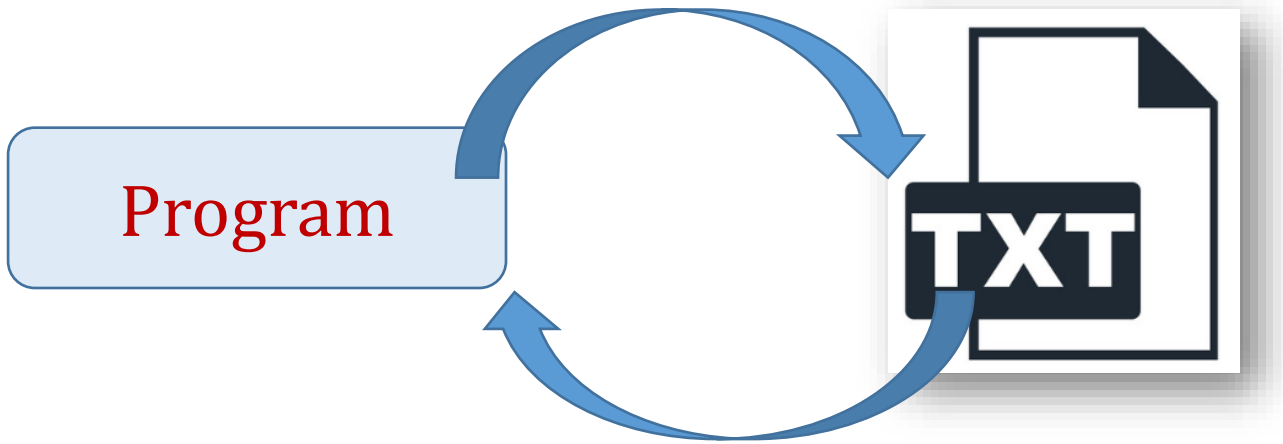
Data structure and Programming II

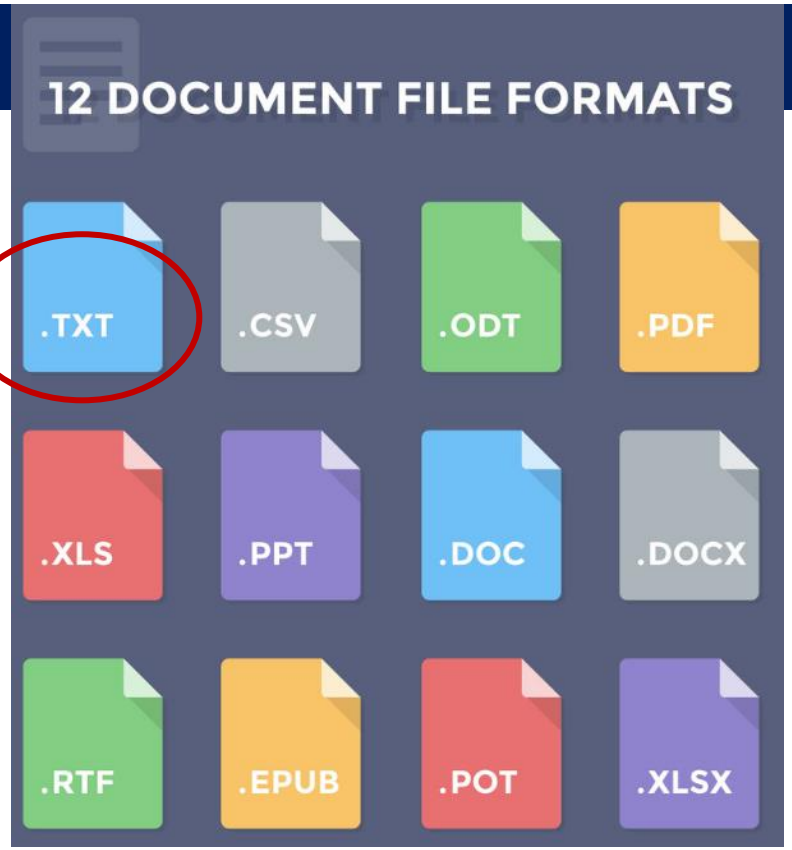
File IO (Input/Output) in C++

Attendance on Moodle



Outline

- What is File IO? File extensions?
- File Operations
  - Read data from file
  - Write data to file
- Examples

