Overview/Questions

- Review: python, functions, the definite loop
- Review: images and pixels
- Computing with images
Working with Pictures

Try these commands at the command line...

```python
file = pickAFile()
pic = makePicture(file)
show(pic)
```

Also:
```
repaInt(<picture>)
```

What is a *Picture* in JES?

In JES/Python, a *Picture* is a data object which represents an image:
- Knows its height and width
- Knows its filename
- Knows its window if it’s opened (via `show` and repainted with `repaInt`)

```python
>>> file = pickAFile()
>>> pic = makePicture(file)
>>> print pic
Picture, filename /Users/azs/Desktop/manzanillo.jpg height 516 width 800
```
Recall: What are Pixels?

- We digitize pictures into lots of little dots called picture elements (pixels)
- Enough dots and it looks like a continuous whole to our eye

The function: `explore(picture)` opens a window where we can explore the picture and its pixels:

Manipulating Pixels

The function: `getPixel(picture, x, y)` gets a single pixel so that we can manipulate it:

```python
>>> px = getPixel(pic, 1, 1)
>>> print px
Pixel red=45 green=85 blue=50
>>> print px.getX()
1
>>> print px.getY()
1
>>> print px.getRed()
```
Manipulating Pixels

getRed(), getGreen(), and getBlue(): functions that take a pixel as input and return a value between 0 and 255

setRed(), setGreen(), and setBlue(): functions that take a pixel as input and a value between 0 and 255

Manipulating Colors

pickAColor()
- lets you use a color chooser and returns the chosen Color
makeLighter(<color>)
makeDarker(<color>)
- Functions that can adjust a Color object to lighten/darken it.
Manipulating Colors

getColor(<pixel>)
takes a pixel as input and returns a Color object
with the color at that pixel

setColor(<pixel>, <color>)
takes a pixel as input and a Color object, then
sets the pixel to that color

makeColor(<red>, <green>, <blue>)
takes red, green, and blue values (in that order)
between 0 and 255, and returns a Color object

Review: The Definite Loop

The definite loop has the general form:
for <var> in <sequence>:
    <body>

The variable after the keyword for is called the loop
index. It will assume each successive value in
<sequence>, and will perform the <body>
statements for each value.
The for loop with images

To perform the same operation to all pixels, we can use the definite loop!

```python
# assume we have a "pic"
for pixel in getPixels(pic):
    # do something on a pixel-by-pixel basis
```

Example: Sunset

Make a sunset by reducing the blue and green components of the picture.

```python
# function to reduce red component:
def makeSunset(pic):
    for pixel in pic.getPixels():
        blue = getBlue(pixel)
        blue = 0.7 * blue
        setBlue(pixel, blue)
        green = getGreen(pixel)
        green = 0.7 * green
        setGreen(pixel, green)
    # don't repaint in a loop!
    repaint(pic)
```
Example: Image Overlay

An image overlay function...

```python
# function to overlay pic1 on top of pic2
def overlay(pic1, pic2):
    for pixel in pic1.getPixels():
        # get this pixel's location:
        x = getX(pixel)
y = getY(pixel)

        # get this pixel's color:
        color = getColor(pixel)

        # find the pixel at the same location in pic2
        target = getPixelAt(pic2, x, y)
        # set that pixel's color
        setColor(target, color)
    repaint(pic2)
```

JES With Help Display

Use Window Layout to get the view you want
This Week’s Lab and HW

In this week’s lab, you will practice using the definite loops with images!

Read the in-program help to find out about the other functions.
   Help menu → Picture Functions

What You Learned Today

– Review: definite loop
– Computing with images
– Programs to modify images
Announcements and To Do

– Download & install JES on your computer!
  • http://code.google.com/p/mediacomp-jes/downloads/list
    (pick 4.3 -- Mac or Windows)

– Readings:
  • The CS101 Guide to Python/JES
    – http://www.cs.bu.edu/courses/cs101b1/jes/
  • Optional (free) book about Python:
    How to Think Like A Computer Scientist: Learning with Python
    Available online at: http://openbookproject.net//thinkCSPy/

– HW10 is due Wednesday 4/6