[Report Lab04]- Affine Transform 2D with OpenGL

CS411 — Computer Graphics

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I. INTRODUCTION

In this lab, the students will implement the algorithms to draw the polygons and transform Affine 2D using OpenGL Library

Objects asked to be performed consist of lines, ovals, polygons, signs, rectangles and free-style shape These shapes must be displayed on Glut window when the users draw them by mouse clicking. After displaying the shapes, the users can choose whether they are colored and are able to choose which shape to transform by context menu.Each shape can be transformed with types of translating, rotating and scaling via hot-keys.

On top of that, students are also asked to constructs their code in OOP methodology.

II. REQUIREMENT

- Write an OpenGL program as follows:
  - Allow to draw any polygon which begin by left mouse click and end by right mouse click (remember to connect first last point).
  - Context menu that allow to select any drawing polygon.
    * Select
      · Triangle
      · Rectangle
      · Free-style polygon
      · ...
    * Hotkeys to transform selected polygon from context menu:
      · Rotate (1 degree per click clockwise counter-clockwise): 'L', 'R'

· Translate (1 pixel per click): 4 arrow keys (up, down, left, right)
· Scale (10 percent per click): '+', '-'
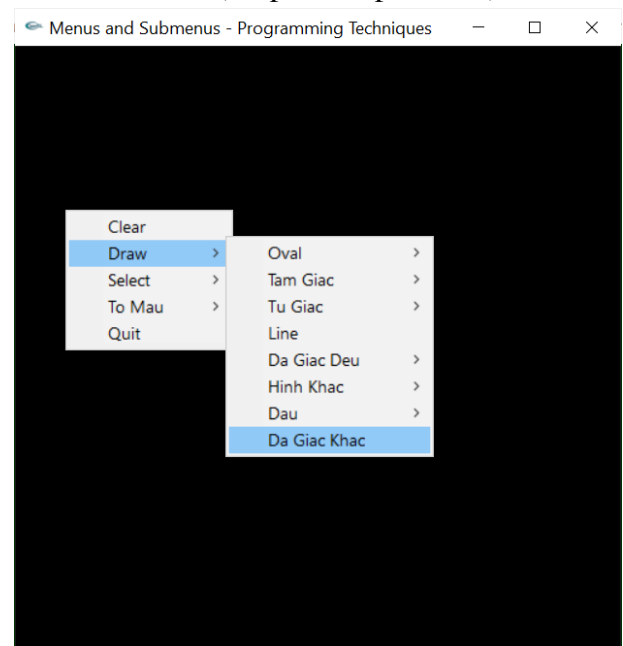
III. INPUT AND EXPERIMENT

Users input completely by mouse clicking. First, users click right-mouse to show and pick a mode.

- Drawing mode: draw objects considering the latest left clicking as the first point and the right clicking as the ending point, with the exception of "Da Giac Khac" objects. "Da giac khac" objects recognize any left clicking as a vertex and right clicking as ending point, then connect these points to generate a polygon.
- Select mode: select an object that was drawn before to transform with hot-keys. When an

object is selected, it is displayed with the light blue. Hot-keys consist of: arrow keys for translating, 'l' and 'r' keys for rotating, '-' and '+'keys for scaling.

Any new drawing shape is saved into a vector of shape. As default, these shapes are drawn without filling. When Users color any shape, this shape will save the color and re-display this color whenever the list of shape is re-drawn. Whenever a new shape is drawn, it is added to an other list in order that users can pick them from tab "select" in the context menu.

