ESS201: C++ Programming

Jaya Sreevalsan Nair *
International Institute of Information Technology, Bangalore

Term I: 2017-18 (Lab on 2017-10-09)

Tasks:

1. Warm up with examples given in the lecture.
2. Write a single C++ program, named `vector3d.cpp` which uses struct to define 3-dimensional vectors, and has functions for performing vector operations, such as addition, subtraction, scalar-vector multiplication, dot product, cross product, normalization.

```
struct vector3d {
  float x, y, z ; // data
}
```

   - The function definitions are:

```
vector3d add(vector3d a, vector3d b)
vector3d subtract(vector3d a, vector3d b)
float dot(vector3d a, vector3d b)
vector3d cross(vector3d a, vector3d b)
float norm(vector3d a)
```

   - The scalar-vector multiplication function has to be overloaded:

```
vector3d scalar_product(float a, vector3d b) ;
vector3d scalar_product(int a, vector3d b) ;
```

   Note: the vectors to be inputted and outputted are formatted with its three components separated by a single space.

*(jnair@iiitb.ac.in)

- Input: should take in 4 lines of input at commandline prompt, i.e. first two lines for vectors, next one for float scalar, and the last one for int scalar. e.g.

```
3 3.4 5
2.1 4.2 4.1
0.5
3
```

- Output: should be in 8 lines, i.e. for addition of two input vectors; then for subtraction; then for scalar-vector multiplication of the float scalar value with the first vector; then for scalar-vector multiplication of the integer scalar value with the second vector; fifth line is for dot product of the two vectors; next one for the cross product; and the last two lines giving the L2 norm of each of the two vectors. e.g. output for the afore-mentioned input is:

```
5.1 7.6 9.1
0.9 -0.8 0.9
1.5 1.7 2.5
6.3 12.6 12.3
41.08
-7.06 -1.8 5.46
6.74981
6.23378
```