Computer Graphics Lab-04
Affine Transform 2D with OpenGL

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1 Draw custom Polygon

Left-clicking the screen will draw a new polygon/add a new vertex to the currently drawing polygon.

Since the right mouse is already attached to the context menu, I can not detect a right click. Instead, I make it stop drawing when the user open the context menu and select something from the menu.

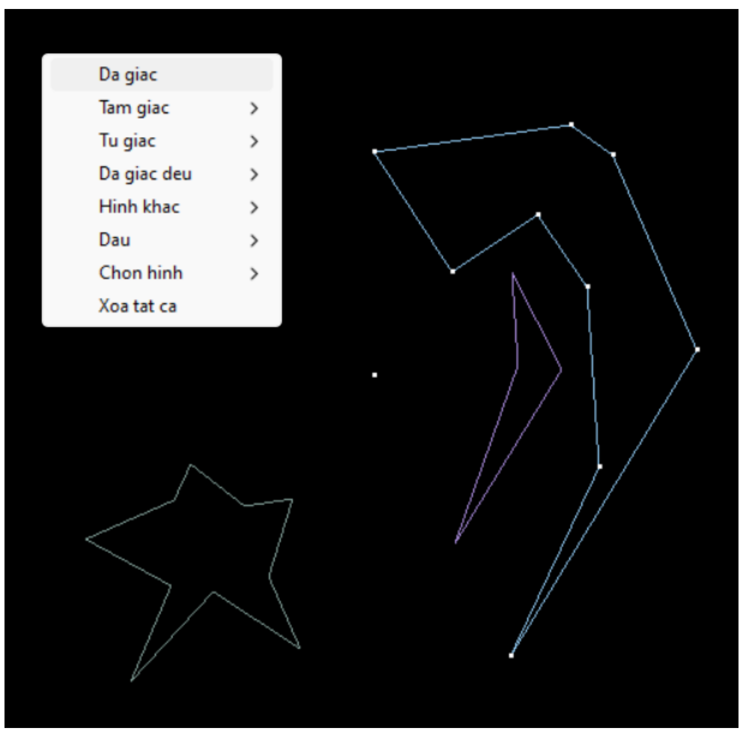

Figure 1: Custom Polygon

2 Draw pre-defined Polygon

Draw polygons from Lab03. Now with the ability to change the size of the shapes by mouse clicking 2 points on the screen as 2 bounds.

