perror("Permission change failed");
}

int main() {
    char userChoice;
    string input1, input2;

    cout << "=== Terminal File Explorer ===" << endl;

    while (true) {
        displayDirectory();
        cout << "\nOptions:\n";
        cout << " [C] Change directory\n";
        cout << " [B] Go back\n";
        cout << " [1] Copy file\n";
        cout << " [2] Move file\n";
        cout << " [3] Delete file\n";
        cout << " [4] Create file\n";
        cout << " [5] Search file/folder\n";
        cout << " [6] View permissions\n";
        cout << " [7] Change permissions\n";
        cout << " [Q] Quit\n";
        cout << "Enter choice: ";
        cin >> userChoice;

        switch (userChoice) {
            case 'C': case 'c':
                cout << "Enter directory name: ";
                cin >> input1;
                navigateTo(input1);
                break;

            case 'B': case 'b':
                navigateTo("..");
                break;

            case '1':
                cout << "Enter source file: ";
                cin >> input1;
                cout << "Enter destination file: ";
                cin >> input2;
                copyData(input1, input2);
                break;

            case '2':
                cout << "Enter source file: ";
                cin >> input1;
                cout << "Enter destination file: ";
                cin >> input2;
                relocateFile(input1, input2);
                break;

            case '3':
                cout << "Enter file to delete: ";
                cin >> input1;
                removeFile(input1);
                break;

            case '4':
                cout << "Enter new file name: ";
                cin >> input1;
                generateFile(input1);
                break;
            case '5':
                cout << "Enter name to search: ";
                cin >> input1;
                {
                    char currentDir[1024];
                    getcwd(currentDir, sizeof(currentDir));
                    cout << "Searching in: " << currentDir << endl;
                    findFile(currentDir, input1);
                }
                break;

            case '6':
                cout << "Enter file name: ";
                cin >> input1;
                showFilePermissions(input1);
                break;

            case '7':
                cout << "Enter file name: ";
                cin >> input1;
                cout << "Enter permission string (rwxr-xr--): ";
                cin >> input2;
                modifyFilePermissions(input1, input2);
                break;

            case 'Q': case 'q':
                cout << "Exiting File Explorer. Goodbye!\n";
                return 0;