When a shape is picked, the user can use hot-keys to transform it. Take the example below as a demonstration.
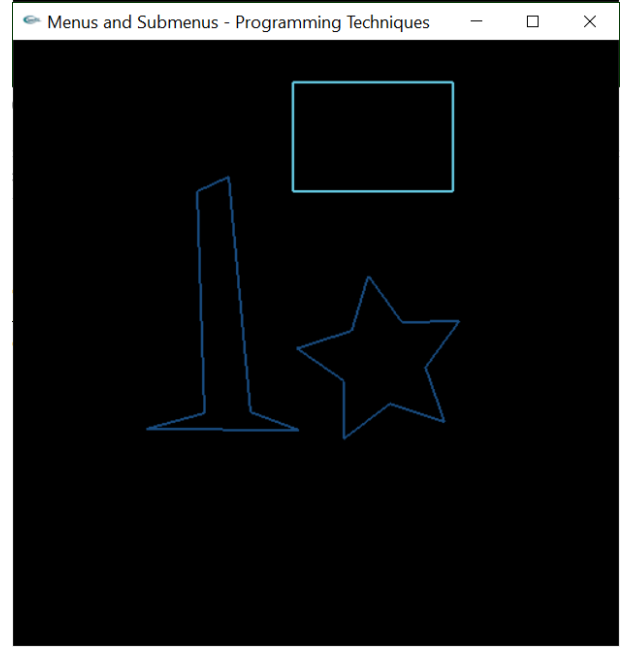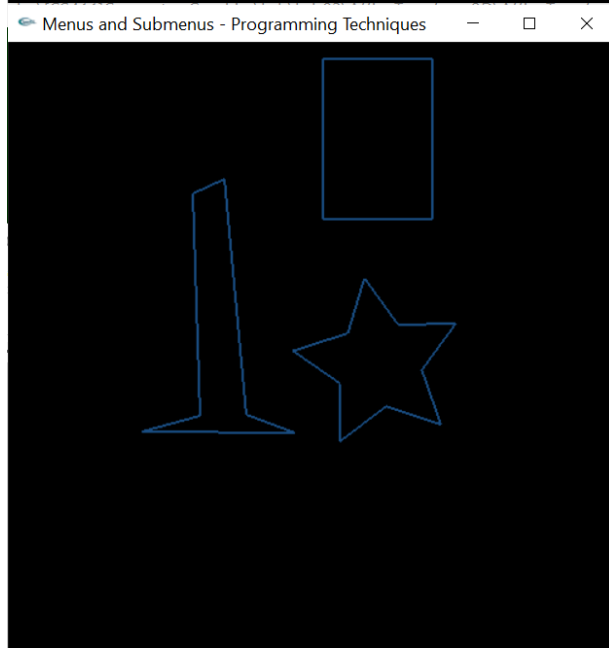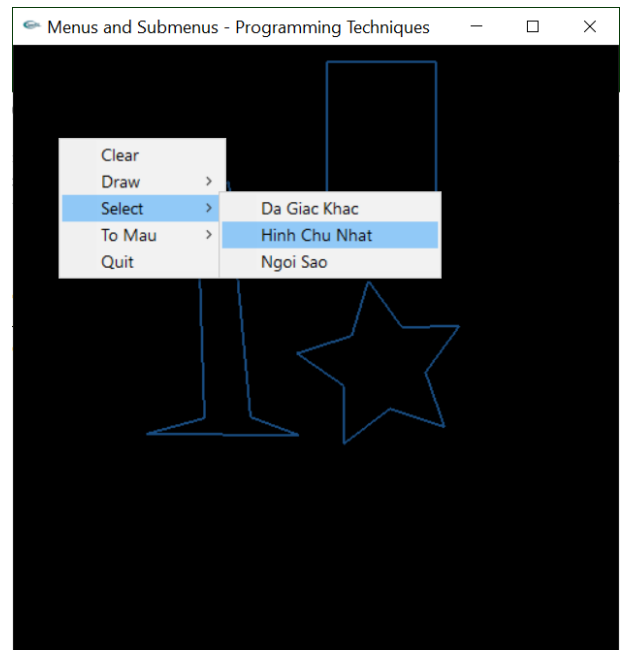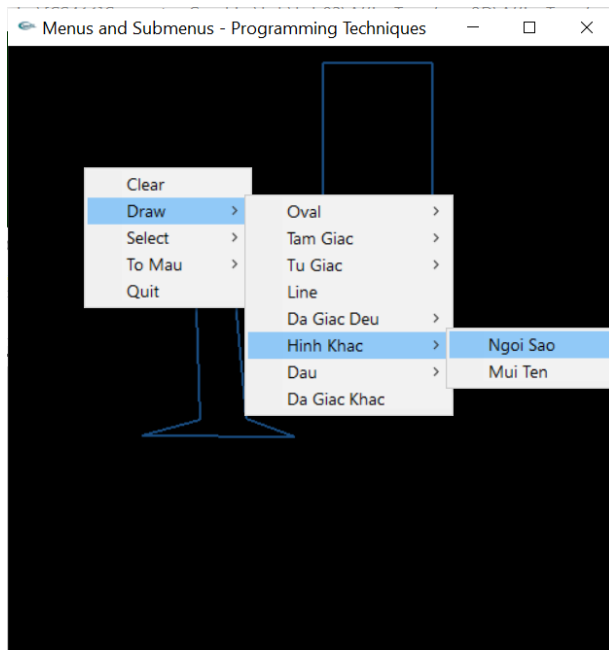
