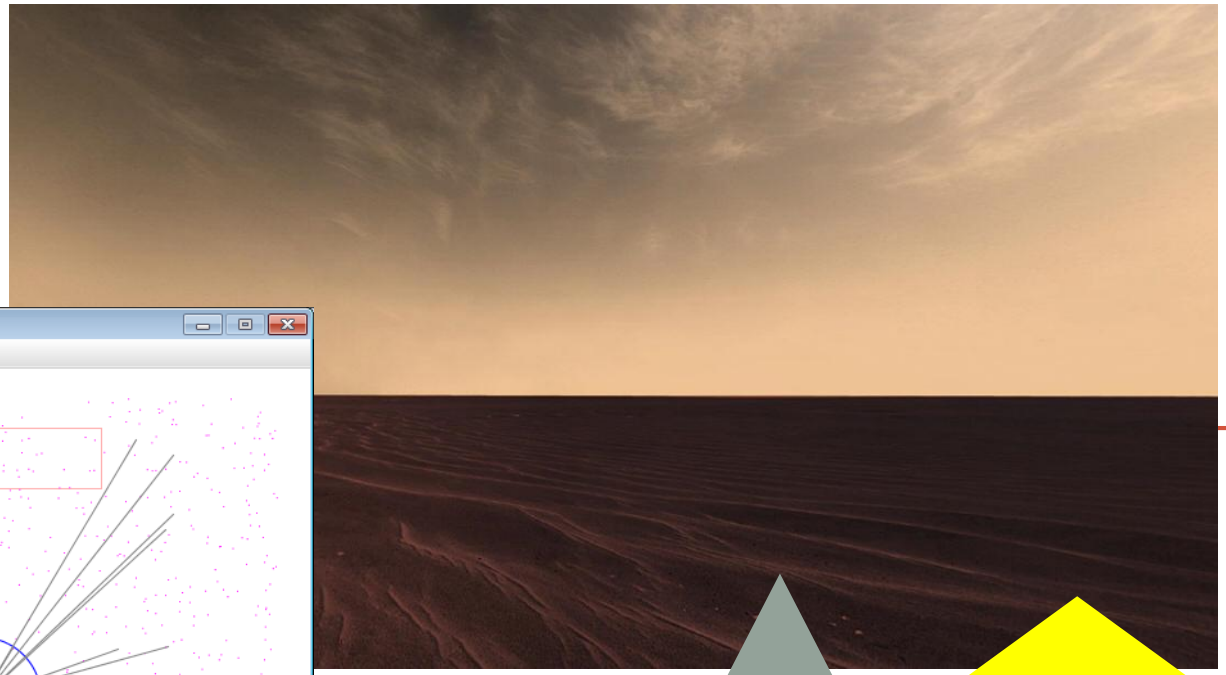
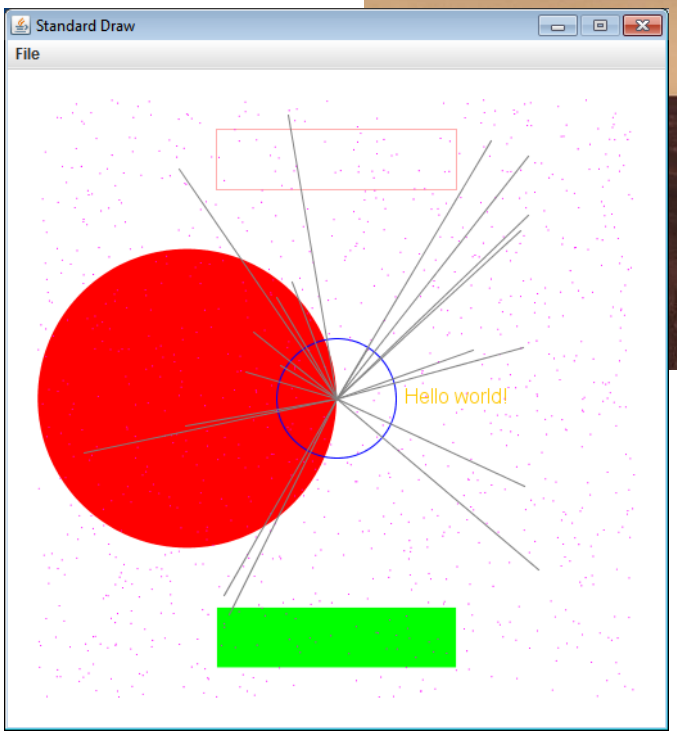
INPUT / OUTPUT PRACTICE





