

#2: Graphics Part 2

SAMS SENIOR NON-CS TRACK

A solid green horizontal bar at the bottom of the slide.

Logistics

- Memory bug – fixed!
- Workshop expectations

- Office Hours- times, locations, OHQueue
- Saving work between computers- Autolab download

Last Time

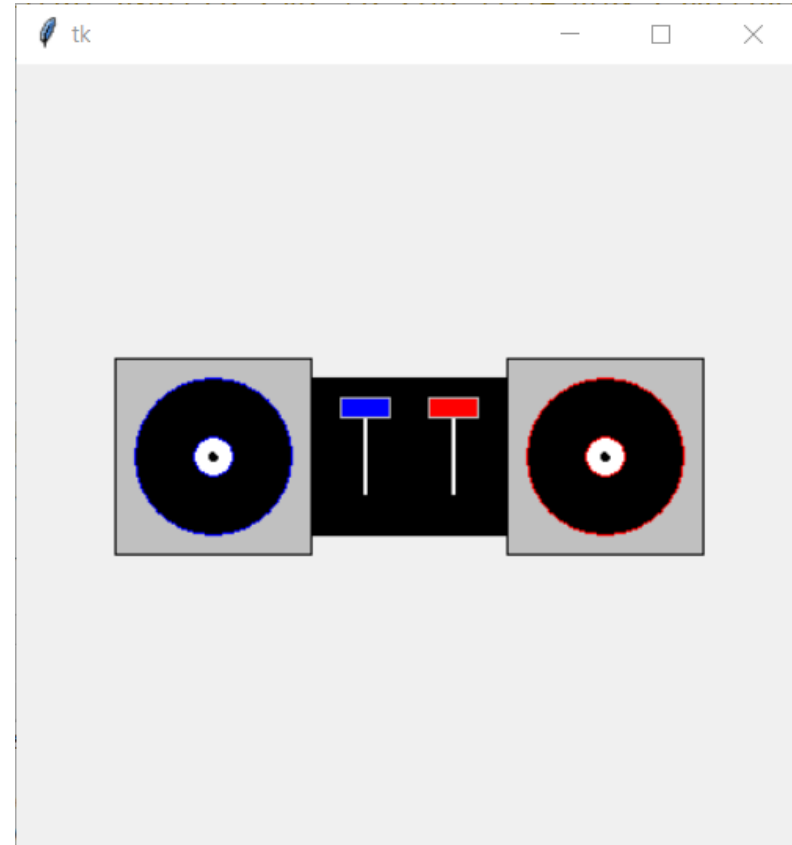
Recognize how a computer makes images from pixels

Use code to draw rectangles and ovals in the window

Ex2-1 Feedback

The first three problems went quite well, but (as expected) #4 was much tougher to finish.

Let's go through how to construct this image together



Today's Learning Goals

Use anchors to draw text on the screen

Draw images using lines and polygons

Review different approaches towards finding where to put shapes on the screen

Text

Text in Tkinter

To write text in the canvas, we use `create_text`. This takes the x, y coordinate of a reference point for the text, as well as the text itself.

```
canvas.create_text(100, 100, text="Hello World!")
```

We can also specify the text color, and the font! The font can contain a lot of information beyond the font name and size- read more here

<http://www.scoberlin.de/content/media/http/informatik/tkinter/x444-fonts.htm>

```
canvas.create_text(100, 100, text="Hello World!", fill="red")
```

```
canvas.create_text(100, 100, text="Hello World!", font="Arial 30")
```

Text Anchors

We can define which reference point should be used to place the text by using the optional parameter **anchor**. This can be set to a value that corresponds to a compass point: CENTER, NW, N, NE, E, SE, S, SW, or W. The default value is CENTER.

The text is then placed so that the coordinate given is located at the anchor point of the text box. If the anchor is N, the top of the text will be at that point; if it is SE, the lower-right corner will be at that point.

