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Manual for Project 2

1. Setup

- To compile I used the following:

    g++ main.cpp -o main.out -lGL -lglut -lGLU -lm
    ./main.out

- This program uses text files for input and output. Make sure that they are in the same working directory or provide the full path. Path can be changed at the top of the program. The string called "inputFile" is the input path, and the string "outputFile" is the output. If they are pointing to the same path, the output will override the input, updating the content.

- The polygons in the text file will be drawn when starting the program.

- It is important that there are new lines(and empty) after the last point in the input file. Otherwise it will not read correctly. Use the same format as the input file provided.

2. Running the program

The program uses the keyboard to select what actions to be performed on the polygons.

After starting the program you will get a list of action in the console. To select an action you need to click on the window with the polygons with your mouse and then press a number on your keyboard.
Then the program will ask you to fill in e.g. "Enter which polygon?" And your choice must be typed into the console. Pressing enter will submit the choice.

The polygons are numbered as they are listed in the input file. Ergo, if you want to transform the first polygon in the input file, you simply type "1" in the console. Likewise if you want to transform the third polygon, you write "3" in the console.

So in short, choose an action by selection the window by simply clicking on it and pressing the desired number, then the rest is done in the console.

I included a text file with the original coordinates I used for the polygons. In case you want to reset everything.

3. Translate

Select the window and press "**1**" to enter translate mode. You will be asked to enter which polygon. Then you enter the distance you want to move the polygon in each x-, y- and z-direction. The coordinates ought to be between -1 and 1. But it is discouraged to enter large abs(numbers), as the polygon will likely move outside of the drawing area.
Example:

```
Enter which polygon
1
Enter new x y z coordinates to move in each direction
0.1 -0.1 0.3
```

4. Scaling

To perform scaling you need to select the window and press "**2**". Then you enter which polygon to scale and subsequently the scaling factor. A factor between 0 and 1 will decrease the size and a number larger than 1 will increase the size.

Example:

```
Enter which polygon
2
Enter what factor to scale with
1.5
```

5. Rotate by arbitrary axis

To perform "Rotate by arbitrary axis" you need to select the window and press "**3**".
You will be asked to enter which polygon, and then the first point in the axis. Lastly you will be asked to enter the coordinates for the second point.

Example:

```
Enter which polygon
2
Enter the first point x1 y1 z1
0 0 0
Enter the second point x2 y2 z2
1 1 1
Enter angle of rotation
30
```

The coordinates can be any number between 0 and 1.

Enter this mode again will clear the axis line.
So if you rotate by arbitrary axis and want to remove the axis line, all you have to do is enter this mode again, and the line will be erased.

6. Continuously rotate the polygon around arbitrary axis.

To perform "Rotate by arbitrary axis" you need to select the window and press "**4**".
Then you will be asked to enter which polygon and the points for the arbitrary axis.

Example:

```
Enter which polygon
3
Enter the first point x1 y1 z1
0.5 0.5 0.5
Enter the second point x2 y2 z2
0.75 0.8 1.0
```

You will not be asked to enter an angle here, as it will just rotate around the axis based on a timer.

To Stop the rotation, you need to select the window and press "**4**". This will also clear the axis line.

7. Reset

This will just reset all transformations done since the start of the program.
To do a reset, select the window and press "**5**";

8. Spinning

8.1. Spinning w.r.t axis of users choice.

Select window and press "**6**". Then enter which polygon and what axis you want it to spin w.r.t.

Example:

```
Enter which polygon
2
which axis (choose number)
 1: x
 2: y
 3: z
1
Enter angle of rotation
45
```

8.2 Spinning Continuously

Selection the window and pressing "**7**","**8**", or "**9**", will make all polygons spin at the same time with regard of axis x, y, z respectively. This will not require any input in the console.

Pressing "**7**","**8**", or "**9**" again will stop the rotation.

9. Save and exit

When all transformations are done and you want to save the coordinates. Press "**0**". This will write the coordinates to file.

10. Implementation

Algorithm	Line
Translate	162-171
Scale	190-200
Rotate x-axis	202-216
Rotate y-axis	218-232
Rotate z-axis	234-248
Rotation Arbitrary Axis	322-362