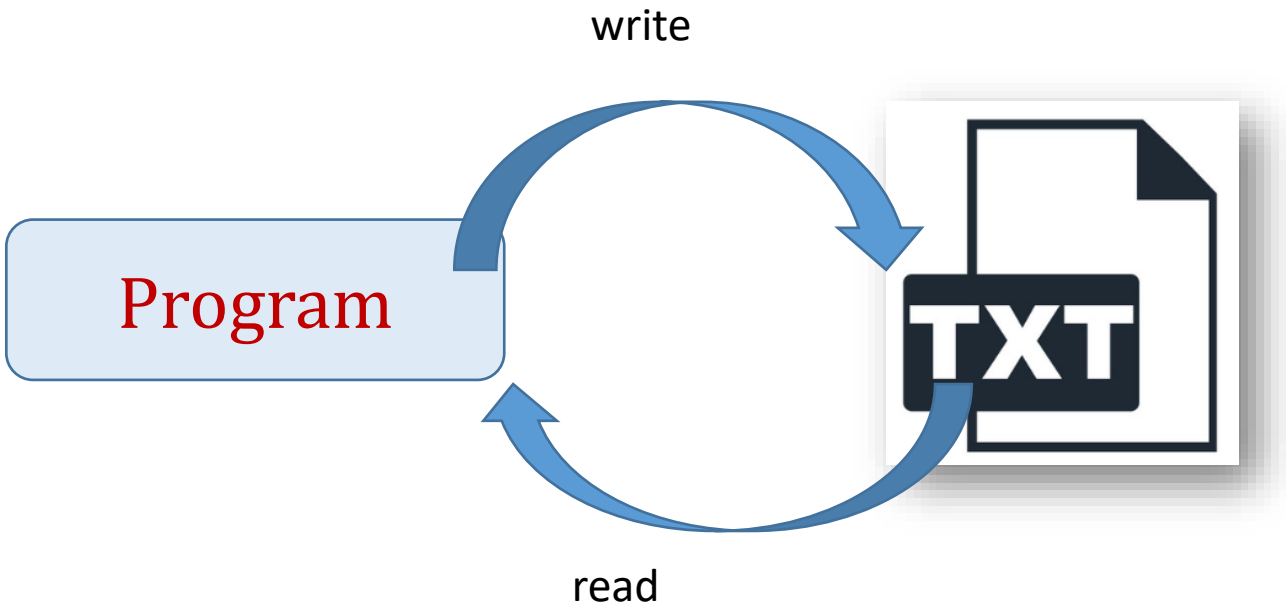


"File IO refers to the transfer of data either to or from a ***storage medium.***"

File IO

❑ What?

- "File IO refers to the transfer of data either to or from a ***storage medium.***"