            default:
                cout << "Invalid choice. Try again.\n";
        }
    }
}
```

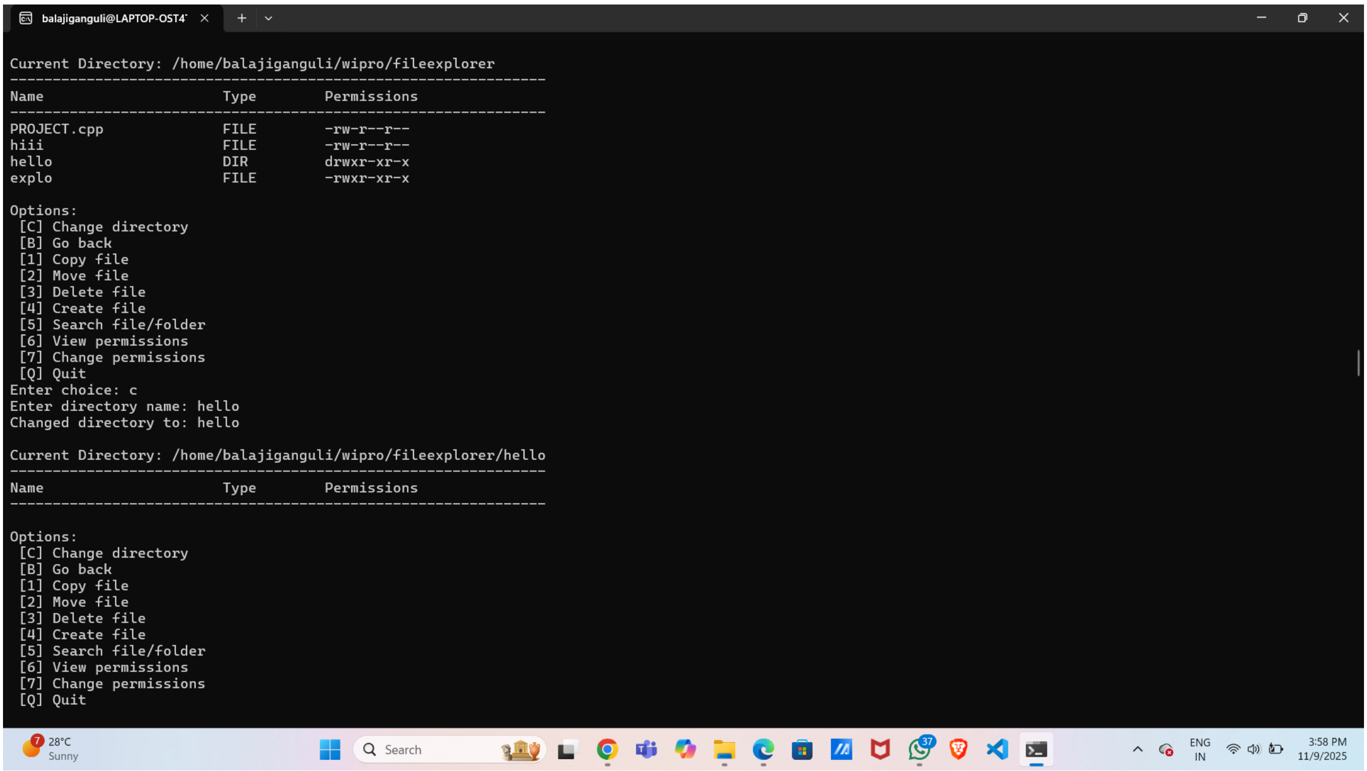
Screenshots (Execution Outputs)



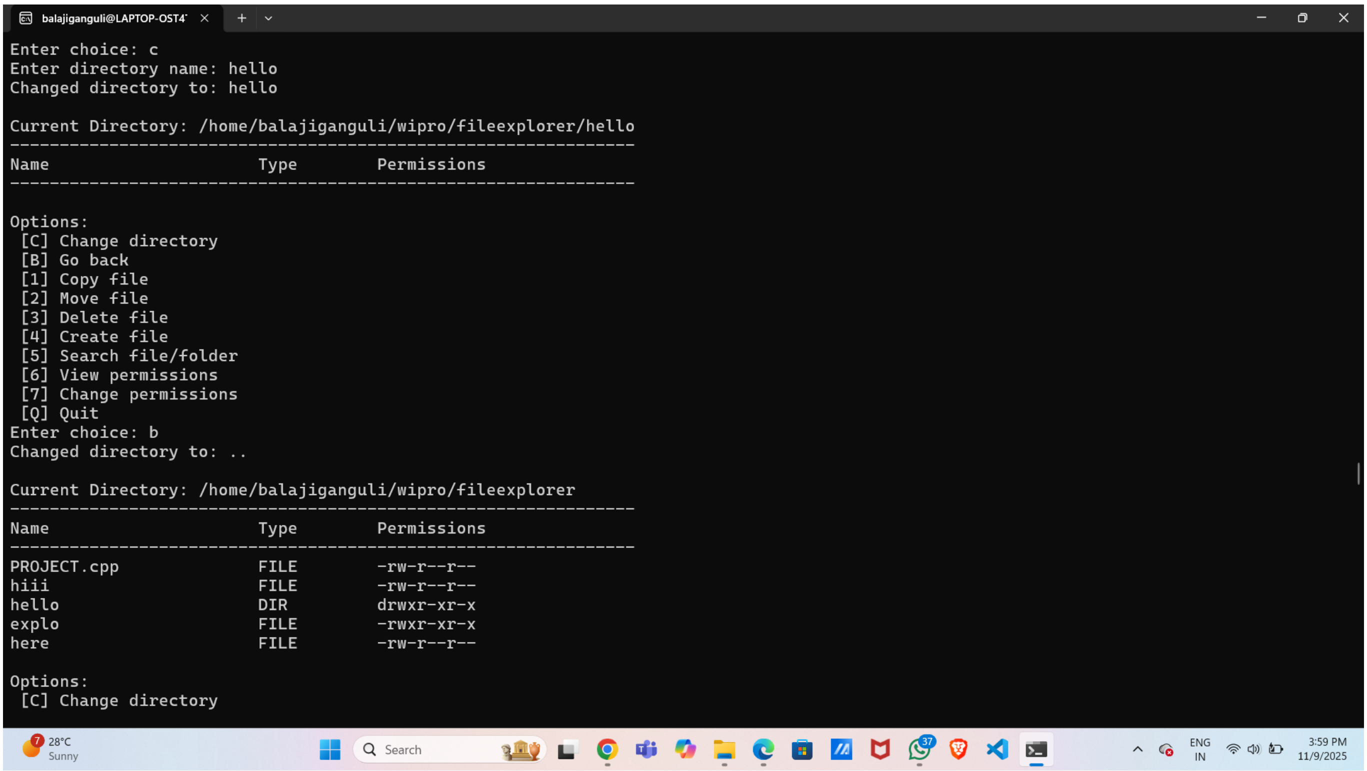
```
balajiganguli@LAPTOP-OST4T4J1:~/wipro/fileexplorer$ ./explo
=== Terminal File Explorer ===

