

10902 CPP Final Exam

Subject: Triangle Json File

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Main testing concept: File inout

Basics

- C++ BASICS
- FLOW OF CONTROL
- FUNCTION BASICS
- PARAMETERS AND OVERLOADING
- ARRAYS
- STRUCTURES AND CLASSES
- CONSTRUCTORS AND OTHER TOOLS
- OPERATOR OVERLOADING, FRIENDS, AND REFERENCES
- STRINGS
- POINTERS AND DYNAMIC ARRAYS

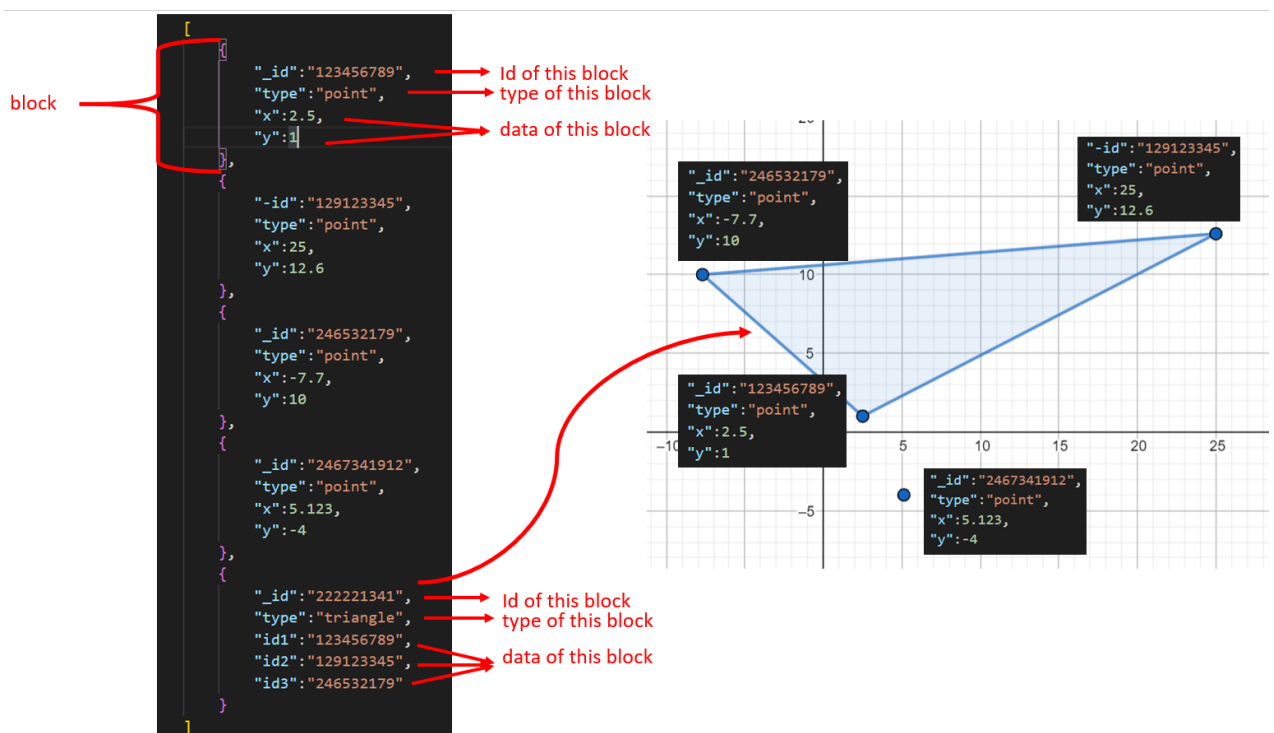
Functions

- SEPARATE COMPILATION AND NAMESPACES
- STREAMS AND FILE I/O
- RECURSION
- INHERITANCE
- POLYMORPHISM AND VIRTUAL FUNCTIONS
- TEMPLATES
- LINKED DATA STRUCTURES
- EXCEPTION HANDLING
- STANDARD TEMPLATE LIBRARY
- PATTERNS AND UML

Description:

CRUD is an acronym for create, read, update, and delete. These are the four basic functions of persistent storage. A pair (name: value) in a JSON file is composed of a name and a value. Each name is followed by a colon, and pairs are separated by a comma. In the sample JSON file, *test.json*, containing records of points and triangles in an array, each record is enclosed with curly brackets. Additionally, while points record the raw data of “id”, “type”, and the coordinate of “x”, “y”, triangles record the raw data of “id” and “type” and the index of its three points. In a record, each field is a name-value pair. A name must be a string while a value can be a string, number, boolean, etc. The figure below illustrates the structure of our triangle JSON file.