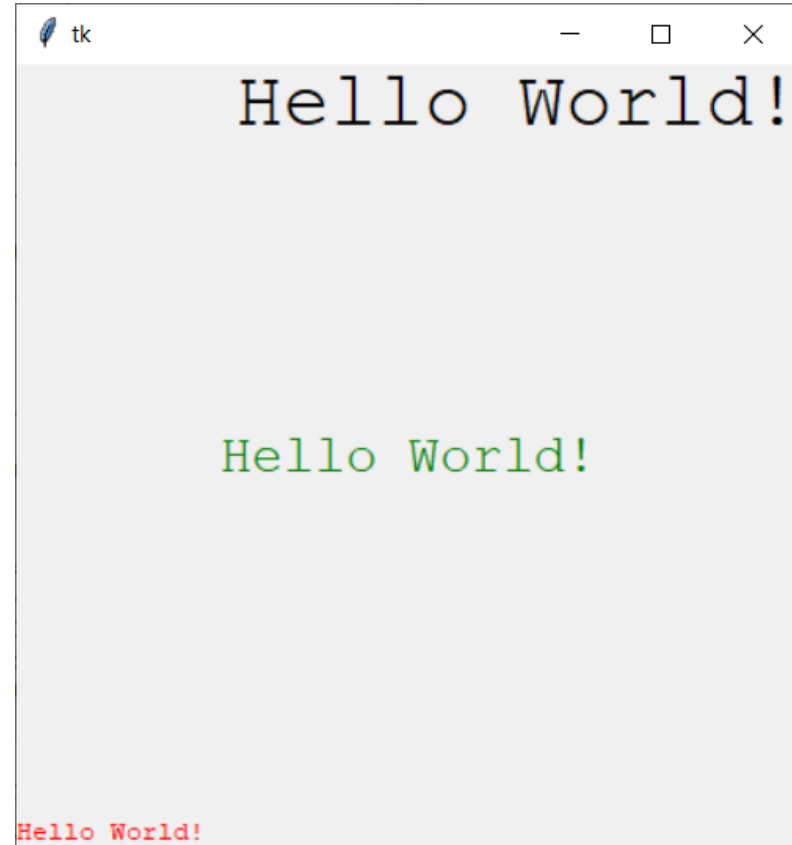
```
canvas.create_text(100, 100, text="Hello World!", anchor=NW)
```


Exercise 1: Draw text

Go to the schedule page and download the starter file for today's lecture. You'll write exercise code under the comment with the exercise's number.

Exercise 1: write tkinter code that draws the text 'Hello World!' in the top right, bottom left, and center of the screen, as shown on the right. Note that the font used is Courier.

Hint: consider using anchor to make finding the coordinates easier



Lines and Polygons

Drawing a line

Drawing a line with **create_line** is fairly simple- we just need to specify the coordinates at the **endpoints** of the line.

```
canvas.create_line(10, 10, 50, 150)
```

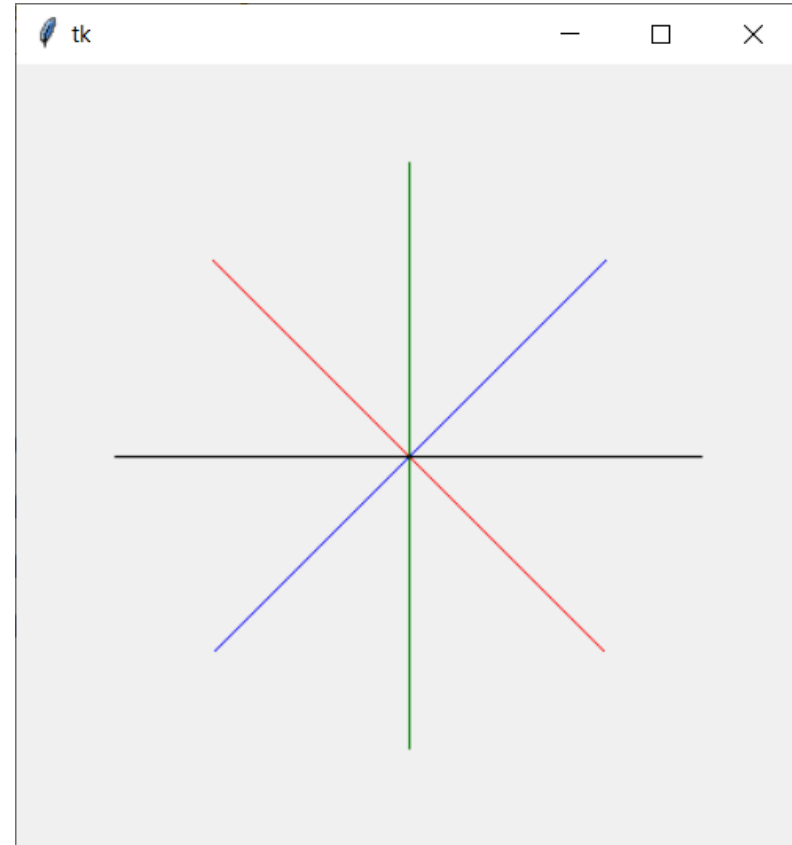
With lines, we can give them a color with **fill**, and we can increase their size with **width**. The width is the number of pixels wide the line will appear to be.

```
canvas.create_line(10, 50, 200, 150, fill="blue")
```

```
canvas.create_line(10, 10, 50, 150, width=5)
```

Exercise 2: Draw lines

Exercise 2: write tkinter code that draws an asterisk in the middle of the screen using lines, as is shown on the right. Each line should be a different color.