Current Directory: /home/balajiganguli/wipro/fileexplorer
---------------------------------------------------------------
Name                     Type        Permissions
---------------------------------------------------------------
PROJECT.cpp              FILE        -rw-r--r--
explo                    FILE        -rwxr-xr-x

Options:
 [C] Change directory
 [B] Go back
 [1] Copy file
 [2] Move file
 [3] Delete file
 [4] Create file
 [5] Search file/folder
 [6] View permissions
 [7] Change permissions
 [Q] Quit
Enter choice: c
Enter directory name: hello
Changed directory to: hello

Current Directory: /home/balajiganguli/wipro/fileexplorer/hello
---------------------------------------------------------------
Name                     Type        Permissions
---------------------------------------------------------------

Options:
 [C] Change directory
 [B] Go back
 [1] Copy file
 [2] Move file
 [3] Delete file
 [4] Create file
 [5] Search file/folder
 [6] View permissions
 [7] Change permissions
 [Q] Quit
```



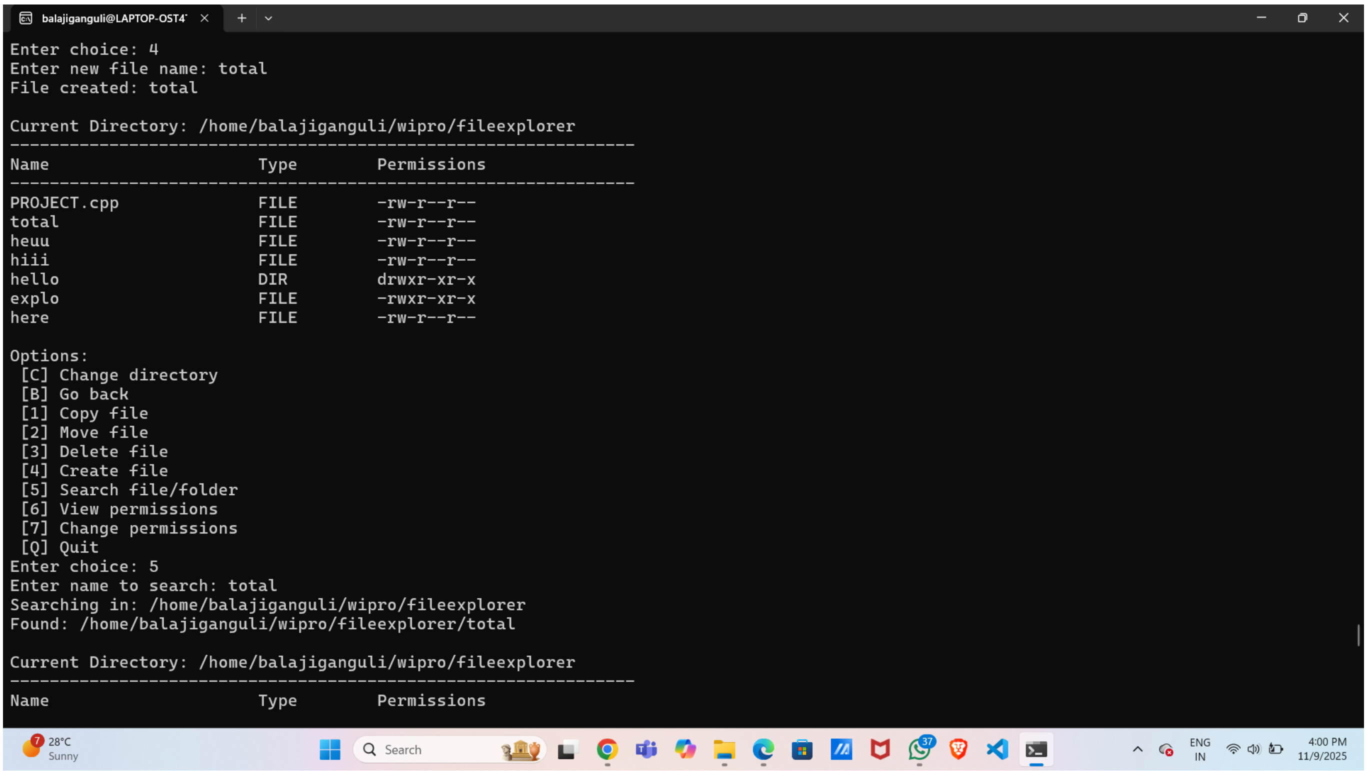
```
Name                     Type        Permissions
---------------------------------------------------------------
PROJECT.cpp              FILE        -rw-r--r--
hell                     FILE        -rw-r--r--
hello                    DIR         drwxr-xr-x
explo                    FILE        -rwxr-xr-x