CSCI 135, 11, Lab Seating Chart

Wednesdays – NRB 228 – 3:00 -5:50

	Aaron Murphree		Michael Nelson		Colter Ore		Race Owens		Alexander Perala		Kolby Peterson
Dylan Mentzer		Reese Lester		Rylee Johnson		Alexus Jenkins		Ty Insko		Erin Hennelly	
	William Franzen		Clay Fulk		Cooper Gaustad		Blake Girdler		Roland Grena		Seth Gutierrez
Will Augustine	Benjamin Biastoch	Adel Bigart		Benjamin Burkhalter	Kevin Cassidy	Michael a Cortright	Matthew Dal Bon	Cole Davies		Brayden Erfle	Clay Fisher

Front of Room

CSCI 135 Section 11 Lab - ENGR 204 Wed. 3:00-6:00

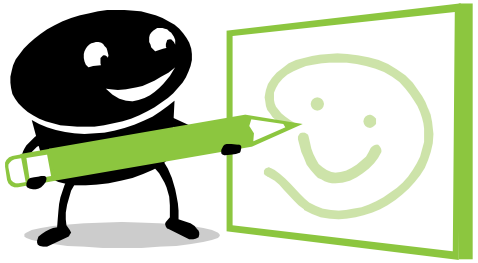
Door

	Austin Wilson		Colton Whitney
Colton Pilon		Zachary Tomaszewski	
	Amelia Stoner		Jessa Steele
Mason Simon		Austin Seyer	
	Dylan Sestrich		Shelby Schweigert
Nicholas Rogers		Jacob Richardson	
	Jace Rhodes		Spencer Reitz
Kolby Tretheway			

(Instructor)

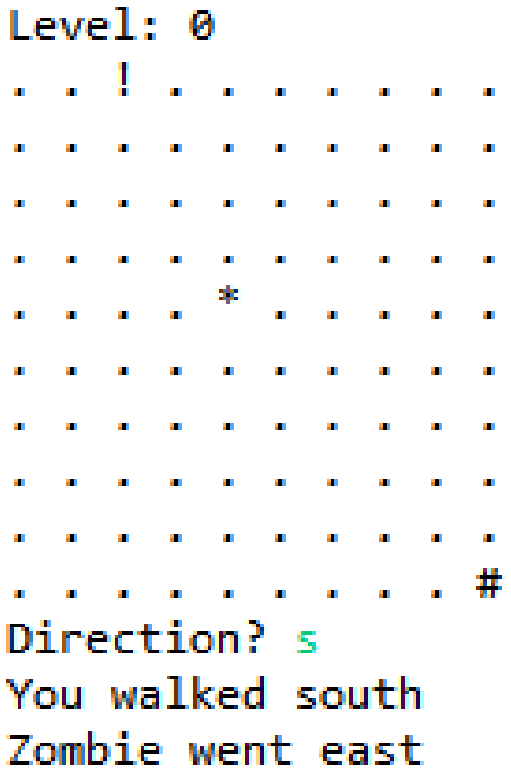
Outline

- File Input
  - Practice
    - Reading configuration files
- Graphics
  - Practice
    - Background Images
    - Animation



Input and Output Thus Far

- Input
  - Parsing command line arguments
  - Reading interactively from user
- Output
  - Display text to console
    - … and some audio output …



Input from Files

- What if..
  - There are too many values for a user to type interactively?
  - These values are stored in a text file?
- Can our program read these values from a file?
  - Yep! ☺

Python File Input

- We need to open the file:
  - `with open(fname, 'r') as f:`
    - fname is a string for the file name
    - f is just any variable that you want to use
    - ‘r’ means we want to read the file (as opposed to writing it)
- Once we are done with the file, we need to close it:
  - **f.close()**

File Input

```
import sys

sum   = 0.0
count = 0

# Check if we need to print out command line help
if len(sys.argv) < 2:
    print("AvgNumsFile <filename>")
else:
     # Open up the text file for reading
     fname = sys.argv[1]
     with open(fname, 'r') as f:
         # Keep going as long as there is more text in the file
         for line in f:
             # Translate that line to a float
             sum += float(line)
             count += 1
     f.close()

    # Print out the final average
    print(sum / count)
```