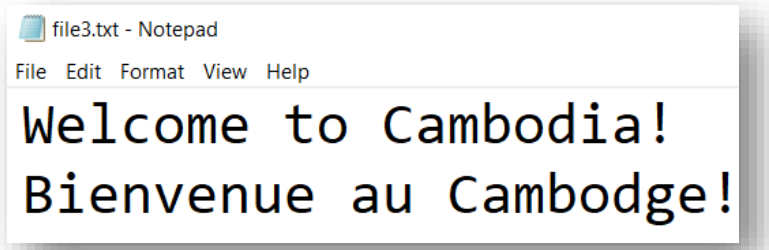
File IO

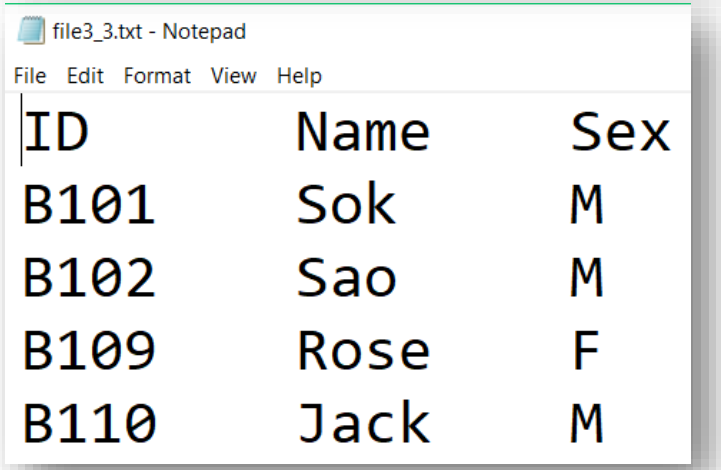
❑ What?

- **iostream** library provides *cin* and *cout* methods for reading from keyboard and writing/displaying on screen
- **fstream** library is used for writing and reading file
  - ofstream : only for wring data to file
  - ifstream : only for reading data from file
  - fstream : can write/read data to/from file

```
#include <iostream>
#include <fstream>
```

Data txt





File IO

❑ Opening a file

- To read or write file, we have to open a file first.
  - We can use either ofstream or fstream

```
open(filename)
```

```
open(filename, mode)
```

Mode	Description
ios::app	Append mode. Data is added more
ios::in	Open file for reading.
ios::out	Open file for writing. If file does not exist, create a new file. If file exists, content is overridden

```
ofstream file;
file.open("filename.dat")
```

```
fstream file;
file.open("filename.dat", ios::out)
```

```
fstream file;
file.open("filename.dat", ios::in)
```

File IO

❑ Closing a file

- We should close file before terminate the program

```
file.close( );
```

```
fstream file;
file.open("filename.dat", ios::out)
……..
//read/write code here
……..

file.close( );
```

File IO

❑ Writing data to a file

- We can use ofstream or fstream for creating file variable
- Then use << to write data
  - file<<data1<<data2<<endl;

```
ofstream file;
file.open("MyFile.dat");
```

```
fstream file;
file.open("MyFile.data", ios::out);
```

```
fstream file;
string filename="MyFile.dat";
//file.open(filename, ios::out); //error
file.open(filename.c_str( ), ios::out);
```

Functions for write data to file

Function	Description
file<<word;	Write one data in word to file
file<<word1<<"\t" <<word2;	Write two data (word1 and word2) separated by a tab to file

Remark: You can write data to file just similar way you display data using *cout*

Write data to file

```
1  #include<iostream>
2  #include<fstream>
3
4  using namespace std;
5
6  main(){
7
8      fstream f1,f2,f3;
9
10     f1.open("mydata.txt", ios::out);
11
12     //write data to file
13     f1<<"Save data to file";
14     for(int k=1; k<50; k=k+1){
15         f1<<k<<" ";
16     }
17     f1.close();
18
19 }
```

Read data from file

```
1   #include<iostream>
2   #include<fstream>
3
4   using namespace std;
5   main(){
6       fstream f1;
7       string ID;
8       string name;
9       int age;
10
11      f1.open("StudentList.txt", ios::in);
12
13      while(!f1.eof()){
14          f1>>ID;
15          f1>>name;
16          f1>>age;
17          cout<<name<<" "<<age<<" "<<ID<<endl;
18      }
19      f1.close();
20  }
```

Write data from user input to file

```cpp
#include<iostream>
#include<fstream>

using namespace std;

struct Student{
    string ID;
    string name;
    int age;
};

main(){
     Student st[50]; //create array with 50 size
     // st[0].ID     st[1].ID       st[0].name
     //using dot operator to access data in structure

     for(int k=0; k<=4; k=k+1){
          cout<<"\n\t*** Input data for student "<<k+1<<endl;
          cout<<"Enter your name: "; cin>>st[k].name;
          cout<<"Enter your ID: "; cin>>st[k].ID;
          cout<<"Enter your age: "; cin>>st[k].age;
     }

     fstream f1;

     f1.open("StudentList.txt", ios::out);

     for(int k=1; k<=5; k=k+1){
          cout<<st[k-1].ID<<" ";
          cout<<st[k-1].name<<" ";
          cout<<st[k-1].age<<"\n";


          f1<<st[k-1].ID<<" ";
          f1<<st[k-1].name<<" ";
          f1<<st[k-1].age<<"\n";
     }

     f1.close();
}
```

