

FACULTY OF COMPUTERS, INFORMATICS AND MICROELECTRONICS

TECHNICAL UNIVERSITY OF MOLDOVA

WINDOWS PROGRAMMING

LABORATORY WORK #3

**Basics of Working with Mouse. GDI Primitives.
Bezier Curve.**

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Laboratory work #3

1 Laboratory Work Requirements

- **Basic Level (grade 5 - 6) you should be able to:**
 - a) Draw 5 lines of different colors and weights
 - b) Draw 2 Bezier curves
 - c) Draw 4 plane objects (ex. circle, square, pie, polygon...) of different colors, weights, filled and not
 - d) Draw 2 different objects using mouse
- **Normal Level (grade 7 - 8) you should be able to:**
 - a) Realize the tasks from *Basic Level*.
 - b) Draw a custom bitmap image
 - c) Fill 2 object with gradient
 - d) Hook keyboard input. Add 2 different keyboard combinations that will change mouse ability to draw objects (ex. on Ctrl+C will draw circles, on Alt+R will continue to draw circles but of read color)
 - e) Draw a Bezier curve using mouse
- **Advanced Level (grade 9 - 10) you should be able to:**
 - a) Realize the tasks from *Normal Level*.
 - b) Zoom in and out application working area using keyboard or mouse wheel
 - c) Use mouse as an eraser (choose 1 option):
 - 1) delete objects using mouse clicking
 - 2) eraser of a fixed width
 - 3) eraser with adjustable width
- **for Bonus Point Tasks :**
 - a) Realize the task with mouse eraser for all 3 cases listed above. In order to choose one of them, add 3 buttons/icons or check boxes.

2 Laboratory work implementation

2.1 Tasks and Points

- Draw 5 lines of different colors and weights

To draw 5 line of different weights and colors I used a for loop in which I created a pen using `CreatePen()` function after that I selected that pen to draw with it using `SelectObject()` function. To make different colors I changed them in dependency of the loop counter. At the end I used `MoveToEx()` function to get the start point of the line and with function `LineTo()` I drew the line.

- Draw 2 Bezier curves

To draw a Bezier curve all you need is to have the coordinates of 4 points in the `POINT` structure and use the function `PolyBezier()` where second parameter is the `POINT` variable and the third is number of points that you want to connect, if you want a Bezier that connects more points just give more points to connect.

- Draw 4 plane objects (ex. circle, square, pie, polygon...) of different colors, weights, filled and not

On my window are a rectangle, a roundrectangle, a circle, and an pie. First of all I created the pan to draw with. To create a circle you have to use `Ellipse` function with the coordinates of rectangle that should be filled by that circle. To draw round rectangle I used `RoundRect()` funtion with the last two parameters the size of the circles that are located at the corners. Exist more ways to draw a filled rectangle, I used `FillRect()` function where the second parameter is the rectangle to fill and the third is the brush to fill with. To create a "pie" I used `Pie()` function with first four parameters - the rectangle that will be filled with the ellipse and the last four coordinates of the radial points.

- Draw 2 different objects using mouse

I can create lines and rectangles using mouse. To do this I got the start point of the object when I press left button and when I release the button I create the rectangle using `Rectangle()` function or line using `LineTo()` function.

- Draw a custom bitmap image

To draw a bitmap image first of all I had to find that image or to create it and save it in the project folder. After that I load it using `LoadImage()` function, after that in `WM_PAINT` I used `BitBlt` function to print it on screen.

- Fill 2 object with gradient

To draw two rectangles filled with gradient I used a for loop with 30 loops in which every loop draw a line one after another and every line have a different color and at the end I got 2 rectangle with 30 pixels height and filled with gradient.

- Hook keyboard input. Add 2 different keyboard combinations that will change mouse ability to draw objects

To make two hot-keys I define two ID's in header file, after that I registered them using `RegisterHotKey()` function and in `WM_HOTKEY` message in case of `Ctrl+r` I draw a rectangle and in case of `Ctrl+l` I draw a line.

- Draw a Bezier curve using mouse

To draw a Bezier curve using mouse I used the same idea as the triangle and line, the only difference is that here you need four points not two, so I use left button to get first two and right button to get the other two points.

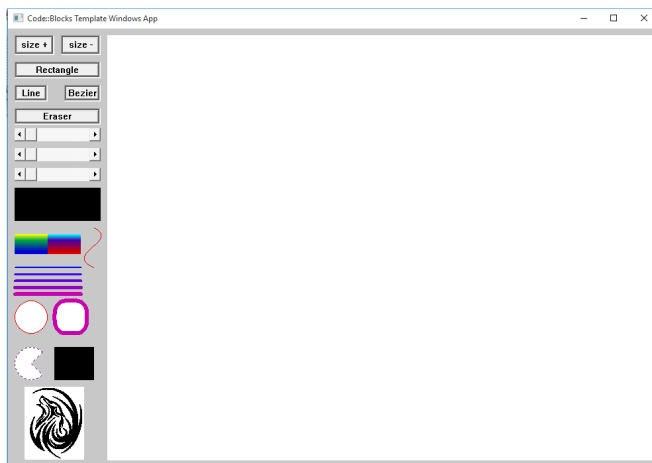
- Use mouse as an eraser

To create the eraser I went into `WM_MOUSEMOVE` message, I created a white pen and I create lines every pixel I move the mouse.