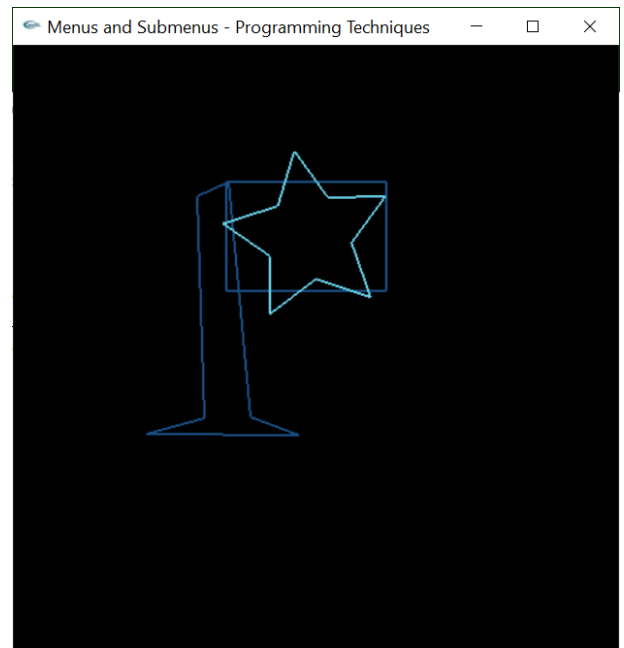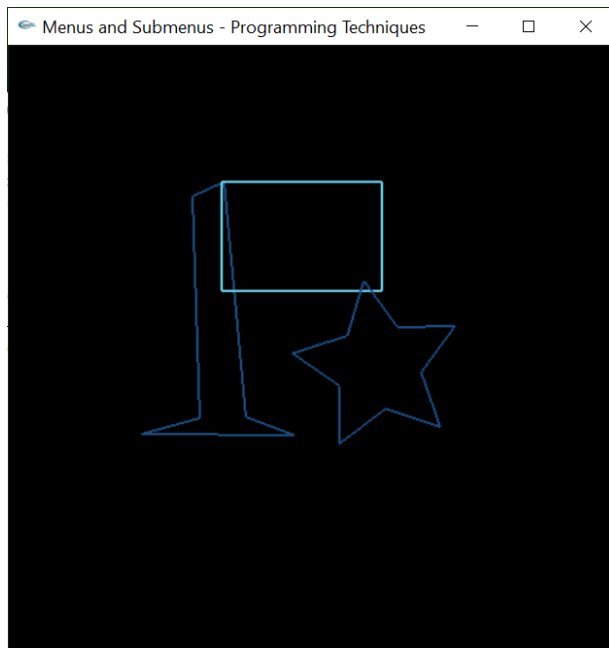- Draw a free-style object: choose drawing mode and draw by mouse clicking.
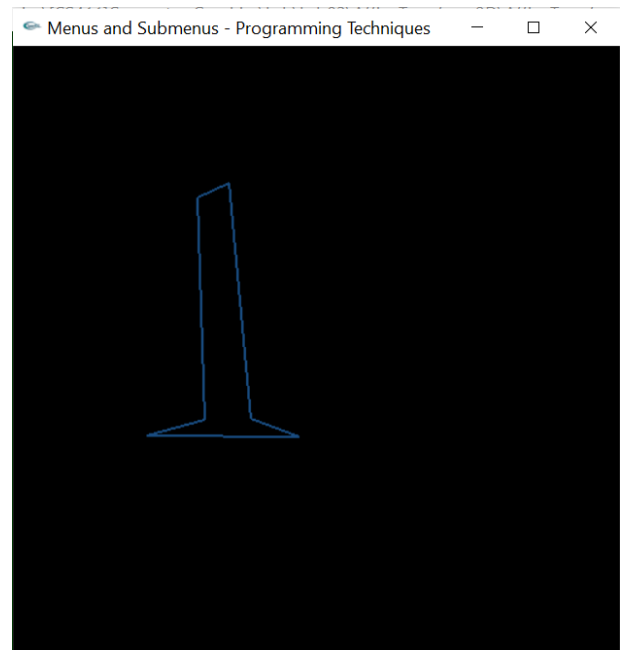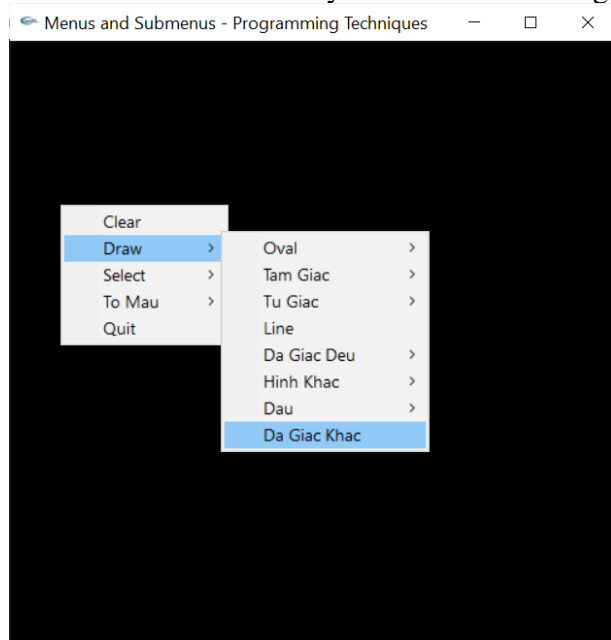