File IO

❑ Reading from a file

- We can use ifstream or fstream for creating file variable
- Then use >> to read data

```
ifstream file;
file.open("filename.dat");
```

```
fstream file;
file.open("filename.dat", ios::in);
```

Functions for reading data from file

Mode	Description
file>>word	Read data from file one word at a time
file.eof( )	Return true when reach **end of file** (data has been read till the end). Otherwise, return false
file.get(ch)	Read data from file one character at a time.
getline(file, line)	Read data from file one line at a time. Return false when no data to read

Reading from a file: One word at a time

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

int main () {
  string data;

  // open a file in read mode.
  ifstream file;
 file.open("filename.txt");

  if(!file){
     cout<<"Error opening file OR file does not exist"<<endl;
  }else{
     cout << "Reading from the file" << endl;
     file >> data;
     cout << data << endl;
     file >> data;
     cout << data << endl;

     file.close();
   }
}
```

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

int main () {
  string data;

  // open a file in read mode.
  fstream file;
  file.open("filename.txt", ios::in);

  if(!file){
     cout<<"Error opening file OR file does not
exist"<<endl;
  }else{
     cout << "Reading from the file" << endl;
     file >> data;
     cout << data << endl;
     file >> data;
     cout << data << endl;

     file.close();
   }
}
```

Read all data from file

```
1   #include<iostream>
2   #include<fstream>
3
4   using namespace std;
5   main(){
6       fstream f1;
7       string ID;
8       string name;
9       int age;
10
11      f1.open("StudentList.txt", ios::in);
12
13      while(!f1.eof()){
14          f1>>ID;
15          f1>>name;
16          f1>>age;
17          cout<<name<<" "<<age<<" "<<ID<<endl;
18      }
19      f1.close();
20  }
```

StudentList.txt

ID	Name	Age
B101	Sok	17
B102	Sao	20
B109	Dara	18
B110	Seyha	22

File IO

❑ Examples

- Read and write data from/to file

```
1  #include <fstream>
2  #include <iostream>
3  using namespace std;
4  int main (){
5      char data[100];
6      // open a file in write mode.
7      ofstream outfile;
8      outfile.open("afile.dat");
9      cout << "Writing to the file" << endl;
10     cout << "Enter your name: ";
11     cin.getline(data, 100);
12     // write inputted data into the file.
13     outfile << data << endl;
14     cout << "Enter your age: ";
15     cin >> data;
16     // again write inputted data into the file.
17     outfile << data << endl;
18     // close the opened file.
19     outfile.close();
```

```
21
22     // open a file in read mode.
23     ifstream infile;
24     infile.open("afile.dat");
25     cout << "Reading from the file" << endl;
26     infile >> data;
27     // write the data at the screen.
28     cout << data << endl;
29     // again read the data from the file and
30     infile >> data;
31     cout << data << endl;
32     // close the opened file.
33     infile.close();
34 }
```

```
Writing to the file
Enter your name: Jack Rose
Enter your age: 18
Reading from the file
Jack
Rose
```

