Assignment 1

Basic Calculator

- *Problem*

  Create a 2D graphical application for rendering a touch-screen calculator.

  1.) The keys and output text box must be modeled using rectangles. Build a 2-dimensional geometric model for the keys and text box.

  2.) It is not necessary to write text using OpenGL, however when a key is pressed, its corresponding number or operator is outputted as text in the console. The box for a number key can be colored with a specific color and operators can be colored in a different color.

  3.) A red overlay must appear upon pressing the left mouse button on top of a the box the click is on and it must be a scaled down version of it. It should rotate from -45 to 45 degrees.

  4.) Use keyboard keys, e.g. m or M to translate the calculator.

  5.) Use keyboard keys, e.g. r or R to rotate the calculator (this is different from rotating each key when pressing a key.

  6.) Use keyboard keys + and - to zoom in and out, respectively.

  7.) Generate a new action of pressing and dragging the right mouse button for moving a key using pick- point action.

- *Approach*

  The model i.e. calculator object is constructed using rectangle objects which have two point objects, bottom left and top right points, a colour object and also text associated with the rectangle.

  Moving, rotating and sizing of the calculator is done through gl functions of translate rotate and scale respectively.

  For drag and drop feature, gluUnProject() function gives the mouse click co-ordinates in the original system with no translation,rotation or scaling. Then one iteration through all the rectangles of the calculator will give which one has been pressed, then we can translate the given rectangle by the difference of the current and original mouse co-ordinates.

Similarly for the overlay feature, we get to know the rectangle which has been clicked, then we use functions glPushMatrix() and glPopMatrix() to display a scaled down rotating animation of the clicked rectangle and also we print the text associated with the rectangle on the console.

- *Answers*

1.) When rotating the entire calculator, it should rotate about the origin of the world space, while when rotating the key, it should rotate about its local origin, i.e. the center of the key. To implement this we first make the key at the origin, rotate it and then translate it the desired amount.

2.) For pick-point first we transform the mouse co-ordinates into the screen coordinates and then we apply the inverse of all transformations applied to the calculator, now the screen co-ordinates will correctly represent the position of the click in terms of the initial positions of the calculator. This is done through the function gluUnProject().