TP 2

Problem. In this TP you have to write functions with the ultimate goal of writing the algorithm to compute Catmull-Clark subdivision of the mesh.

1   Functions

1. `void myMesh::inflateMesh(double dist)`. Given the input parameter `dist`, this function moves each `myVertex *v` in the direction of its normal by distance `dist`:

   `*(v->point) = *(v->point) + (*(v->normal))*dist`.

   Calling it gives the appearance of inflating the mesh.

2. `void myMesh::smoothenMesh(double dist)`. Moves each vertex point in the direction of the average of it's neighbors in the mesh. If neighbors average is `myPoint *X`, your new point for `myVertex *v` should be:

   `*(v->point) = (*(v->point))*(1-dist) + (*X)*dist`.

   Note that each point moves `dist` portion towards its neighbor points.

3. `void myMesh::splitEdge(myHalfedge *e, myPoint3D *p)`. Given as input `myHalfedge *e`, the function splits e by adding a vertex with point position as `p` to the `myMesh` (and 4 new edges will be also added). You have to be careful that all the variables are updated properly.

4. `void myMesh::splitFace(myFace *f, myPoint3D *p)`. Given as input `myFace *f`, the function splits f by adding a new vertex `c` with point position `p` to M. f will then be broken into many triangles, each triangle formed by `c` and two consecutive vertices on the boundary of f. Note that f need not be a triangle, and can have many vertices on its boundary.

5. `void myMesh::subdivisionCatmullClark()`. Do one round of Catmull-Clark subdivision on the myMesh. This requires adding a *face* point at the centroid location of each face, an *edge* point at each edge, and then connecting them appropriately as we covered in class. You will also need to change the positions of the original vertices. You should modify and use the functions `splitEdge` and `splitFace` if it will make it easier to write the code.

2   Other code to write

Write other code in the `main.cpp` file to get the following popup menu options working:

1. `Mesh Operations -> Inflate`

2. `Mesh Operations -> Smoothen`

3. `Face Operations -> Split Edge`

4. `Face Operations -> Split Face`

5. `Mesh Operations -> Catmull-Clark Subdivision`