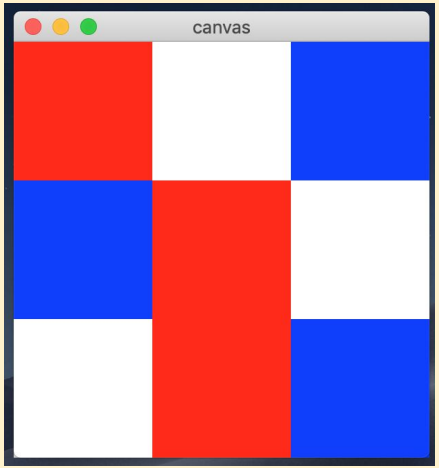
# CSc 110
# PPM

Benjamin Dicken

# Display the grid

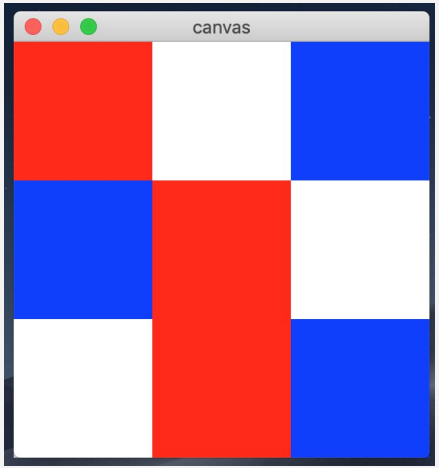



```
colors = [ ['red', 'white', 'blue'],
           ['blue', 'red', 'white'],
           ['white', 'red', 'blue']]

gui = graphics(300, 300, 'canvas')

# Complete the code
```

# Display the grid

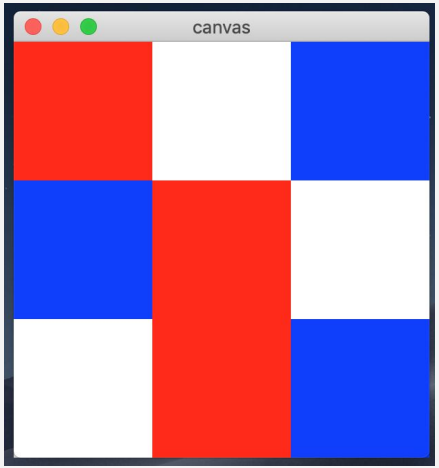



```
colors = [ ['red', 'white', 'blue'],
           ['blue', 'red', 'white'],
           ['white', 'red', 'blue']]

gui = graphics(300, 300, 'canvas')

x = 0
y = 0
for i in colors:
    for j in i:
        gui.rectangle(x, y, 100, 100, j)
```

# Display the grid




```
colors = [ ['red', 'white', 'blue'],
           ['blue', 'red', 'white'],
           ['white', 'red', 'blue']]

gui = graphics(300, 300, 'canvas')

x = 0
y = 0
for i in colors:
    x = 0
    for j in i:
        gui.rectangle(x, y, 100, 100, j)
        x += 100
    y += 100
```

```
colors = [ ['red', 'white', 'blue'],
           ['blue', 'red', 'white'],
           ['white', 'red', 'blue']]

gui = graphics(300, 300, 'canvas')

for i in range(len(colors)):
    for j in range(len(colors[0])):
        gui.rectangle(j * 100, i * 100, 100, 100, colors[i][j])
```

# Storing image data

- Discuss
  - How would you read a PPM file in python?
  - What data structure(s) would you use to store PPM image data so that you could access all of the rows, columns, and RGB values?

```
P3
4 2
255
255 0 0   255 0 0   0 0 255     0 0 255
0 255 0   0 255 0   50 50 50   50 50 50
```

```
image = [ [[255, 0, 0],  [255, 0, 0],  [0, 0, 255],    [0, 0, 255]],
          [[0, 255, 0],  [0, 255, 0],  [50, 50, 50],  [50, 50, 50]] ]
```

# Read a PPM file

```
image = []
file_name = input('Enter file name: ')
ppm_file = open(file_name, 'r')



# Write the missing code to read in the PPM file
```

# Read a PPM file

```
image = []
file_name = input('Enter file name: ')
ppm_file = open(file_name, 'r')
ppm_file.readline()
ppm_file.readline()
ppm_file.readline()
```

```
P3
3 3
255
255 255 255 255 255 255 0 100 200
255 255 255 0 100 200 0 100 200
0 100 200 0 100 200 255 255 255
```

# ?

# Activity

```
image = []
file_name = input('Enter file name: ')
ppm_file = open(file_name, 'r')
ppm_file.readline()
ppm_file.readline()
ppm_file.readline()

for line in ppm_file:
    line = line.strip('\n').split()
    # ?
```

```
P3
3 3
255
255 255 255 255 255 255 0 100 200
255 255 255 0 100 200 0 100 200
0 100 200 0 100 200 255 255 255
```