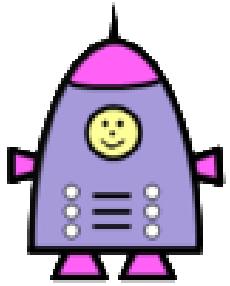
Configuration File: hitchhiker.txt

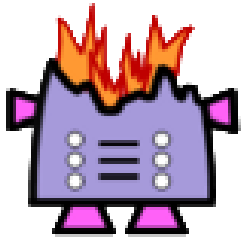
```
stars.jpg
dont_panic_40.png 0.5 0.5 0.035 100
6
asteroid_small.png 0.1 0.1 0.018 -0.002 -0.003
asteroid_medium.png 0.2 0.2 0.030 0.002 -0.003
asteroid_large.png 0.3 0.3 0.065 -0.002 0.003
asteroid_small.png 0.4 0.4 0.018 -0.001 -0.004
asteroid_medium.png 0.6 0.6 0.030 0.002 -0.003
asteroid_large.png 0.7 0.7 0.065 -0.0035 0.0025
```

```
# Hitchhikers Guide to the Galaxy: Avoid a bunch of asteroids
#  <background image>
#  <player image> <player x-position> <player y-position> <player radius> <player speed factor>
#  <number enemies>
#  <enemy0 image> <enemy0 x-position> <enemy0 y-position> <enemy0 x-velocity> <enemy0 y-velocity>
#  <enemy1 image> <enemy1 x-position> <enemy1 y-position> <enemy1 x-velocity> <enemy1 y-velocity>
#  ...
```

StdDraw Overview

- StdDraw
  - Like `random` and `sys`, we'll use another library: `StdDraw`
  - Put `StdDraw.py` in directory with your program
    - You will also need:
      - stdarray.py
      - picture.py
      - color.py
  - Draw simple things:
    - Rectangles, circles, lines, polygons, text
    - Make them different colors
  - Draw images loaded from a file:
    - e.g. spaceship, Mars background, etc.
  - Animate things:
    - e.g. bouncing ball, video games





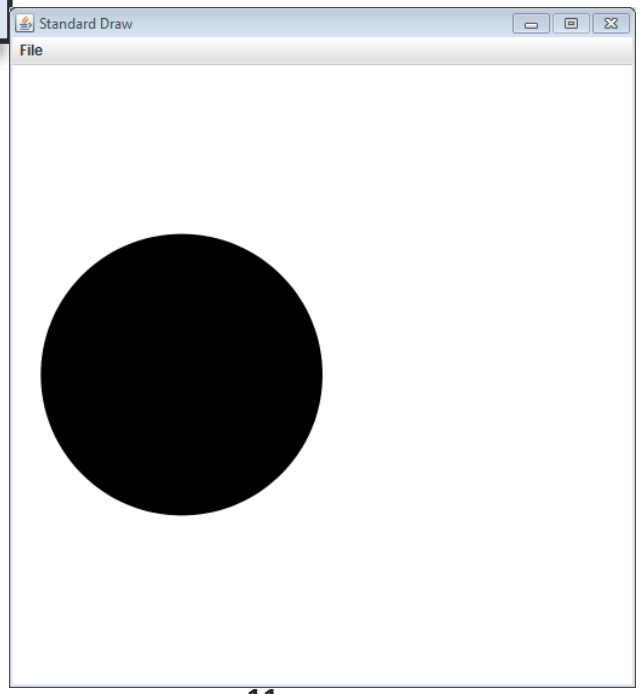
Hello Drawing!

```
import StdDraw

StdDraw.filledCircle(0.25, 0.5, 0.25)
StdDraw.show(0.0)
```

