CS475/CS675
Computer Graphics

ASSIGNMENT 1

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Introduction

Aim of the assignment is to create a 3D paint like program which can be used to create a cubified model of anything. The program offers a cursor cube inside a $n \times n \times n$ grid, where the user can freely move the cursor cube. The program allows the user to draw colored cubes at the cursor location and also provides a 3-dimensional view of the model which can be explored by rotating the model along all the three axes of rotation. The drawn model can be saved to a file and also other models can be loaded into the grid.

Code Structure

A VAO/VBO dedicated for storing and drawing of the grid. The grid is drawn by drawing 3 lines along the three axes from each vertex, except for the edge and corner ones. For drawing of the cursor cube and all the other cubes in the model, another set of VAO, VBO and shader files are maintained. In the VBO for the cube, 36 vertices are entered. Since each cube is completely of the same color in the model, the color vector is passed to the vertex shader as a uniform variable. Since the cubes can be situated anywhere in the model and all the cubes are of the same size and configuration, we made only one VAO/VBO set to draw all the cubes in the model, by translating them by passing a uniform translation matrix to the vertex shader. Hence by this approach, very less memory is used in the VBO. To store the contents of the grid, we maintain a 3D array of `bool`, to store whether a particular cell of the grid is occupied and we maintain a 3D array of `vec4` to store the color of each cell in the model. A common rotation matrix is maintained to be passed to both the shader programs so that both the grid and the model is rotated in-sync. Global flags for storing the current mode and for storing the current location of the cursor cube are also maintained. On pressing the **s/S** key in the modelling mode, for all the cells containing the colored boxes, the co-ordinates and the 3 cell color components are written to the user entered file line by line.

Models

We made a model of a hut, with four walls, roof, door and four windows. The second one is an attempted model of The Florence Baptistery. Following are the isometric view of the models when the grid is made invisible:
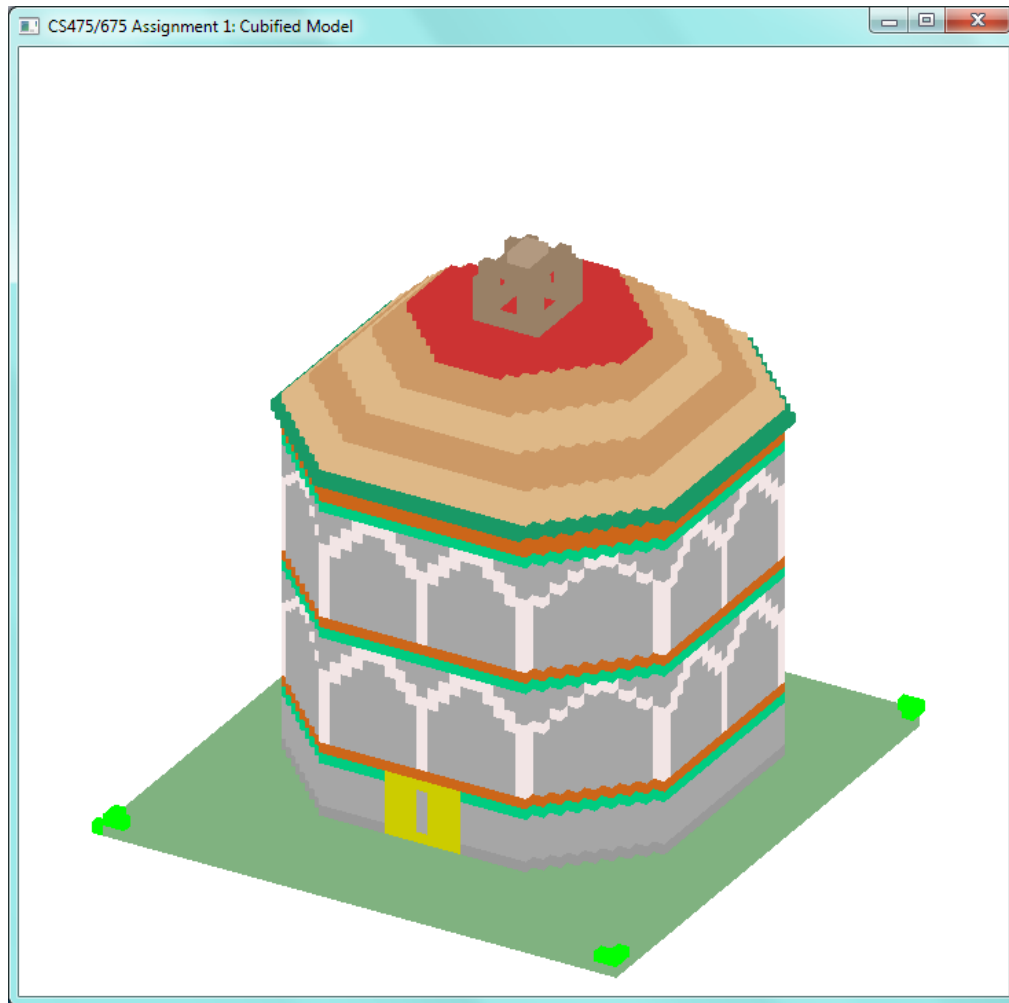
Figure 1: Model of a hut.

Figure 2: Model of **The Florence Baptistery**

References

1. Format/Boilerplate code taken from the tutorial `02_colorcube` of course CS675/475 by Prof. Parag Chaudhuri.

2. Functionality for grid rotation adapted from the tutorial `03_colorcube_rotate` of course CS675/475 by Prof. Parag Chaudhuri.