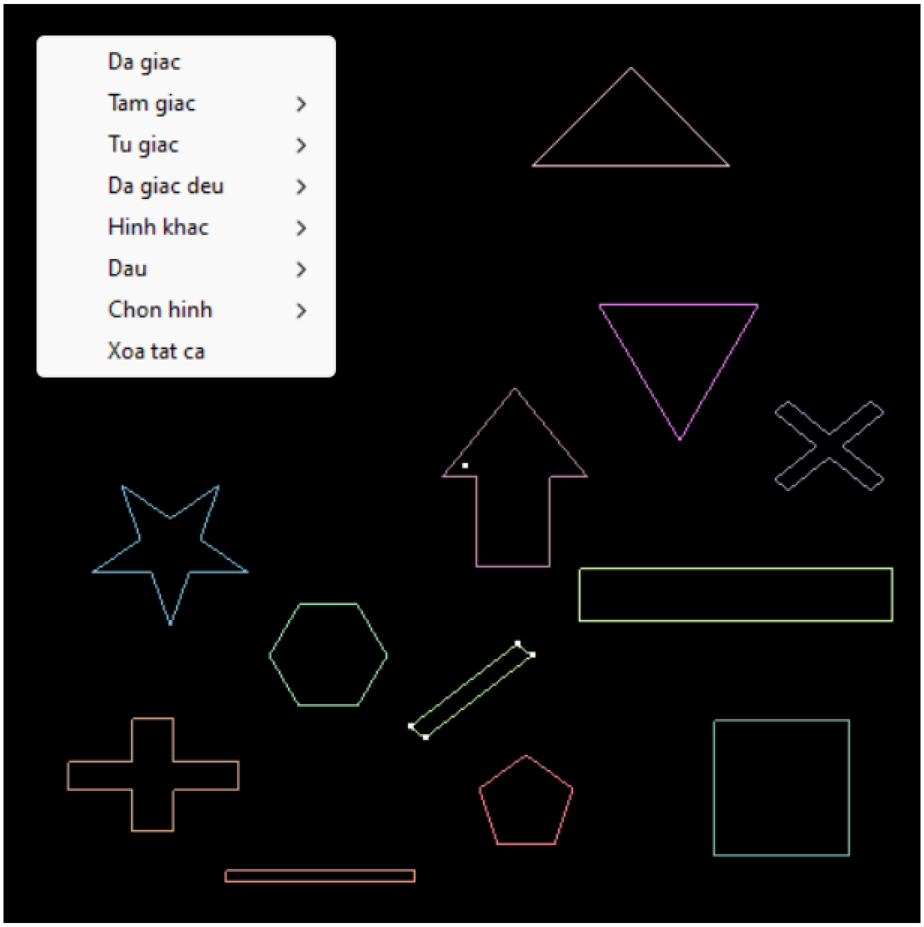

Figure 2: Other Polygon

3 Select a Polygon

For now, each polygon is assigned a random number. The context menu will contain the id of all generated shapes.

Selected polygon will have its vertices highlighted.

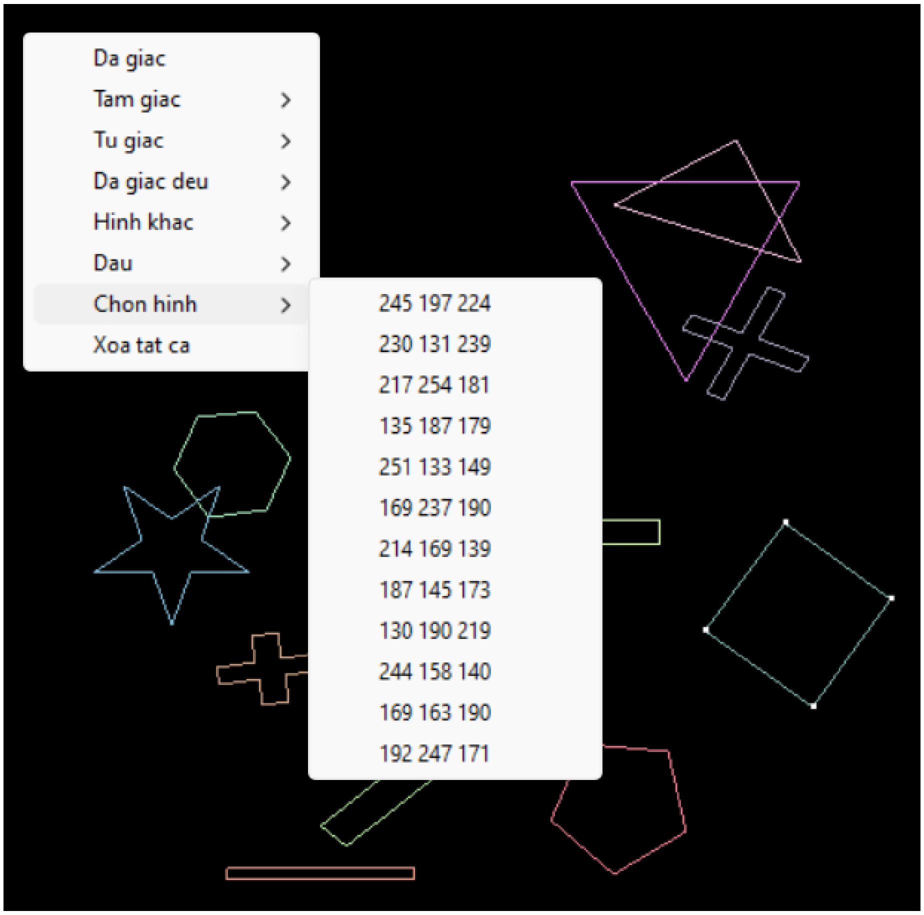

Figure 3: Select a Polygon

4 Affine Transformation

Because the transformation is simple, I code each transformation without using transformation matrices.

