ENGR 212 Programming Practice
Mini Project 7
May 19, 2016

*(Due: **8:00 am**, June 6, 2016) (<u>No</u> late submissions allowed!) (Interviews on June 6th)*

Kids like drawing, and in just minutes, they may fill in all the pages of an entire notebook with great pieces of "art". Then, they start drawing on the walls, which may not be that joyful for the parents. Fortunately, computers may be of help here as well. In this last mini project of the semester, you are going to develop a simple paint program for kids. This program will allow drawing basic shapes with different colors, moving them around, and removing them off the canvas. This last mini project will serve as a kind of a take-home final exam. Details regarding the requirements are as follows:

1. Your program will have a graphical user interface (GUI) which will look like as shown in Figure 1. Details about how it should work are provided below. Besides, for your convenience, a short video is also made available that demos how the tool should work:
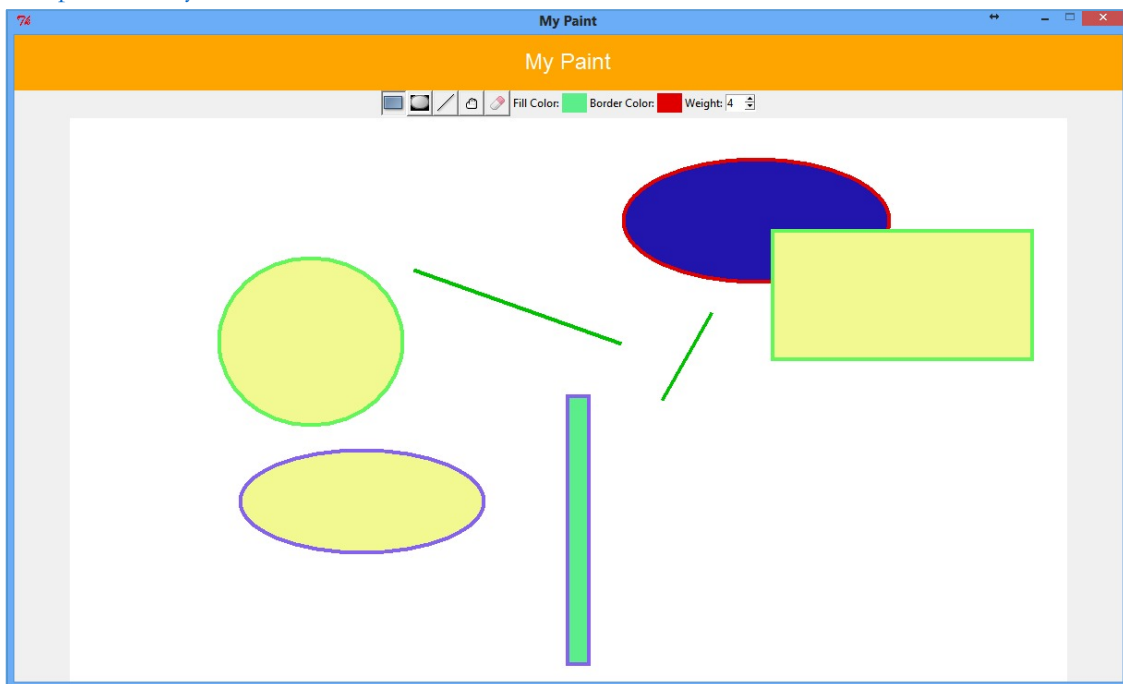
     https://www.youtube.com/watch?v=HYl-O2TT7v8

Figure 1

- At the top, there will be a toolbar that houses a number of shape buttons, an eraser, a drag tool, fill and border color choosers, and a border thickness setting. Figure 2 zooms into toolbar.
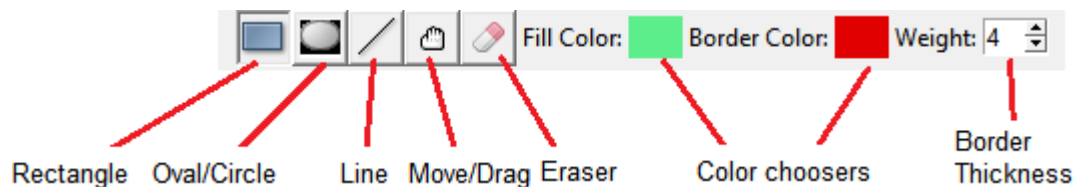

Figure 2

- When user clicks on any of rectangle, oval, line, move/drag, and eraser buttons, it will stay pressed so that the user knows which shape/functionality is currently active/selected (by default, initially, rectangle will be selected when the program starts). The buttons will have the following behavior:

  o *Rectangle, Oval, Line:* When any of these buttons are in pressed form, when the user left clicks on any place on the canvas, holds the left button pressed, and drags the mouse, your tool will start drawing the corresponding chosen shape dynamically as the mouse moves. When the user releases the left mouse button, the shape drawing will be finalized at wherever the mouse left button is released.

o *Move/Drag:* When move/drag button is in pressed state, the user may left-click on any shape and move the shape to any place on canvas by keeping left button clicked while moving the mouse.

o *Eraser:* When eraser button is in pressed state, the user may left-click on any existing shape on the canvas to remove it off the canvas.