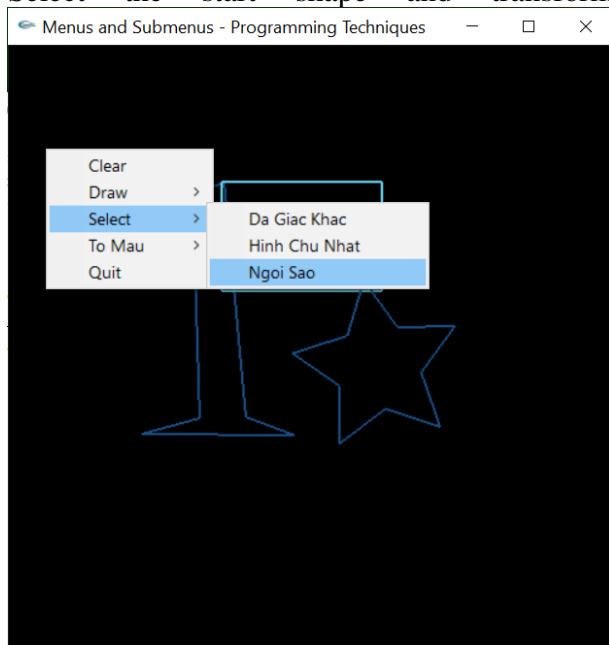- Draw a rectangle: choose drawing mode and draw by mouse clicking.
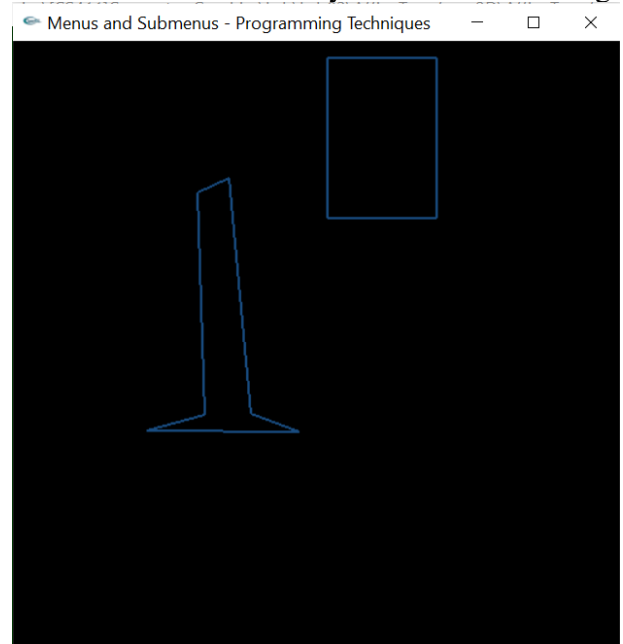
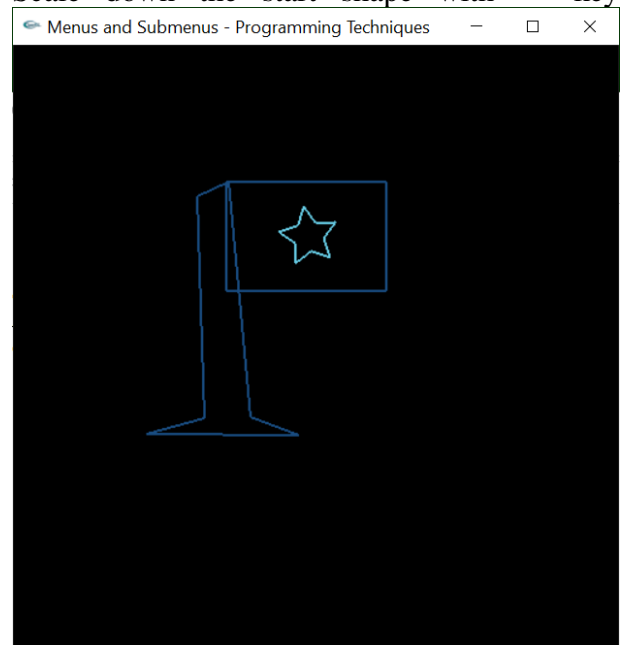- Draw a star shape: choose drawing mode and draw by mouse clicking.