Put the circle at x coordinate 0.25

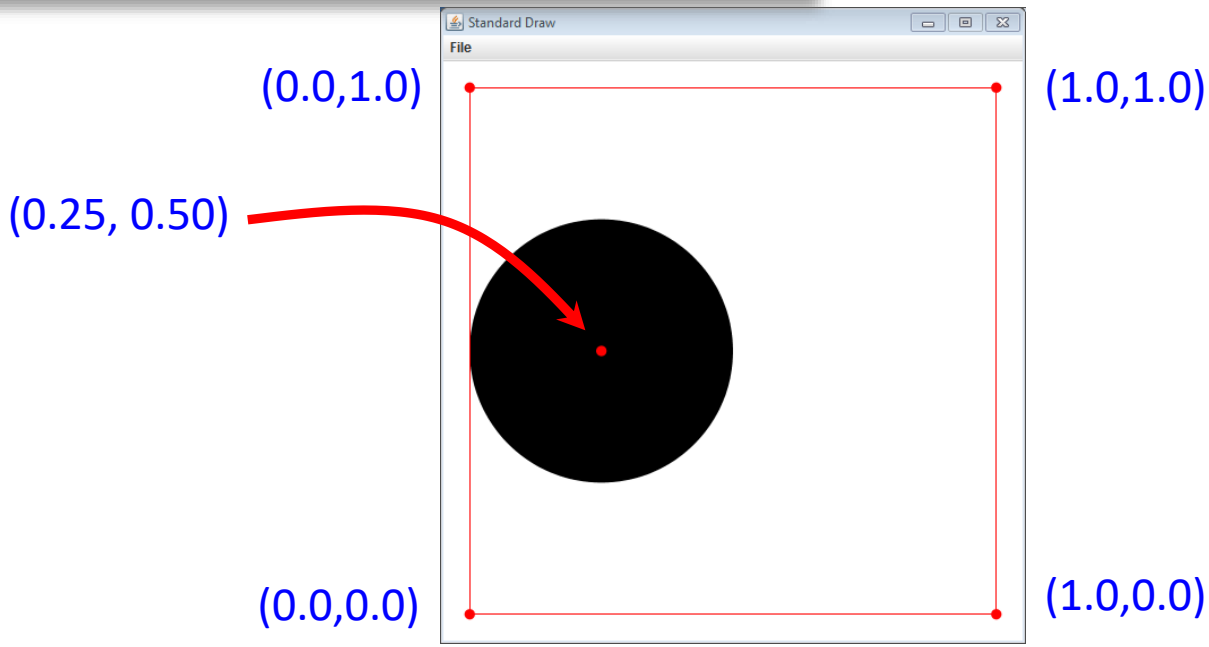
Put the circle at y coordinate 0.5

Make the circle be of radius 0.25



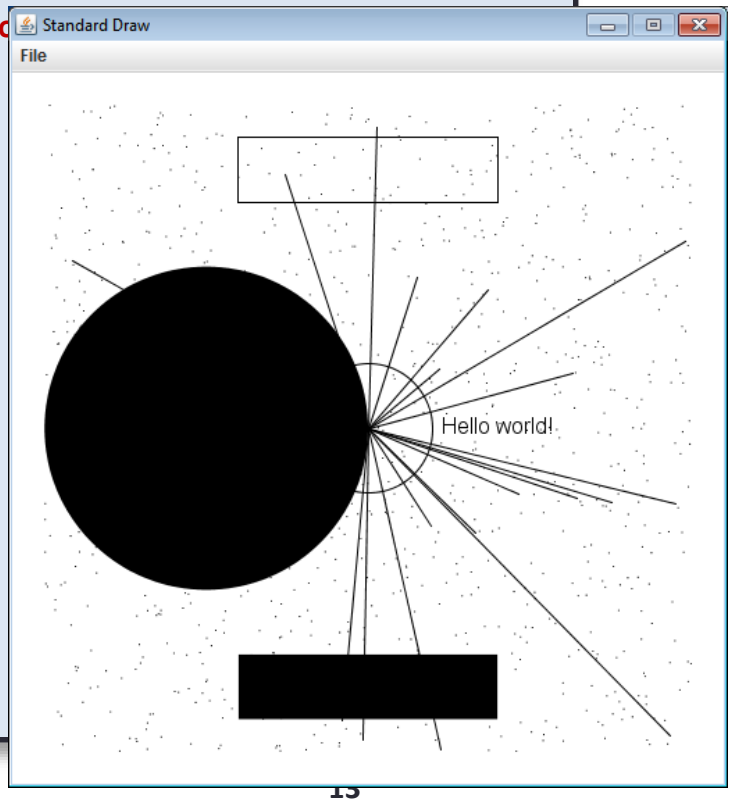
Default Coordinate System

```
import StdDraw

StdDraw.filledCircle(0.25, 0.5, 0.25)
StdDraw.show(0.0)
```