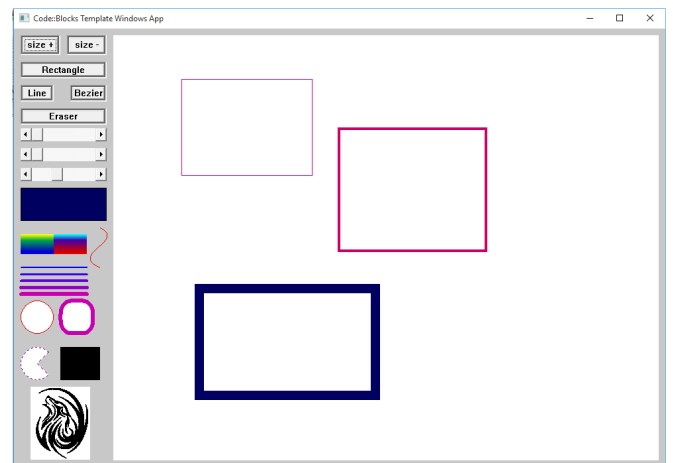
2.2 Laboratory work analysis

<https://github.com/UnnemotionalHyena/WP>

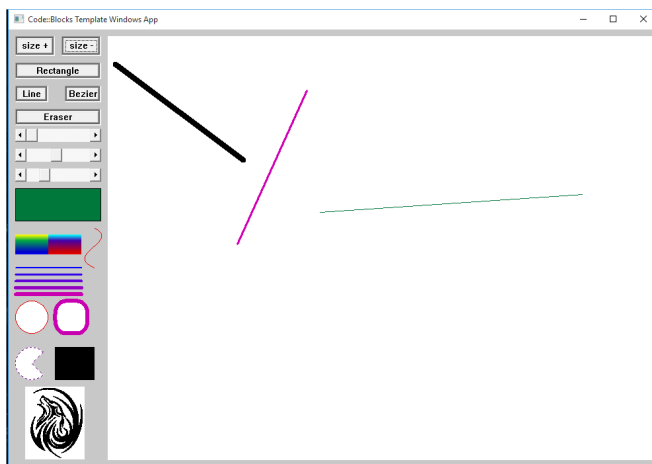
2.3 Prove your work with screens



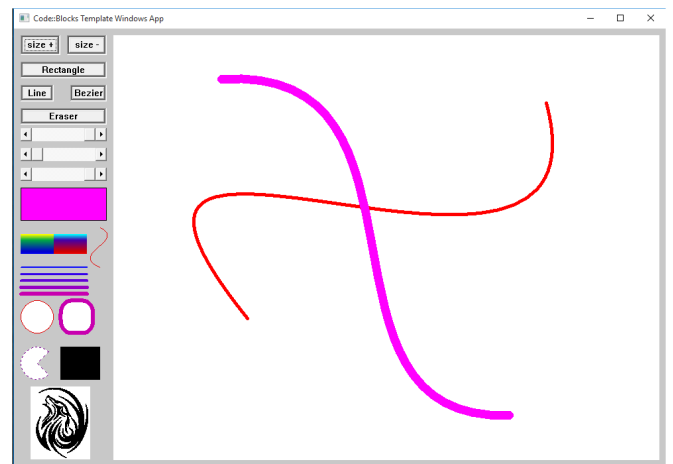
The basic window



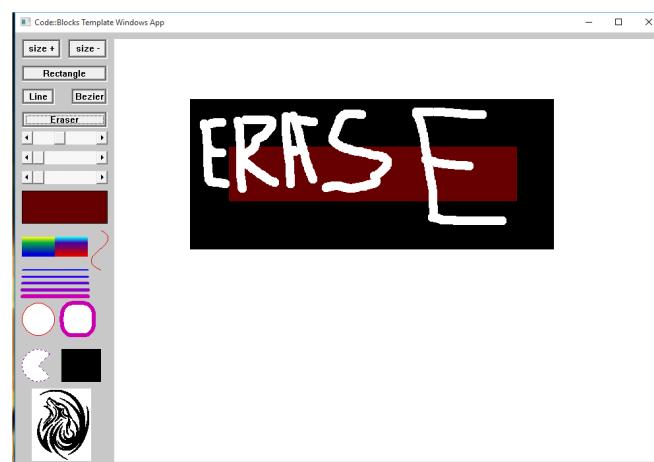
Drawing rectangles



Drawing lines



Drawing Bezier



Using eraser

Conclusions

During this laboratory work, I learned about how to work with GDI. The GDI of the win32 is very primitive and hard to work with. It has memory problems and you can get a lot of crashes or messages like "Program stopped working...". I created something like a primitive Paint, but this sounds scary because what can be more primal than "Paint".

References

- 1 Charles Petzold, *Programming Windows, 5th Edition*, 1998