- Select the rectangle to rotate ('l' key) multiple times.

- Continue transforming the rectangle with translating (arrow keys)
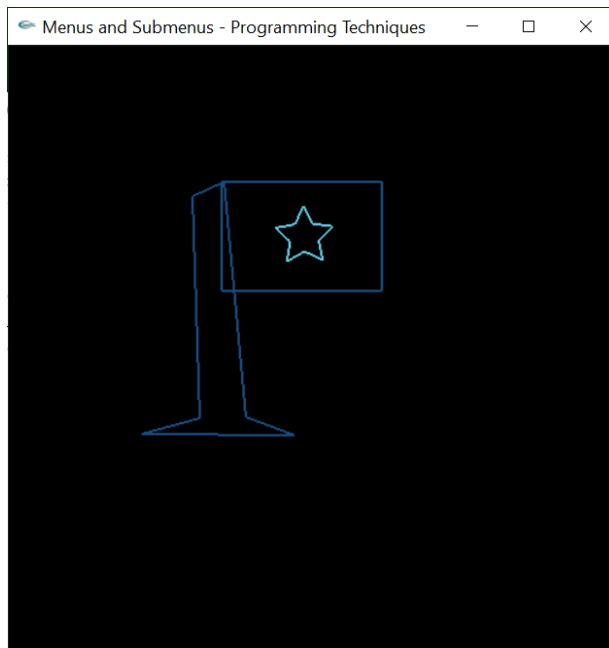
- Select the start shape and transform

- Scale down the start shape with '-' key

- Rotate the start shape with 'r' key

IV. CONCLUSION

In order to draw object by mouse clicking, the right mouse has 2 functions including display menu and recognize ending vertex of the drawing object. The feasible solution for this problem is de-attach menu when choose an object type in drawing mode and then create menu after drawing object. Any Matrix and vector using for transformation are in GLM library

V. REFERENCE

- https://www.youtube.com/watch?v=pZJInpnqAm8

- Graham Sellers, OpenGL SupperBidle, Cheapter 1, 2, and 3.

- https://glm.g-truc.net/0.9.9/

- http://www.cplusplus.com/reference/stl/vector/