Other Shapes and Text

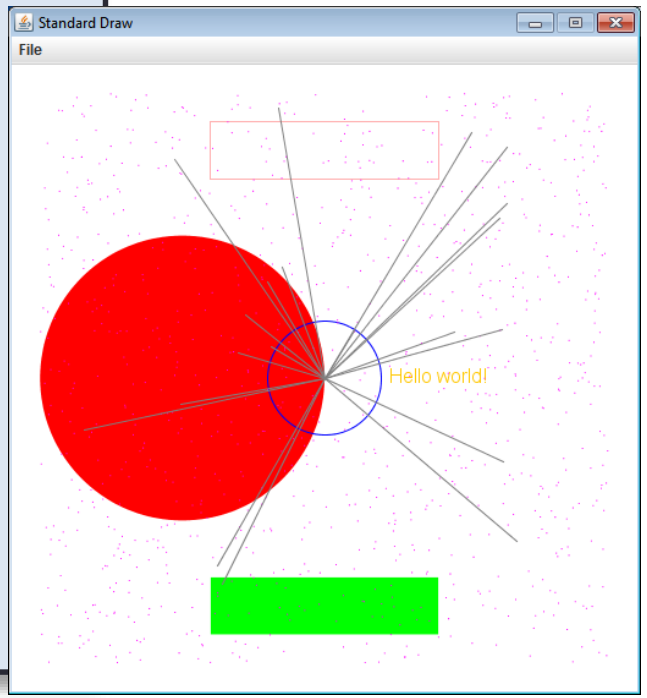
```
import StdDraw
import random

# Drawing circles involves sending in an (x,y) center plus a radius
StdDraw.filledCircle(0.25, 0.5, 0.25)
StdDraw.circle(0.5, 0.5, 0.1)
StdDraw.show(0.0)

# Rectangles are drawn at an (x,y) center with the passed in half
# width and half height argument (the distance to the edge fro
# (x,y) center).
StdDraw.filledRectangle(0.5, 0.1, 0.2, 0.05)
StdDraw.rectangle(0.5, 0.9, 0.2, 0.05)
StdDraw.show(0.0)

# Text is drawn centered at the given (x,y)
StdDraw.text(0.7, 0.5, "Hello world!")
StdDraw.show(0.0)

# Scatter a 1000 random points around the screen
for i in range(0, 1000):
    StdDraw.point(random.random(), random.random())
StdDraw.show(0.0)

# 20 random lines radiating from the center
for i in range(0,20):
    StdDraw.line(0.5, 0.5, random.random(), random.random())
StdDraw.show(0.0)
```



Adding Color

```
import StdDraw
import random

# Drawing circles involves sending in an (x,y) center plus a radius
StdDraw.setPenColor(StdDraw.RED)
StdDraw.filledCircle(0.25, 0.5, 0.25)
StdDraw.setPenColor(StdDraw.BLUE)
StdDraw.circle(0.5, 0.5, 0.1)
StdDraw.show(0.0)

# Rectangles are drawn at an (x,y) center with the passed in half
# width and half height argument (the distance to the edge from the
# (x,y) center).
StdDraw.setPenColor(StdDraw.GREEN)
StdDraw.filledRectangle(0.5, 0.1, 0.2, 0.05)
StdDraw.setPenColor(StdDraw.PINK)
StdDraw.rectangle(0.5, 0.9, 0.2, 0.05)
StdDraw.show(0.0)

# Text is drawn centered at the given (x,y)
StdDraw.setPenColor(StdDraw.ORANGE)
StdDraw.text(0.7, 0.5, "Hello world!")
StdDraw.show(0.0)

# Scatter a 1000 random points around the screen
StdDraw.setPenColor(StdDraw.MAGENTA)
for i in range(0, 1000):
    StdDraw.point(random.random(), random.random())
StdDraw.show(0.0)

# 20 random lines radiating from the center
StdDraw.setPenColor(StdDraw.GRAY)
for i in range(0, 20):
    StdDraw.line(0.5, 0.5, random.random(), random.random())
StdDraw.show(0.0)
```

```
StdDraw.BLACK
StdDraw.BLUE
StdDraw.CYAN
StdDraw.DARK_GRAY
StdDraw.GRAY
StdDraw.GREEN
StdDraw.LIGHT_GRAY
StdDraw.MAGENTA
StdDraw.ORANGE
StdDraw.PINK
StdDraw.RED
StdDraw.WHITE
StdDraw.YELLOW
```



Changing Coordinate Size

- Often convenient to use different coordinates
  - 0.0 to 1.0 is default x-size and y-size
  - Change x-size `StdDraw.setXscale(min, max)`
  - Change y-size `StdDraw.setYscale(min, max)`