Drawing a polygon

Finally, to draw a polygon with `create_polygon`, we specify the coordinates of **each of the polygon's points, in perimeter order**. The polygon can have as many points as needed, but will need at least three points to appear. Note that the last point will automatically be connected to the first one.

```
canvas.create_polygon(10, 10, 50, 150, 100, 50)
```

Polygons, like the other shapes, can have a fill color and an outline color.

```
canvas.create_polygon(10, 10, 50, 150, 100, 50, fill="red", outline="blue")
```

Exercise 3: Draw Flag of Seychelles

Exercise 3: write tkinter code that draws the Flag of Seychelles (shown to the right) in a 600px x 300px window.

Hint: this is actually easier than it looks! Use logic to find the appropriate coordinates on the top and right sides, and note that all the shapes share one point- the bottom-left corner.



Problem-Solving with Graphics

Strategy 1: Paper First

When you're not sure what coordinates to use, try drawing the shapes on paper before writing the code.

Divide the paper up into segments to figure out approximately where the drawn shapes are located, then use those coordinates.

Example: how to draw a lightning bolt?



Strategy 2: Reference Points

When you know some information but don't have the coordinates you need, use the reference points in the shapes.

If you know where the corner of a shape should be, determine the opposing corner using the size.

If you know the center point of the shape and the size, subtract/add half the size to get the left/right sides.

Example: Flag of Benin



Strategy 3: Guess and Check

Finally, when all else fails, try coordinates that are approximately what you want to see if they work! Run the code to see where it shows up. You can then adjust the coordinates to move it or change the size as needed.

If it's too far to the left, make the x coordinates bigger; if it's too far down, make the y coordinates smaller; if it's too wide, make the x coordinates closer together, etc.

Example: Flag of Kuwait

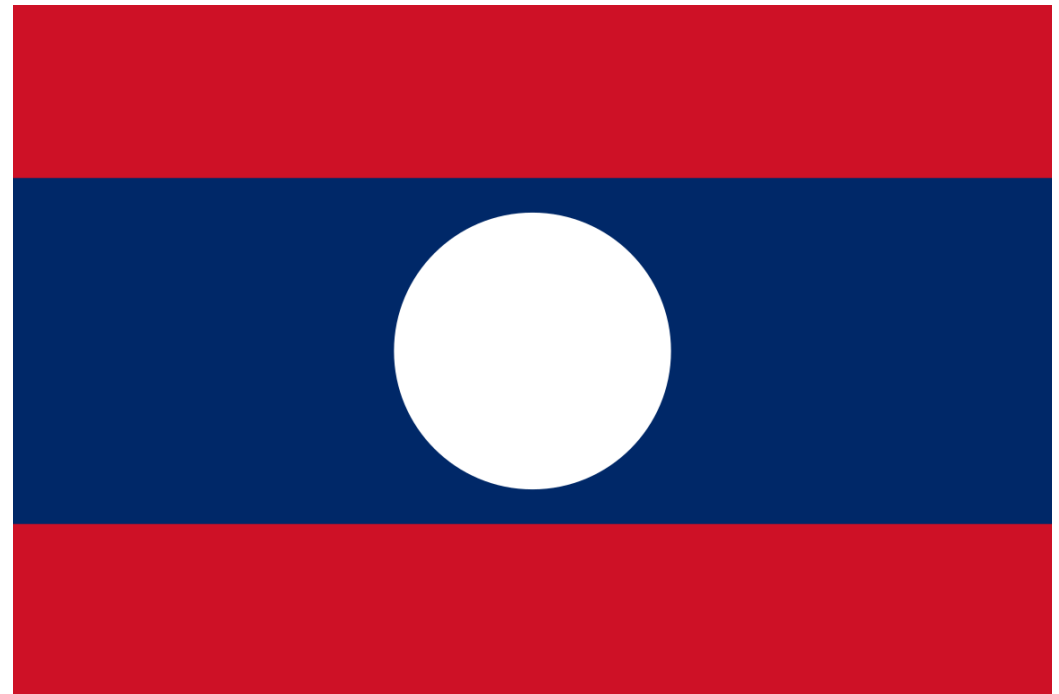


Exercise 4: Flag of Laos

Exercise 4: using tkinter, draw the Flag of Laos in a 600px x 400px window. The flag is shown to the right.

Try to get your flag to match the given flag as closely as possible!

If you have extra time, feel free to keep working on the turntable problem from Tuesday.



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