Q & A

Read CSV data

ReadCSV-G1.cpp

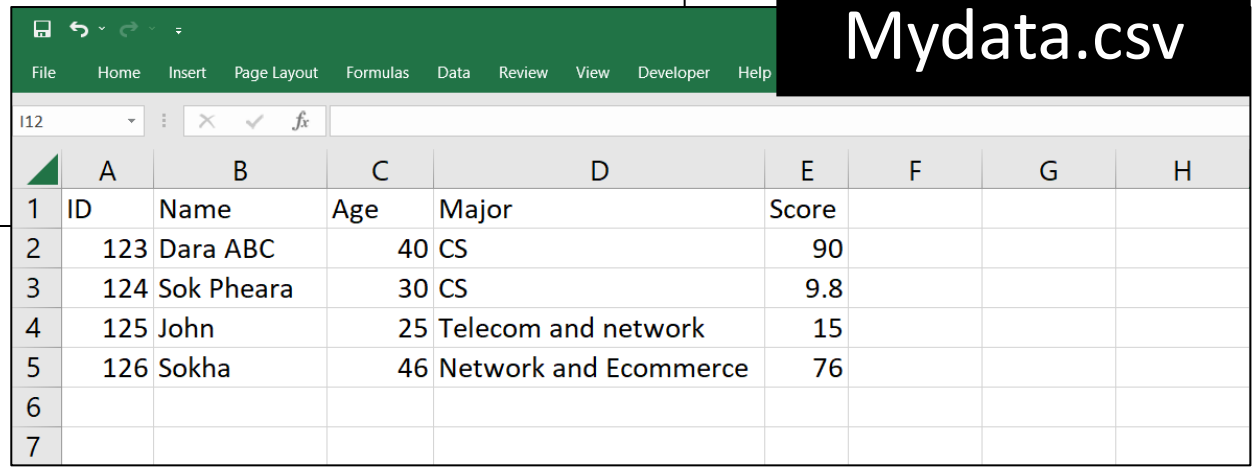
```cpp
#include<iostream>
#include<sstream>
#include<fstream>
using namespace std;

main(){
    string line="ID,Name,Age,Major";
    string word;
    fstream f;

    f.open("Mydata.csv", ios::in);
    while(getline(f, line)){ //read data from file csv line by line
        //cout<<line<<endl;
       stringstream s(line);
       while(getline(s, word, ',')){
            cout<<word<<"\t";
       }
       cout<<endl;
    }
}
```

A C++ program to read file CSV data using ***getline*** and ***stringstream***

Mydata.csv



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I12

	A	B	C	D	E	F	G	H
1	ID	Name	Age	Major	Score			
2	123	Dara ABC	40	CS	90			
3	124	Sok Pheara	30	CS	9.8			
4	125	John	25	Telecom and network	15			
5	126	Sokha	46	Network and Ecommerce	76			
6								
7								

*FileIO.cpp - Code::Blocks 20.03

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```cpp
#include<iostream>
#include<fstream>
using namespace std;
struct Student{
    int id;
    string name;
    int age;
};

main(){
    fstream myfile;
    Student s;

    myfile.open("data.txt", ios::in);
    //Try this if you are using vs code.
    //Keep your data.txt in drive D:
    //myfile.open("D:\\data.txt", ios::in);

    while(!myfile.eof()){
        myfile>>s.id >>s.name>>s.age;
        cout<<s.id<<"\t"<<s.name<<"\t"<<s.age<<endl;
    }
    //read data from file above here....
//    myfile>>s.id >>s.name>>s.age;
//    cout<<s.id<<"\t"<<s.name<<"\t"<<s.age<<endl;
//
//    myfile>>s.id >>s.name>>s.age;
//    cout<<s.id<<"\t"<<s.name<<"\t"<<s.age<<endl;
//
//    myfile>>s.id >>s.name>>s.age;
//    cout<<s.id<<"\t"<<s.name<<"\t"<<s.age<<endl;

    myfile.close();
}
```

"D:\GoogleDriveLocal\Working\ITC\Data structure and programming I2 (2023-24)\CodingDemo\Cplus

```
123     Dara    20
124     Sok     24
125     Sao     22
120     Jack    22
127     Rose    22

Process returned 0 (0x0)   exec
Press any key to continue.
```

data.txt - Notepad

File Edit Format View Help

```
123     Dara    20
124     Sok     24
125     Sao     22
120     Jack    22
127     Rose    22
```