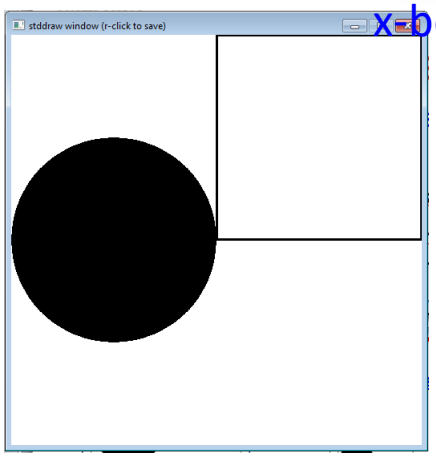
```
StdDraw.filledCircle(0.25, 0.5, 0.25)
StdDraw.rectangle(0.5, 0.5, 0.5, 0.5)
```

x-bottom of rectangle

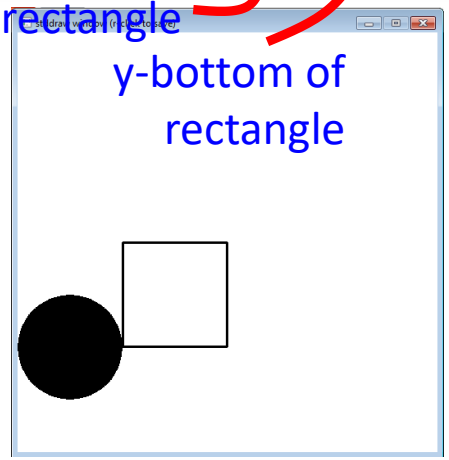
y-bottom of rectangle

width

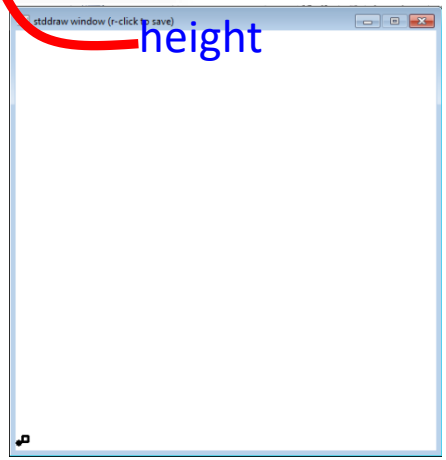
height



`StdDraw.setXScale(0.0,1.0)`
`StdDraw.setYScale(0.0,1.0)`



`StdDraw.setXScale(0.0,2.0)`
`StdDraw.setYScale(0.0,2.0)`



`StdDraw.setXScale(0.0,30.0)`
`StdDraw.setYScale(0.0,30.0)`

Drawing Images

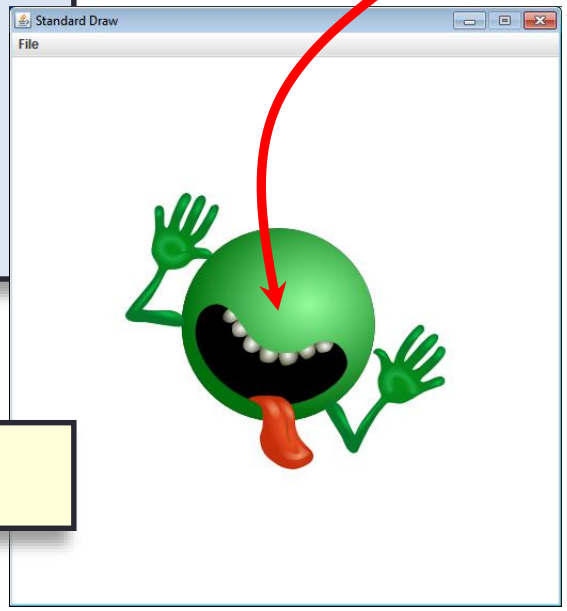
- Loading image from file
  - Supports various formats such as JPG and PNG
  - Put image files in same directory with program
  - `StdDraw.picture(picture, x, y)`