Options:
 [C] Change directory
 [B] Go back
 [1] Copy file
 [2] Move file
 [3] Delete file
 [4] Create file
 [5] Search file/folder
 [6] View permissions
 [7] Change permissions
 [Q] Quit
Enter choice: 3
Enter file to delete: hell
File deleted successfully!

Current Directory: /home/balajiganguli/wipro/fileexplorer
---------------------------------------------------------------
Name                     Type        Permissions
---------------------------------------------------------------
PROJECT.cpp              FILE        -rw-r--r--
hello                    DIR         drwxr-xr-x
explo                    FILE        -rwxr-xr-x

Options:
 [C] Change directory
 [B] Go back
 [1] Copy file
 [2] Move file
 [3] Delete file
 [4] Create file
 [5] Search file/folder
 [6] View permissions
 [7] Change permissions
 [Q] Quit
```



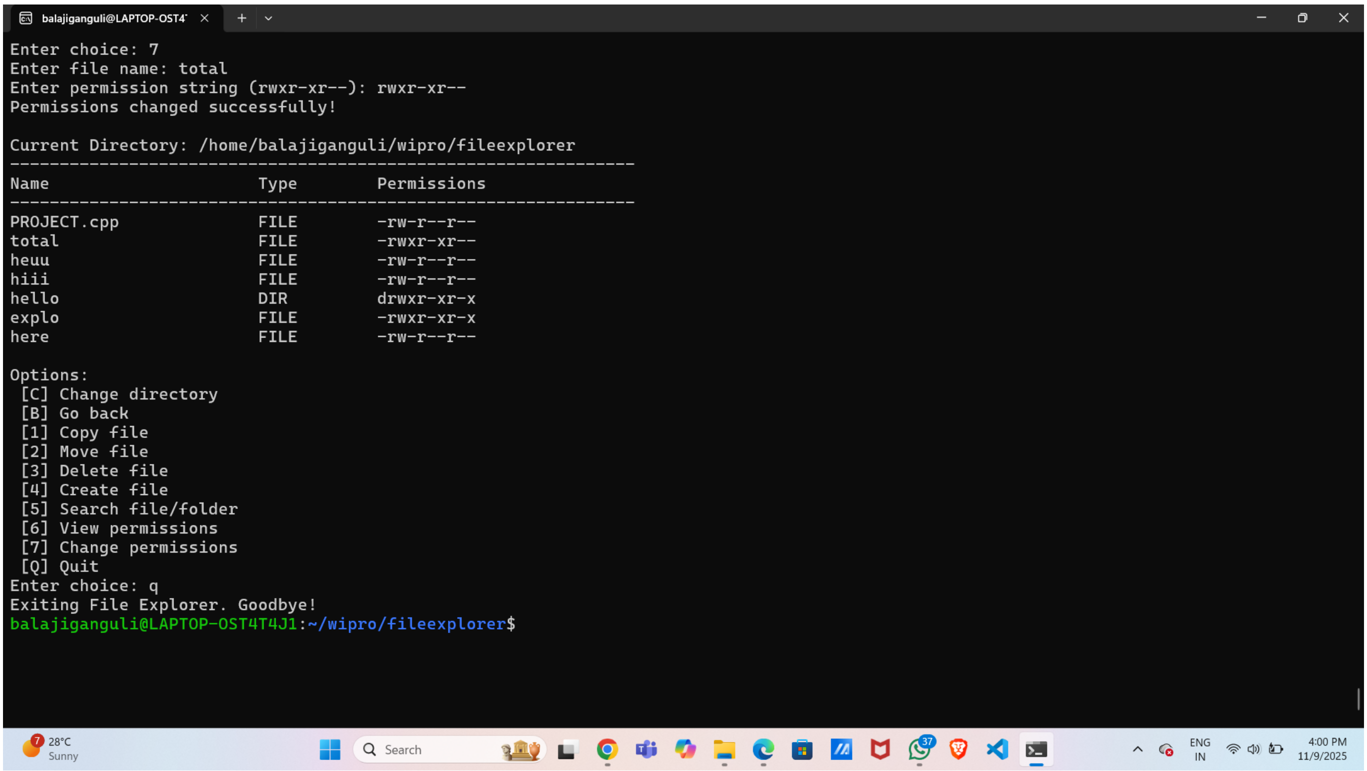
```
Current Directory: /home/balajiganguli/wipro/fileexplorer
----------------------------------------------------------------
Name                     Type        Permissions
----------------------------------------------------------------
PROJECT.cpp              FILE        -rw-r--r--
hiii                     FILE        -rw-r--r--
hello                    DIR         drwxr-xr-x
explo                    FILE        -rwxr-xr-x

