Introduction to Programming
Files Handling

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Summary

- Why Files
- Characters, Field, Records, and Files
- Streams & Files
- Ifstream
- ofstream
- Syntax
- Programs

Why Files ?

- All programs we did so far, the input was given from the keyboard, and the output was received on the computer screen.
- This method works well when input and output are not many and are small. But when the input becomes large, it is not possible to enter data from the keyboard.
- If there is a mistake in entering data, all data will have to be entered again.
- Similarly, if the output is large, it is necessary to keep it permanently stored on the disk for future use.
- The data files provide a solution to this problem.
- The file saved on the disk is used to give input into the program.
- The input data is written in the file. The program reads the data from the file. Similarly, the program writes the output in a file on the disk.

Files

- Before discussing file-handling techniques in C++, it is important to understand the following basic terms used in input/ output files

Characters:

Characters consist of alphabets, digits, and special characters. These are represented inside the computer as a sequence of 1s and 0s. It requires 8 bit (one byte) to store one character.

Fields:

A group of characters or bytes that represents a piece of data is called field. For example, in a file, the name of a person represents one field. Similarly, home address represents another field.

Record: A group of related field is called record.

Files

File:

- A group of related records is called a file. The data or records in files can be organized into different ways. In C++, files are processed into two ways:

- Formatted input/output
- Binary input/output

Streams & Files

Stream is a general term. It refers to the flow of data from a source to a destination. The process of inputting data from the source is known as reading, extracting, getting or fetching. The process of outputting data to the destination is known as writing, inserting, putting, or storing.

Files

In C++, special classes known as stream classes are used to handle data streams. These classes are called stream classes. Stream classes are defined in header files and these are included in the program through their header files. The objects of stream classes are used to control the flow of data.

For example, in C++ programs, we commonly include the header file”<iostream>”. This header file contains the objects “cin”, “cout”, “cerr”, and "clog". These objects are used to move streams of data across various parts of the computer.

Files

Ifstream:
This stream is used to perform input operations on data files on the disk. The objects of this stream are used to read data from a file on disk into the computer memory.
ofstream:
This stream is used to perform output operations on data files on the disk. The objects of this stream are used to write data from the computer memory into a file on the disk.

In C+ programs, the header file "fstream.h" must be included in to the program. The "ifstream",', "ofstream", classes are defined in this header file. These classes contain some member functions that are used to perform input and output operations on disk files.

C++ File handling

Write a C++ Program to store user data in a .txt file

```cpp
#include <iostream>
#include <fstream>
#include <string>
using namespace std;

int main() {
    ofstream data("records.txt");   // Open file for writing
    string name;
    int age;

    for (int i = 1; i <= 3; i++) {
        cout << "Enter Record #" << i << endl;
        cout << "Enter Name: ";
        cin >> name;
        cout << "Enter Age: ";
        cin >> age;

        data << name << "\t" << age << endl;   // Write to file
    }

    data.close();   // Close the file
    return 0;
}
```

```
Enter Record #1
Enter Name: Ali
Enter Age: 19
Enter Record #2
Enter Name: Yousaf
Enter Age: 22
Enter Record #3
Enter Name: Gulalai
Enter Age: 21
```

C++ File handling

Write a C++ Program while loop to store user data in a .dat File

```cpp
#include <iostream>
#include <fstream>
using namespace std;

int main() {
    ofstream data("records3.dat");
    string name;
    int age, i = 1;

    while (i <= 3) {

        cout << "Enter Record #" << i << endl;
        cout << "Enter Name: ";
        cin >> name;
        cout << "Enter Age: ";
        cin >> age;

        data << name << "\t" << age << endl;
        //data << name << "       " << age << endl;
        i++;
    }
    data.close();  // Good practice to close the file
    return 0;
}
```

```
Enter Record #1
Enter Name: Yousaf
Enter Age: 22
Enter Record #2
Enter Name: Gulalai
Enter Age: 21
Enter Record #3
Enter Name: Ali
Enter Age: 19
```

C++ File handling

Write a C++ Program do-while loop to store user data in a .xlsx file

```cpp
#include <iostream>
#include <fstream>
using namespace std;

int main() {
    ofstream data("records.xlsx");
    string name;
    int age, i = 1;

    do {
        cout << "Enter Record #" << i << endl;
        cout << "Enter Name: ";
        cin >> name;
        cout << "Enter Age: ";
        cin >> age;

        data << name << "\t" << age << endl;
        i++;
    } while (i <= 3);  // Condition checked after each iteration

    data.close();
    return 0;
}
```

```
Enter Record #1
Enter Name: Ali
Enter Age: 19
Enter Record #2
Enter Name: Gulalai
Enter Age: 21
Enter Record #3
Enter Name: Yousaf
Enter Age: 22
```

C++ File handling

Write a C++ Program function to store user data in an .xlsx file

```cpp
#include <iostream>
#include <fstream>
#include <string>
using namespace std;

// Function to write records to file
void writeRecordsToFile(string filename, int recordCount) {
    ofstream data(filename);
    string name;
    int age;

    for (int i = 1; i <= recordCount; i++) {
        cout << "Enter Record #" << i << endl;
        cout << "Enter Name: ";
        cin >> name;
        cout << "Enter Age: ";
        cin >> age;
        data << name << "\t" << age << endl;
    }
    data.close();
    cout << "\nSuccessfully wrote " << recordCount << " records to " << filename << endl;
}

int main() {
    writeRecordsToFile("records.xlsx", 3);  // name of file and number of records
    return 0;
}
```

```
Enter Record #1
Enter Name: Ali
Enter Age: 19
Enter Record #2
Enter Name: Gulalai
Enter Age: 21
Enter Record #3
Enter Name: Yousaf
Enter Age: 22

Successfully wrote 3 records to records.xlsx
```

C++ File handling

Write a C++ Program function to read the contents of a file and print it to the console.

```cpp
#include <iostream>
#include <fstream>
#include <string>
using namespace std;

void readRecordsFromFile(string filename) {
    ifstream data(filename);
    string name;
    int age;

    if (!data.is_open()) {
        cerr << "Error: Could not open file '" << filename << "'" << endl;
        return;
    }
    cout << "Records from " << filename << " "<<endl;
    cout << "-----------------"<<endl;
    while (data >> name >> age) {
        cout << "Name: " << name << "\tAge: " << age << endl;
    }
    data.close();
}

int main() {
    readRecordsFromFile("records.xlsx");  // name of the file

    return 0;
}
```

```
Records from 'records.xlsx':
-----------------
Name: Ali       Age: 19
Name: Gulalai   Age: 21
Name: Yousaf    Age: 22

Process returned 0 (0x0)   execution
```

Quiz # 3

Get ready for a surprise

Thanks