o *Fill and Border Color Chooser:* When any of these color buttons are clicked, it will open a color selection pane (see Figure 3), and allow the user to choose a color from there. Afterwards, the drawn shapes will have the corresponding border and fill colors.
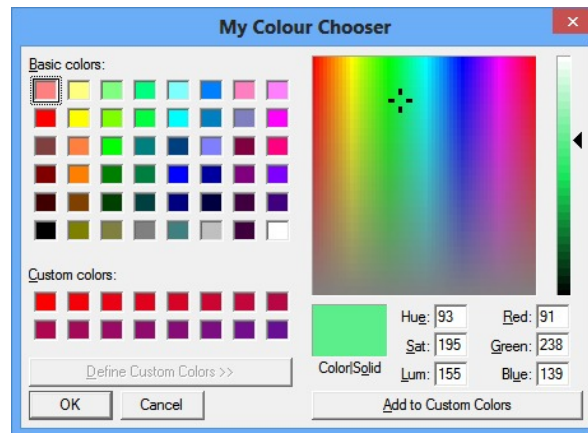

Figure 3

o *Border Thickness:* Through this setting, the user may adjust the border thickness of the shapes to be drawn.

- Mouse cursor should change according to the chosen tool (the example at the following link may be helpful: http://www.tutorialspoint.com/python/tk_cursors.htm)

Bonus (50 Points): Add a button with label "Beautify Layout" on the toolbar that, when clicked, will re-arrange the locations of the existing shapes on canvas automatically to come up with an arrangement that will minimize (or diminish, if possible) the overlaps between the shapes. You may model this as an optimization problem, and use the skills that you have developed in the last two weeks of the course to solve it.

Can you provide any further pointers that may be helpful?:

- The practice session of Week 4 includes lots of hints on how to draw and move a shape on canvas. You may study it again (if you do not remember), and adapt the similar principles in this project.
- At the toolbar, to mimic the buttons, you may use Label widget with an image on it, and use the "relief" option to mimic the pressed or normal states. Images are provided as part of the project. Assume that they are located under a directory named as "assets" in your current working directory.
  - o http://effbot.org/tkinterbook/label.htm

- For color chooser example, please refer to http://knowpapa.com/cchoser/
- For event bindings, please refer to our lecture slides and practice session material for the first several weeks. Additional tutorials are available at the following link:
  - o http://effbot.org/tkinterbook/tkinter-events-and-bindings.htm
- You are going to draw the shapes on Canvas widget. Please refer to our lecture slides and practice session material for the first several weeks. Additional tutorials are available at the following link:
  - o http://effbot.org/tkinterbook/canvas.htm
- You may use the Spinbox widget for the thickness setting:
  - o http://effbot.org/tkinterbook/spinbox.htm

Warnings:

- **Do not** talk to your classmates on project topics when you are implementing your projects. **Do not** show or email your code to others. **Do not** work together if you are not in the same group. If you need help, talk to your TAs or myself, not to your classmates. If somebody asks you for help, explain them the lecture slides, but do not explain any project related topic or solution. Any similarity in your source codes will have **serious** consequences for both parties.

- Carefully read the project document, and pay special attention to sentences that involve "**should**", "**should not**", "**do not**", and other underlined/bold font statements.

- If you use code from a resource (web site, book, etc.), make sure that you reference those resource at the top of your source code file in the form of comments. You should give details of which part of your code is from what resource. Failing to do so **may result in** plagiarism investigation.

- Even if you work as a group of two students, each member of the team should know every line of the code well. Hence, it is **important** to understand all the details in your submitted code. You may be interviewed about any part of your code.

How and when do I submit my project? :

- Projects may be done individually or as a small group of two students (doing it individually is recommended for best learning experience). If you are doing it as a group, only **one** of the members should submit the project. File name will tell us group members (Please see the next item for details).

- Submit your own code in a **single** Python file. **Do not** submit image files. Your implementation should assume that label images are located under a directory named as "assets" in your current working directory. We will test your code file under this setting. Name your code file with your and your partner's first and last names (see below for naming).
    - If your team members are Deniz Barış and Ahmet Çalışkan, then name your code file as deniz_baris_ahmet_caliskan.py (Do **not** use any Turkish characters in file name).

    - If you are doing the project alone, then name it with your name and last name similar to the above naming scheme.

    - Those who **do not** follow the above naming conventions **will get -5 off** of their grade.

    - Submit it online on LMS (Go to the Assignments Tab) by **8:00 am on Monday, June 6, 2016 (Please note the time change)**k/s.

        Absolutely No Late Submissions Allowed!

Grading Criteria? :

Code Organization			Functionality						
Meaningful variable names (%3)	Classes and objects used (%4)	Sufficient commenting (%4)	Compiles? (20)	GUI Design (10)	Drawing Shapes Properly (20)	Moving Shapes Properly (20)	Erasing Shapes Properly (10)	Thickness, Color, Cursor Settings Work properly (10)	Automatic Layout (Bonus: 50)

- Interview evaluation (on *June 6th*)
    - Your grade from interview will be between 0 and 1, and it will be used as a coefficient to compute your final grade. For instance, if your initial grade was 80 before the interview, and your interview grade is 0.5, then your final grade will be 80*0.5 = 40. Not showing up for the interview appointment will **result in** grade 0.

Have further questions?:

- Please contact your TAs (Jareth or Dogukan are focusing on projects. You may want to talk to them first, but you may talk to Ali and Bekir as well) if you have further questions. If you need help with anything, please use the office hours of your TAs and the instructor to get help. **Do not walk in randomly (especially on the last day) into your TAs' or the instructor's offices. Make an appointment first. This is important. Your TAs have other responsibilities. Please respect their personal schedules!**