Options:
 [C] Change directory
 [B] Go back
 [1] Copy file
 [2] Move file
 [3] Delete file
 [4] Create file
 [5] Search file/folder
 [6] View permissions
 [7] Change permissions
 [Q] Quit
Enter choice: c
Enter directory name: hello
Changed directory to: hello

Current Directory: /home/balajiganguli/wipro/fileexplorer/hello
----------------------------------------------------------------
Name                     Type        Permissions
----------------------------------------------------------------

Options:
 [C] Change directory
 [B] Go back
 [1] Copy file
 [2] Move file
 [3] Delete file
 [4] Create file
 [5] Search file/folder
 [6] View permissions
 [7] Change permissions
 [Q] Quit
```



```
Enter choice: c
Enter directory name: hello
Changed directory to: hello

Current Directory: /home/balajiganguli/wipro/fileexplorer/hello
----------------------------------------------------------------
Name                     Type        Permissions
----------------------------------------------------------------

Options:
 [C] Change directory
 [B] Go back
 [1] Copy file
 [2] Move file
 [3] Delete file
 [4] Create file
 [5] Search file/folder
 [6] View permissions
 [7] Change permissions
 [Q] Quit
Enter choice: b
Changed directory to: ..

Current Directory: /home/balajiganguli/wipro/fileexplorer
----------------------------------------------------------------
Name                     Type        Permissions
----------------------------------------------------------------
PROJECT.cpp              FILE        -rw-r--r--
hiii                     FILE        -rw-r--r--
hello                    DIR         drwxr-xr-x
explo                    FILE        -rwxr-xr-x
here                     FILE        -rw-r--r--

Options:
 [C] Change directory
```



```
Enter choice: 4
Enter new file name: total
File created: total

Current Directory: /home/balajiganguli/wipro/fileexplorer
---------------------------------------------------------------
Name                     Type        Permissions
---------------------------------------------------------------
PROJECT.cpp              FILE        -rw-r--r--
total                    FILE        -rw-r--r--
heuu                     FILE        -rw-r--r--
hiii                     FILE        -rw-r--r--
hello                    DIR         drwxr-xr-x
explo                    FILE        -rwxr-xr-x
here                     FILE        -rw-r--r--

Options:
 [C] Change directory
 [B] Go back
 [1] Copy file
 [2] Move file
 [3] Delete file
 [4] Create file
 [5] Search file/folder
 [6] View permissions
 [7] Change permissions
 [Q] Quit
Enter choice: 5
Enter name to search: total
Searching in: /home/balajiganguli/wipro/fileexplorer
Found: /home/balajiganguli/wipro/fileexplorer/total

Current Directory: /home/balajiganguli/wipro/fileexplorer
---------------------------------------------------------------
Name                     Type        Permissions
```



```
Enter choice: 7
Enter file name: total
Enter permission string (rwxr-xr--): rwxr-xr--
Permissions changed successfully!

Current Directory: /home/balajiganguli/wipro/fileexplorer
---------------------------------------------------------------
Name                     Type        Permissions
---------------------------------------------------------------
PROJECT.cpp              FILE        -rw-r--r--
total                    FILE        -rwxr-xr--
heuu                     FILE        -rw-r--r--
hiii                     FILE        -rw-r--r--
hello                    DIR         drwxr-xr-x
explo                    FILE        -rwxr-xr-x
here                     FILE        -rw-r--r--

Options:
 [C] Change directory
 [B] Go back
 [1] Copy file
 [2] Move file
 [3] Delete file
 [4] Create file
 [5] Search file/folder
 [6] View permissions
 [7] Change permissions
 [Q] Quit
Enter choice: q
Exiting File Explorer. Goodbye!
balajiganguli@LAPTOP-OST4T4J1:~/wipro/fileexplorer$
```

Conclusion

The File Explorer Application successfully demonstrates how a terminal-based file manager can be implemented

using C++. It provides hands-on experience with file system operations, Linux APIs, and permissions management.

Future enhancements could include adding GUI features, improved error handling, and concurrent file operations.