y-center

x-center

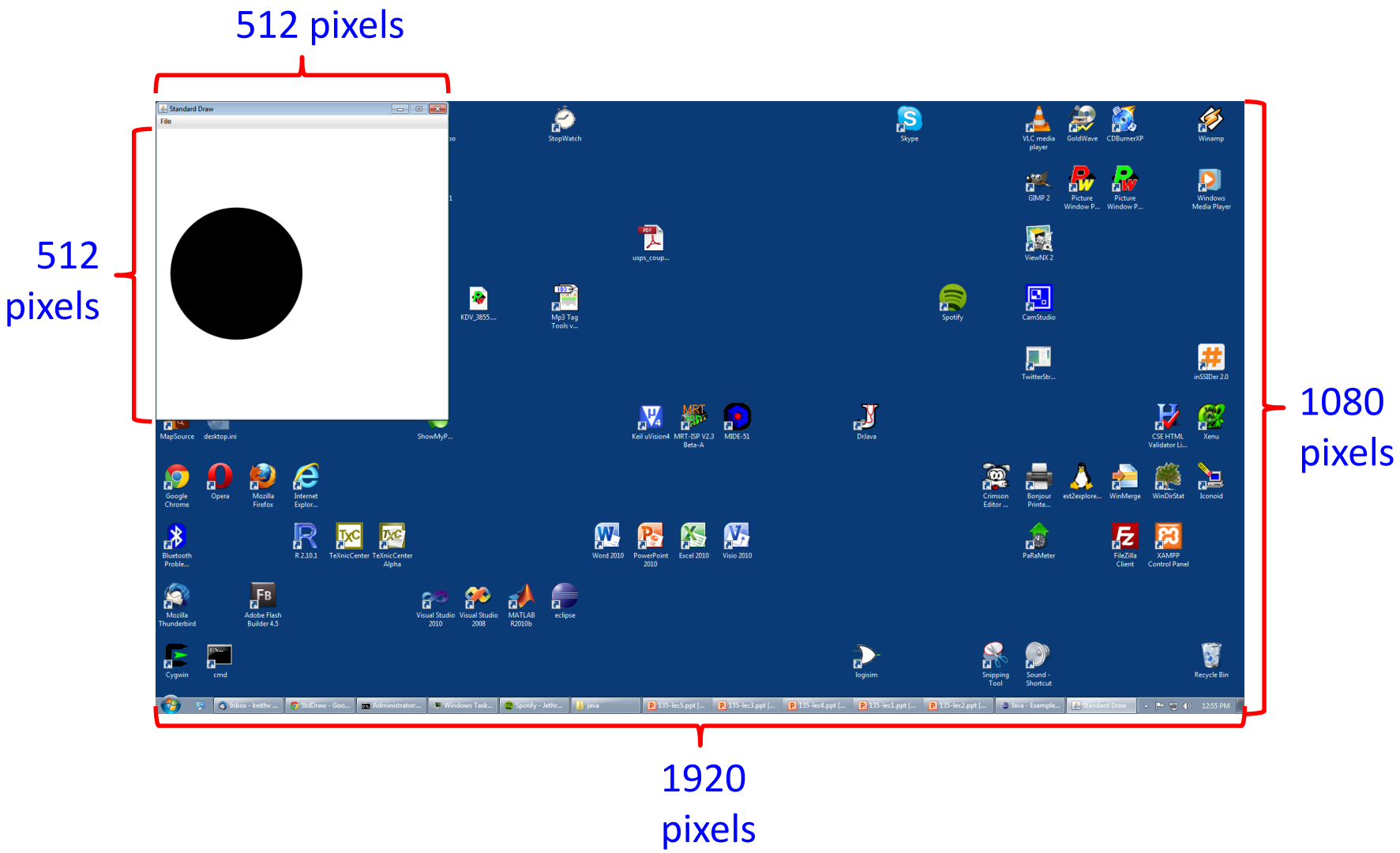
```
import StdDraw
import sys
import picture as p

pic = p.Picture(sys.argv[1])
StdDraw.picture(pic, 0.5, 0.5)
while True:
    StdDraw.show(0.0)
```

(0.5, 0.5)



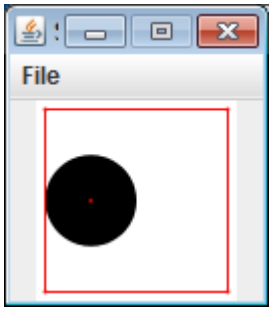

```
% python DrawImage.py dont_panic.png
```

Window Size

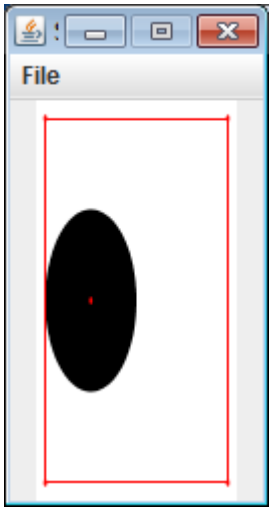

512 pixels
512 pixels
1080 pixels
1920 pixels
Standard Draw
File

Changing Window Size

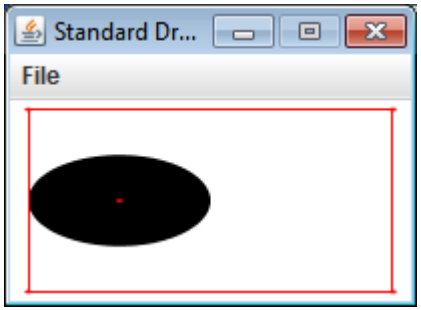
- Window size
  - Default size: 512 x 512 pixels
  - Set different size:
    - `StdDraw.setCanvasSize(width, height)`
  - Call just once at start of program