CRUD 是创建、读取、更新和删除的首字母缩写。这是持久性存储的四个基本功能。JSON 文件中的一对(名称:值)由名称和值组成。每个名称后面跟一个冒号, 对之间用逗号分隔。在样例 JSON 文件中, 测试。Json 包含数组中的点和三角形记录, 每条记录都用大括号括起来。另外, 点记录“id”、“type”的原始数据以及“x”、“y”的坐标, 三角形记录“id”、“type”的原始数据及其三个点的索引。在记录中, 每个字段是一个名值对。名称必须是字符串, 而值可以是字符串、数字、布尔值等。下图展示了我们的三角形 JSON 文件的结构。



Given a JSON file containing the record of points and triangles, which has member functions to parse the file, manipulate (RUD) records in the given file, output manipulated records to a JSON file in the same format of input JSON file. Note that the class BasicJSON includes at least the following member functions:

给定一个包含点和三角形记录的 JSON 文件，该文件具有解析该文件的成员函数，操作给定文件中的(RUD)记录，以与输入 JSON 文件相同的格式将被操作的记录输出到 JSON 文件。注意，BasicJSON 类至少包含以下成员函数：

1. **bool Parse(std::string InputFileName);** Read a list of records from the file *InputFileName* and parse the contents in the file to construct your data with your selected structure. Also, if the file is parsed successfully, return `true`. Otherwise, return `false`.

从文件 *InputFileName* 中读取记录列表，并解析文件中的内容，以使用所选的结构构造数据。此外，如果文件被成功解析，则返回 `true`。否则，返回 `false`。

2. **void Write(std::string OutputFileName);** Output all records to the file *OutputFileName* in JSON format listed above. Do not add tab or space in front of line. see reference in below.

将所有记录输出到上面列出的 JSON 格式的 *OutputFileName* 文件。不要在行前添加制表符或空格。参见下面的参考资料。

3. **void Delete(std::string Name);** Delete a record of the passed *Name(id)*. If a point is be deleted, you should remove all triangles which have the deleted point as one of their vertices.

删除传递的 *Name(id)* 的记录。如果一个点被删除，你应该删除所有的三角形，其中有删除的点作为他们的顶点之一。

4. **float TotalArea();** Return the sum of the area of all triangles in the JSON. If it does not contain any triangle, output "File dont have triangle\n" and return 0. The area of a triangle can be computed using Heron's formula listed at the end of the file.

返回 JSON 中所有三角形的面积之和。如果不包含任何三角形，输出 "File don ' t have triangle\n" 并返回 0。三角形的面积可以使用文件末尾列出的 Heron 公式来计算。

5. **overload [] operator** such that

1. **JSONObject[index]:** an *index* is a non-negative integer for accessing an array element (record).索引是一个访问数组元素(记录)的非负整数。
2. **JSONObject[index][name]:** get a value associated with given *index* and *name*.获取与给定索引和名称相关联的值。

Please note that:

1. We will provide main.cpp and products.json to test your class. Sample files input-main.cpp, test.json and output.json are shown as an example of testing cases, located under the same directory, e.g.

..\

├ Q5

... └ CPP 程式設計題-JSON.pdf

└ input-main.cpp

└─ output.json

└─ test.json

2. No comments are included in the JSON file.
3. The comma at the end of any last pair in an object or array is optional
4. A few redundant spaces and next-line characters are acceptable.
5. All coordinate is float type

1. 我们将提供主要的。cpp 和 products.json 测试你的类。示例文件 input-main.cpp, test.json 和输出。Json 显示为一个测试用例的例子，位于相同的目录下，例如。

2. JSON 文件中没有包含任何注释。

3. 对象或数组中最后一对结尾处的逗号是可选的

4. 一些多余的空格和下一行字符是可以接受的。

5. 所有坐标为浮点型

Input:

Substitution of your main function.

Output:

Please refer to the sample output.

Sample Input / Output :

Sample Input	Sample Output
According to the given main function and json file	point 5 129123345 37.5 File dont have triangle 0

☐ Easy, Only basic programming syntax and structure are required.

☐ Medium, Multiple programming grammars and structures are required.

☒ Hard, Need to use multiple program structures or complex data types.

Expected solving time:

60 minutes

Other notes:

Given main function:

```
int main()
{
    BasicJson json;
    if(json.Parse("Test.json"))
    {
        cout<<json[0]["type"]<<endl;
        cout<<json[0]["x"]<<endl;
        cout<<json[1]["_id"]<<endl;
        json[1]["y"]=20;
        cout<<json.TotalArea()<<endl;
        json.Delete("129123345");
        cout<<json.TotalArea()<<endl;
        json.write("out.json");
    }
}
```

```
}  
}
```

Given json file (Test.json):

```
[  
  {  
    "_id": "123456789",  
    "type": "point",  
    "x": 5,  
    "y": 0  
  },  
  {  
    "-id": "129123345",  
    "type": "point",  
    "x": 0,  
    "y": 0  
  },  
  {  
    "_id": "246532179",  
    "type": "point",  
    "x": 0,  
    "y": 5  
  },  
  {  
    "_id": "2467341912",  
    "type": "point",  
    "x": 5.123,  
    "y": -4.5  
  },  
  {  
    "_id": "222221341",  
    "type": "triangle",  
    "id1": "123456789",  
    "id2": "129123345",  
    "id3": "246532179"  
  }  
]
```

Output file (output.json):

```
[  
  {  
    "_id": "123456789",  
    "type": "point",  
    "x": 5,  
    "y": 0  
  },  
  {  
    "_id": "246532179",  
    "type": "point",  
    "x": 0,  
    "y": 5  
  },  
  {  

```

```
"_id": "2467341912",  
"type": "point",  
"x": 5.123,  
"y": -4.5  
}  
]
```

Heron's formula

$$A = \sqrt{s(s-a)(s-b)(s-c)}, \text{ 其中 } s = \frac{a+b+c}{2}$$

a, b, c are triangle edge length