Chapter 5

Object Oriented Programming

5.1 structs

We use structs to group connected variables.

```c
// Define a struct
struct struct_name
{
    data_type member_variable1, member_variable2;
    data_type member_variable3, member_variable4;
};
// Declare struct variables
struct_name variable1, variable2, ...;
// Use . to work with member variables for example
variable1.membervariable1=1.2
```

5.1.1 Passing Structs to Functions

The first problem is that in order to have a function that has vector arguments or returns a vector we need to somehow have the definition of vector available to both the function and the main function. How can we do that? Put it in a header file and include it in both files.

```c
//vector_functions.h
struct Vector
{
    double x,y,z;
};
Vector cross_product(Vector A, Vector B);
void cross_product(Vector A, Vector B, Vector& cross);
```

```c
//vector_functions.cpp
#include "vector_functions.h"
void cross_product(Vector A, Vector B, Vector& cross)
{
    cross.x=(A.y*B.z-A.z*B.y);
    cross.y=-(A.x*B.z-A.z*B.x);
    cross.z=(A.x*B.y-A.y*B.x);
}
```
Vector cross_product(Vector A, Vector B,)
{
    Vector cross;
    cross.x=(A.y*B.z-A.z*B.y);
    cross.y=-(A.x*B.z-A.z*B.x);
    cross.z=(A.x*B.y-A.y*B.x);
    return cross;
}

5.2 classes

5.2.1 user defined class

So next we will do the same thing but instead of a string class we will make a matrix class. Our goal here is to create a data type called matrix and make it so we can do Matrix1=2Darray1 and Matrix3=Matrix1*Matrix2 along with a useful function or two(1Norm) and output.

In general a class is an object that constains both data and functions. So think super-struct. So in a header file we will define the class just like we defined the structs.

```cpp
class class_name
{
public:
    class_name(); // default constructor
    ~class_name(); // destructor
    // additional functions or variables
private:
    // private variables and functions
};
```

The private variables/functions are those items which can only be seen within the class and that never need to be called or used by other functions. So lets start.