100 x 100



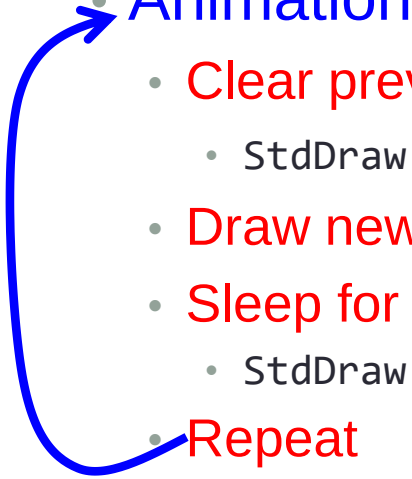
100 x 200



200 x 100

Animating Things

- Animation loop
  - Clear previous drawing
    - `StdDraw.clear()` (or draw a picture over the screen)
  - Draw new stuff
  - Sleep for awhile
    - `StdDraw.show(timeMs)`
  - Repeat



```
import StdDraw
import sys
import picture as p

x, y = 0.5, 0.5
xOffset, yOffset = 0.01, 0.01
pic = p.Picture(sys.argv[1])
while True:
    StdDraw.clear()
    StdDraw.picture(pic, x, y)
    x += xOffset
    y += yOffset
    if x > 1.0 or x < 0.0:
        xOffset *= -1
    if y > 1.0 or y < 0.0:
        yOffset *= -1
    StdDraw.show(50)
```

Keyboard Input

- Responding to keyboard input
  - Problem: Interactive input waits for text then enter key
  - `StdDraw` gives us real-time keyboard input
    - Check if key was pressed: `StdDraw.hasNextKeyTyped()`
    - Find out the key: `StdDraw.nextKeyTyped()`
  - Note: must click on drawing window first
  - Example:
    - Make image change x direction on ‘x'
    - Make image change y direction on ‘y'
    - Go back to default on any other key

Interactive Bouncing Image

```
import StdDraw
import sys
import picture as p

x, y = 0.5, 0.5
xDirection, yDirection = 0.0, 0.0
xOffset, yOffset = 0.01, 0.01
pic = p.Picture(sys.argv[1])
while True:
    StdDraw.clear()
    StdDraw.picture(pic, x, y)
    if StdDraw.hasNextKeyTyped():
        ch = StdDraw.nextKeyTyped()
        if ch == 'a':
            xOffset += 0.05
        elif ch == 's':
            yOffset += 0.05
    x += xOffset
    y += yOffset
    if x > 1.0 or x < 0.0:
        xOffset *= -1
    if y > 1.0 or y < 0.0:
        yOffset *= -1
    StdDraw.show(50)
```

Adding Sound

- `StdAudio`
  - Plays sound files in .wav format
    - Plays one time
    - `StdAudio.playFile(filename)`
  - Also can play raw audio in double []
    - For creating your own sounds
  - Example, add audio to our bouncing image:

```
import StdAudio
…
 else:
             xOffset = 0.01
             yOffset = 0.01
             StdAudio.playFile(sys.argv[2])
```

Additional information

- Many more functions in `StdDraw` and `StdAudio`
  - Can look at the individual programs to see the functions you can call:

```
line(x0, y0, x1, y1)
point(x, y)
circle(x, y, radius)
filledCircle(x, y, radius)
rectangle(left_x, bottom_y, width, height)
filledRectangle(left_x, bottom_y, width, height)
square(left_x, bottom_y, length)
filledSquare(left_x, bottom_y, length)
Polygon(listOfXs, listOfYs)
text(x, y, string)
setFontFamily(fontFamily)
setPenRadius(radius)
setPenColor(color)
...
```

Summary

- File Input
- Graphics
  - `StdDraw.py`
    - Draw primitive shapes
    - Draw images from a file
    - Create animation loops
    - Get keyboard input from users
- Audio
  - StdAudio.py
    - Play audio files