CPSC 679b HW 2 – Due Feb 14, 2016, 11:55 pm.

Submit code and text via classesv2, leave your prints in the "Results" area in the lab.

1. (40pts) Getting into CGAL:
CGAL is installed in the Zoo under /usr/local/include and /usr/local/lib. Download the CGAL tarball and work with programs in the directory "examples". Each subdirectory has a CmakeLists.txt file so that you can cmake and make the programs. You can use the entries in the CmakeLists.txt file as a model to add an entry for the new programs you write.

a.) Minkowski Sums and Convex Hulls in 2D
i. -- Rewrite the Minkowski_Sum_2 program sum_triangle_square.cpp to read points for pairs of triangles from a file (file name given as an argument to the program) and write the results to a file with the same name but with ms_ appended to the beginning. Call your program sum_triangle_triangle. The program should process however many pairs of triangles are listed in the input file, and the format should just be a list of 12 numbers per line, giving the 2D coordinates of the vertices of the two triangles.

ii. -- Write another version of sum_triangle_triangle called sum_triangle_triangle_ch that finds the sum by summing all of the points appropriately and then calling the convex hull routine ch_graham_andrew for reference (see the example program ch_from_cin_to_cout.cpp under Convex_hull_2 for reference. The input file should be the same as for i.

iii. – Prepare a large file of triangle pairs, and compare the results of the two approaches listed above in terms of results and in terms of timing.

b.) Half-edge data structure
In the Polyhedron directory, study the program polyhedron_prog_subdiv.cpp. Using programs in the Polyhedron_IO directory as examples, write a new version of the subdiv program called polyhedron_prog_subdiv_off.cpp to read a file in OFF format (name read from command line) and write the same file name with sd appended to the name (i.e. myfile.off as input results in myfile_sd.off as output.) Describe how new vertices/edges/facets in the subdivided mesh are related to the vertices/edges/facets in the original mesh.

The full OFF specification is here http://www.geomview.org/docs/html/OFF.html, but you only need to use files in the form described in https://en.wikipedia.org/wiki/OFF_(file_forma)

c.) Select one other program from the examples, describe what it does, and make some modification of it. Describe your modification, and how to run the program.

2. (40pts) Printing and Scanning

a) Print a new version of your squirrel, at any reasonable scale that you have the patience for, that avoids the printing errors we found in the first group of prints.

b) Scan a new object with the NextEngine. Scan another object with KinectFusion. Select one of the objects and print it. Upload your models as stl.

3. (20pts) Technical paper: a comparison

Read "Kinect Range Sensing: Structured-Light versus Time-of-Flight Kinect" (in Resources/Readings) and briefly describe the scanning operating principle of the two Kinect sensors, and the quality of results produced by each.