## Activity

```
image = []
file_name = input('Enter file name: ')
ppm_file = open(file_name, 'r')
ppm_file.readline()
ppm_file.readline()
ppm_file.readline()

for line in ppm_file:
    line = line.strip('\n').split()
    row = []
    # ?
```

```
P3
3 3
255
255 255 255 255 255 255 0 100 200
255 255 255 0 100 200 0 100 200
0 100 200 0 100 200 255 255 255
```

## Activity

```
image = []
file_name = input('Enter file name: ')
ppm_file = open(file_name, 'r')
ppm_file.readline()
ppm_file.readline()
ppm_file.readline()

for line in ppm_file:
    line = line.strip('\n').split()
    row = []
    for i in range(0, len(line), 3):
        # ?
```

```
P3
3 3
255
255 255 255 255 255 255 0 100 200
255 255 255 0 100 200 0 100 200
0 100 200 0 100 200 255 255 255
```

```python
image = []
file_name = input('Enter file name: ')
ppm_file = open(file_name, 'r')
ppm_file.readline()
ppm_file.readline()
ppm_file.readline()

for line in ppm_file:
    line = line.strip('\n').split()
    row = []
    for i in range(0, len(line), 3):
        pixel = line[i:i+3]
        row.append(pixel)
    image.append(row)
```

# Get the width and height

How would you get the width and height here?

```
image = []
file_name = input('Enter file name: ')
ppm_file = open(file_name, 'r')
ppm_file.readline()
ppm_file.readline()
ppm_file.readline()

for line in ppm_file:
    line = line.strip('\n').split()
    row = []
    for i in range(0, len(line), 3):
        pixel = line[i:i+3]
        row.append(pixel)
    image.append(row)
```

```
P3
3 3
255
255 255 255   255 255 255   200 100 100
255 255 255   200 100 100   200 100 100
200 100 100   200 100 100   255 255 255
```

# Get the width and height

```
w_h = ppm_file.readline()
sp = w_h.split(' ')
width = int(sp[0])
height = int(sp[1])
```

```
image = []
file_name = input('Enter file name: ')
ppm_file = open(file_name, 'r')
ppm_file.readline()
ppm_file.readline()
ppm_file.readline()

for line in ppm_file:
    line = line.strip('\n').split()
    row = []
    for i in range(0, len(line), 3):
        pixel = line[i:i+3]
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    image.append(row)
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        row.append(pixel)
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for line in ppm_file:
    line = line.strip('\n').split()
    row = []
    for i in range(0, len(line), 3):
        pixel = line[i:i+3]
        row.append(pixel)
    image.append(row)
```

```
width = len(image[0])
height = len(image)
```

# What next?

After the width, height, and pixel info are available, what can be done?

# What next?

After the width, height, and pixel info are available, what can be done?

- Display it!
- Process it!
- Implement a greenscreen!

# Display the image

```
image = []
file_name = input('Enter file name: ')
ppm_file = open(file_name, 'r')
ppm_file.readline()
ppm_file.readline()
ppm_file.readline()

for line in ppm_file:
    line = line.strip('\n').split()
    row = []
    for i in range(0, len(line), 3):
        pixel = line[i:i+3]
        row.append(pixel)
    image.append(row)

width = len(image[0])
height = len(image)
```

**Activity**

```
image = []

. . .

width = len(image[0])
height = len(image)

gui = graphics(width, height, file_name)

for i in range(len(image)):
    for j in range(len(image[i])):
        # What goes here?
```

```
image = []

. . .

width = len(image[0])
height = len(image)

gui = graphics(width, height, file_name)

for i in range(len(image)):
    for j in range(len(image[i])):
        color = gui.get_color_string(int(image[i][j][0]),
                                     int(image[i][j][1]),
                                     int(image[i][j][2]))
        gui.rectangle(j, i, 1, 1, color)
```

# What happens . . .

- When this program is run with a small image?

# What happens . . .

- When this program is run with a small image?
- How could we change the program so that:
  - The user could specify a scale factor
  - The canvas size and displayed image would be zoomed in/out by the number the user specifies

# Add a scale factor

```
width = len(image[0])
height = len(image)

gui = graphics(width, height, file_name)

for i in range(len(image)):
    for j in range(len(image[i])):
        color = gui.get_color_string(int(image[i][j][0]),
                                     int(image[i][j][1]),
                                     int(image[i][j][2]))
        gui.rectangle(j, i, 1, 1, color)
```

# Add a scale factor

```
scale = float(input('Scale factor: '))

width = len(image[0]) * scale
height = len(image) * scale

gui = graphics(width, height, file_name)

for i in range(len(image)):
    for j in range(len(image[i])):
        color = gui.get_color_string(int(image[i][j][0]),
                                     int(image[i][j][1]),
                                     int(image[i][j][2]))
        gui.rectangle(j * scale, i * scale, scale, scale, color)
```