# *Laboratory 09 —tkinter, canvas widgets*

# *Drawing patterns in the canvas area using nested loops*

## TKINTER

Tk is a robust and platform independent windowing toolkit and is available to Python programmers through the tkinter package. Tk provides the definitions of many "widgets" (labels, buttons, text boxes, etc.) – the components of a GUI.

Tkinter is not the only GUI-programming toolkit for Python. It is however the most commonly used one.

**Canvas**
The canvas is a general purpose widget, which is typically used to display and edit graphs and other drawings.

Each pixel in the Canvas area has an x position (across the canvas) and a y position (down the canvas). Position (0, 0) is the top left corner of the canvas.

**What can be done in the Canvas window?**

**`create_line`**`(x0, y0, x1, y1, `*`options`*`)`
The line is defined by 2 points (x0, y0) and (x1, y1). For example:

```
my_canvas.create_line(200,250, 150,175, fill = "purple", width = 3)
```

**`create_rectangle`**`(x0, y0, x1, y1, `*`options`*`)`
The rectangle is defined by 2 points: (x0, y0) the top left position and (x1, y1) the bottom right position. For example:

```
my_canvas.create_rectangle(50,100, 150,200, fill = "blue", outline ="red")
```

**`create_oval`**`(x0, y0, x1, y1, `*`options`*`)`
The oval is defined by 2 points: (x0, y0) the top left position of the bounding rectangle and (x1, y1) the bottom right position of the bounding rectangle. For example:

```
my_canvas.create_oval(50,100, 150,200, fill = "pink", outline ="black")
```

**`create_polygon`**`(coordinates of points, `*`options`*`)`
The polygon is defined by a series of points: (x0, y0, x1, y1, …. xn, yn). For example:

```
my_canvas.create_polygon(50,100, 125,25, 200,100, fill = "blue", outline = "black")
```

**`create_text`**`(coordinates of position, `*`options`*`)`
Draws text in the canvas. For example:

```
my_font = ("Courier", 12, "bold")
my_canvas.create_text(50,100, text = "Hello", font = my_font)
```

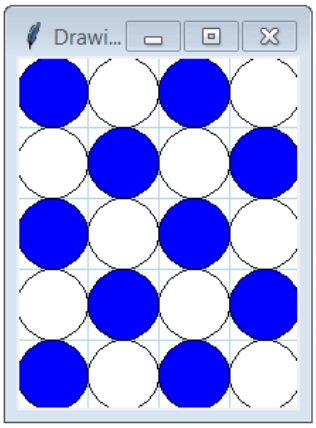
By default, the text is centred on the position. You can override this with the anchor option. For example, if the position specified is the upper left corner, set the anchor to NW.

```
my_canvas.create_text(50,100, text = "Upper left corner", anchor = NW)
```

**Drawing patterns using nested loops**.

To create rows and columns of shapes we need nested loops, e.g.

```
from tkinter import *

def draw_pattern_in_canvas(canvas):
    grid_size = 50
    y = 0
    for row in range(0, 5):
        x = 0
        fill_in = row % 2 == 0
        for column in range(0, 4):
            if fill_in:
                canvas.create_oval(x, y, x + grid_size, y + grid_size, fill = "blue")
            else:
                canvas.create_oval(x, y, x + grid_size, y + grid_size)
            x += grid_size
            fill_in = not fill_in
        y += grid_size

def draw_grid(a_canvas):
    for row in range(50, 300, 50):
        a_canvas.create_line(-1, row, 201, row, fill = "lightblue")
    for column in range(50, 250, 50):
        a_canvas.create_line(column, -1, column, 251, fill = "lightblue")

def main():
    window = Tk()
    window.title("Drawing")
    window.config(background = 'white')
    window.geometry("200x250+10+20")

    a_canvas = Canvas(window)
    a_canvas.config(background = "white")
    a_canvas.pack(fill = BOTH, expand = True)
    draw_grid(a_canvas)
    draw_pattern_in_canvas(a_canvas)
    window.mainloop()

main()
```




## LAB 9 MARK

Name: Prince Bhatia

Lab day and time (e.g. Monday 12 – 2): Monday 4-6

Exercises: ____/9 On Time: ☐ (1 mark) Total Mark: ___/10

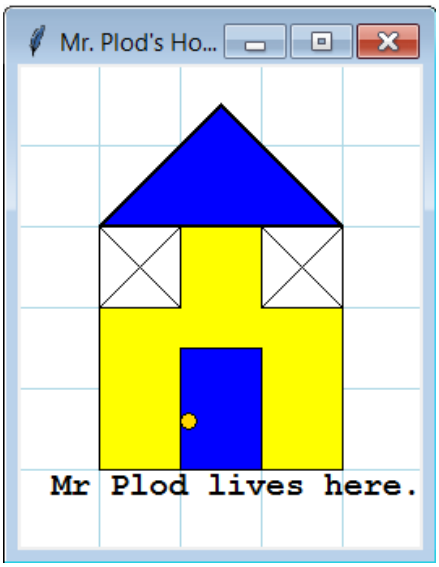
Teaching Assistant: _____ Tutor: _____

# *Laboratory 09 —tkinter, canvas widgets*

## EXERCISES

The following exercises must be completed during your allocated laboratory time. You must show your work to the laboratory tutor who will sign off when the work is completed correctly.

### EXERCISE 9.1 – DRAWING IN A CANVAS WIDGET




Complete the code in the `draw_in_canvas()` function in the `Lab09Ex1.py` file so that the picture in the screenshot on the left is drawn. The gridlines are 50 pixels apart and have already been drawn for you. Both the roof and the door are blue, the windows are white, and the rest of the house is yellow. The doorknob is gold. Each shape has a black outline.

### EXERCISE 9.2 – DRAWING A PATTERN IN THE CANVAS WIDGET USING NESTED FOR LOOPS

Complete the code in the `draw_pattern_in_canvas()` function in the `Lab09Ex2.py` file so that the pattern in the screenshot on the right is drawn. The gridlines are 50 pixels apart and have already been drawn for you but they will be covered once you have drawn the correct pattern. The circles are red and the squares are green. Each shape has a 2 pixel black outline. The lines are black.