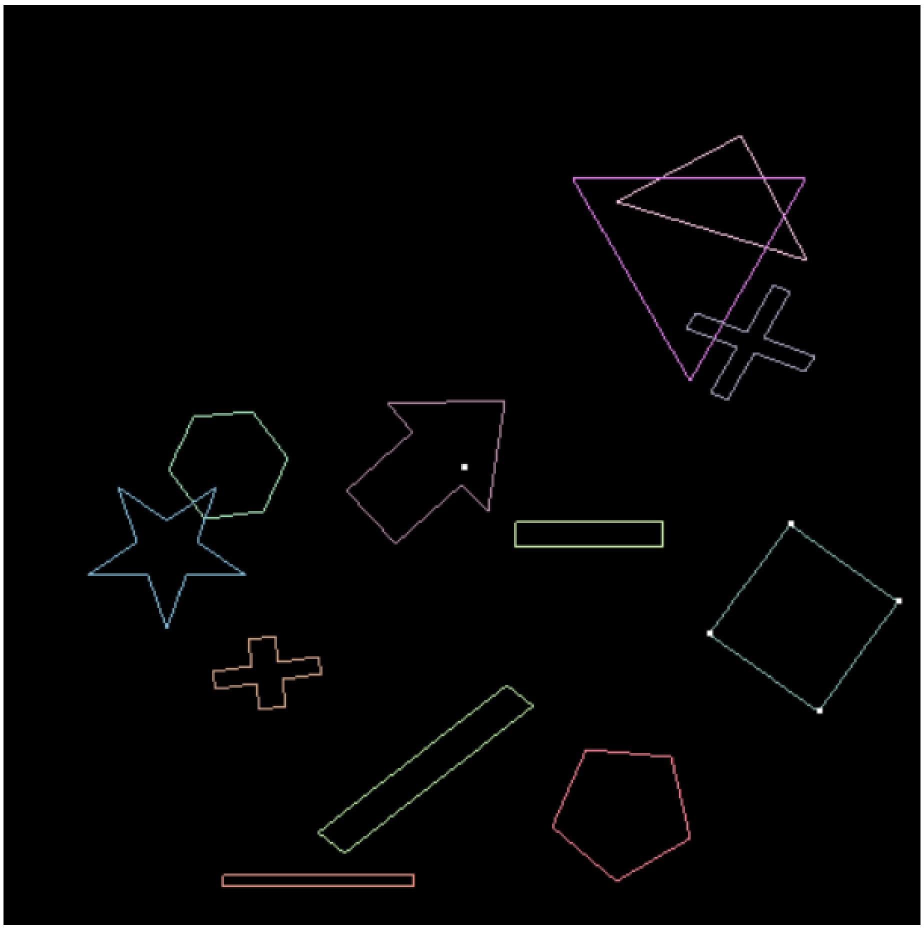

Figure 4: All the shapes transformed (translated, scaled, rotated).

4.1 Translation

Translating every vertices of a polygon using the parameter equation:

$$\begin{cases} x' = x + d_x \\ y' = y + d_y \end{cases}$$

In this lab, the 4 directions should be $(d_x, d_y) \in \{(1, 0), (-1, 0), (0, 1), (0, -1)\}$.

4.2 Scale (fixed point at center of screen)

Scaling every vertices of a polygon using the parameter equation, c_x, c_y being the center of the screen:

$$\begin{cases} x' = p_x + (x - c_x) * S_x \\ y' = p_y + (y - c_y) * S_y \end{cases}$$

In this lab, the scale factor is 1.1 for scaling up and 1/1.1 for scaling down.

4.3 Scale (fixed point at center of screen)

Rotating every vertices of a polygon using the parameter equation, c_x, c_y being the center of the screen:

$$\begin{cases} x' = p_x + (x - c_x) \cdot \cos\alpha - (y - c_y) \cdot \sin\alpha \\ x' = p_y + (x - c_x) \cdot \sin\alpha + (y - c_y) \cdot \cos\alpha \end{cases}$$

In this lab, $\alpha = \pi/180$ for clockwise rotation and $\alpha = -\pi/180$ for counter-clockwise rotation.