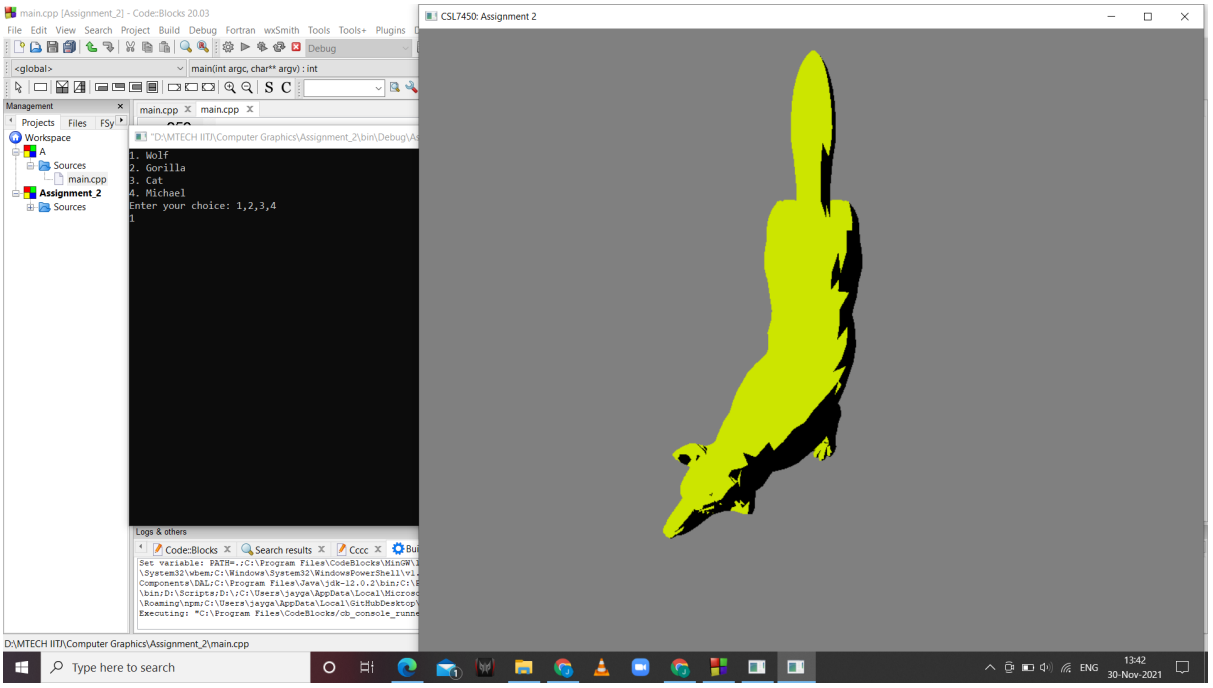
Computer Graphics
Assignment 2

Problem Statement:
For each of the attached mesh, choose a suitable camera location and light source direction. Assume that the camera and object coordinate systems are aligned. Transform the object w.r.t. the camera coordinate system. Find oriented normal for each triangle of the mesh. Determine the coordinates of the view frustum such that all the triangles lie in the view frustum. Perform the normalized device coordinate transformation. Now, implement the back-face culling and Z-buffer algorithms to remove the invisible triangles. Use the Phong shading algorithm with highlights and ambient lightning to find the intensity of each pixel. Now, use any of the triangle rasterization algorithms to render the object.
Determine the window and viewport sizes accordingly. Compare your results with the results obtained by using inbuilt functions to perform these steps.

Solution:
1. Data is read from the file using **ifstream** and then split based on **‘,’** character and the data of different **triangles** and **faces** are stored in the variables using the format of .off files.
2. As we know a .off file has a format like:
   OFF
   <Number of triangles> <number of faces> <number of edges>
   Then each triangle’s coordinates and,
   Then the number of triangles that make up a face and the triangle numbers
   Same for edges.
   Also, information about colors may also be present.
3. Then object coordinates are transformed to camera coordinates but as provided in the question **we need to consider the same coordinate systems for object and camera**.
4. Then we need to find the oriented normal vector for each triangle as:
   Consider the vertices of triangles are p1,p2, and p3
   The normal can be calculate as n = (p3-p1)*(p2-p1).
5. Then determine the coordinates of the view frustum.
6. Then applying the Backface and Phong shading algorithm.
7. For the Assignment, the light source location is considered as **-80,50,60**.
8. Finally, triangle rasterization uses **inbuilt functions**.

Running the code:
1. For running the code in code blocks, Save all the object files in **C:\Program Files\CodeBlocks\MinGW\bin.**
2. Create an empty Glut project and paste the code provided in **M21CS007.cpp**

Outputs:


main.cpp [Assignment_2] - Code::Blocks 20.03
File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins
Management
Projects Files
Workspace
A
Sources
main.cpp
Assignment_2
Sources
main.cpp
main.cpp
"D:\MTECH IIT\Computer Graphics\Assignment_2\bin\Debug\A
1. Wolf
2. Gorilla
3. Cat
4. Michael
Enter your choice: 1,2,3,4
1
Logs & others
Code::Blocks
Search results
Cccc
D:\MTECH IIT\Computer Graphics\Assignment_2\main.cpp
CSL7450: Assignment 2
Type here to search
ENG
13:42
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