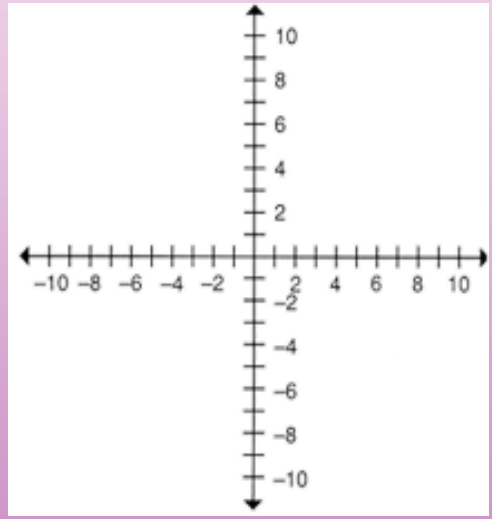
Multimedia

Ohhhhh yeahhhhh!!

The Coordinate Plane

- Have you ever used a coordinate plane in math?
- The type of coordinate planes that you're used to look like this:



- In the above picture, (0,0) is in the center of the coordinate plane
- The coordinate planes used in Python have (0,0) at the top left corner

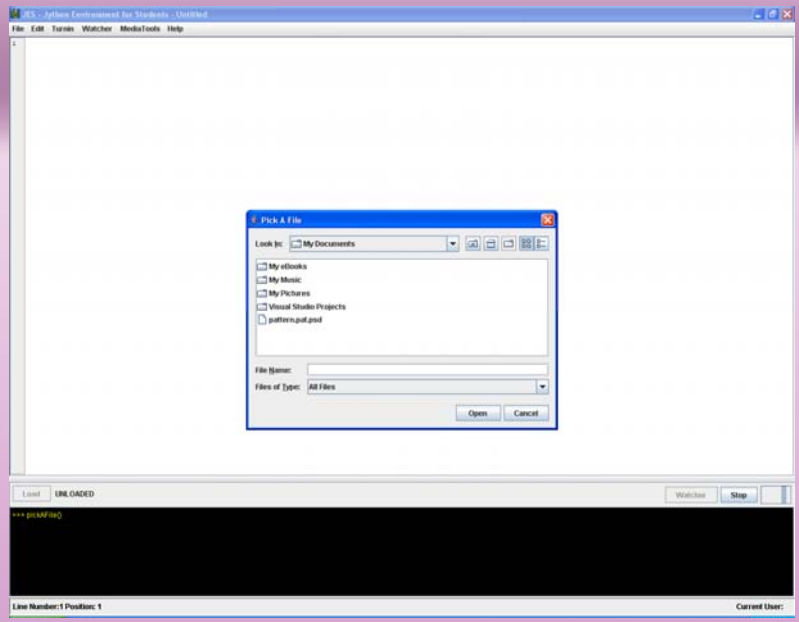
The Coordinate Plane and Images

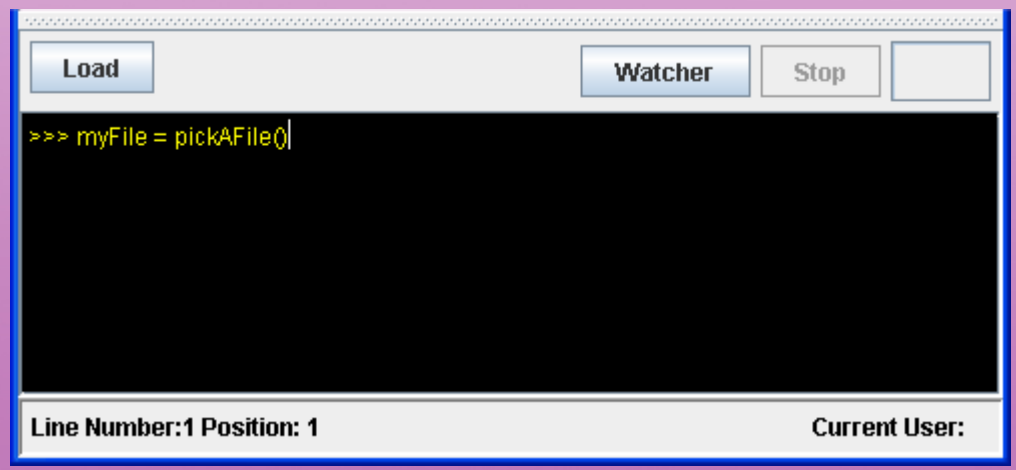
- The coordinate plane is like a grid
- If there is an image on the coordinate plane, each of the items in the grid is a pixel (picture element)
- Each of the pixels is made up of a combination of three colors (Red, Green and Blue)
- Each of the three colors has a value between 0 and 255
- For example, if a pixel has the color black, the value for each of the colors is:

  R: 0 G: 0 B: 0

pickAFile()

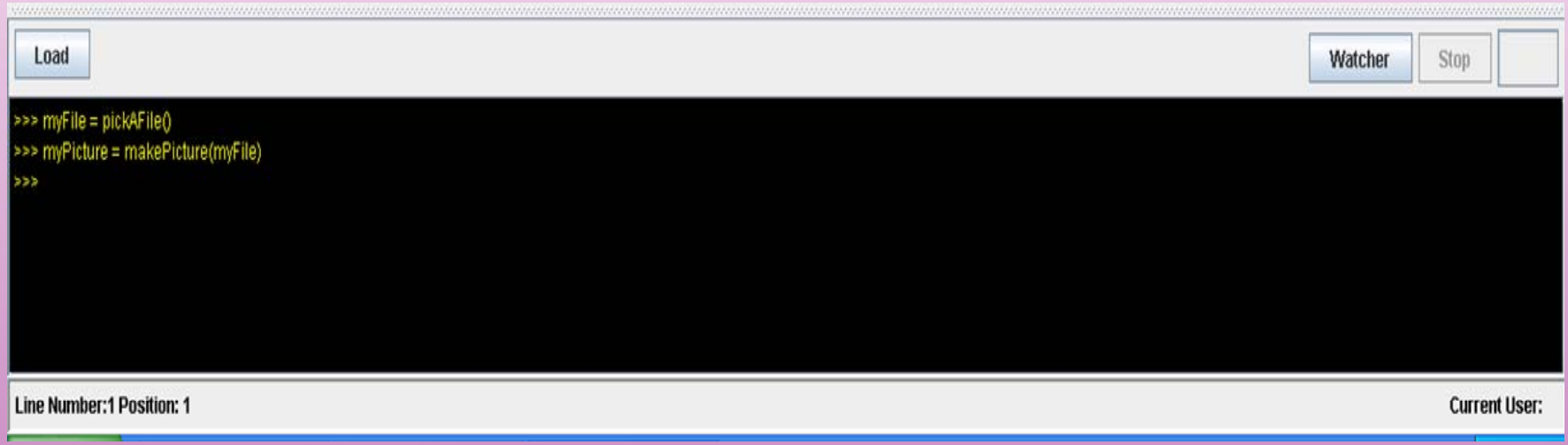
- In order to pick a file to store as an image, you use the predefined method, pickAFile().
- If you just call the method, a screen pops up allowing you to browse your folders so that you can select a file
- However, if you would actually like to do something with your file, it is recommended that you store it as a variable:





makePicture()

- After you have picked your file and stored it, if your file is a picture, you have to actually make a picture using the file and pass in the file as a parameter into makePicture():



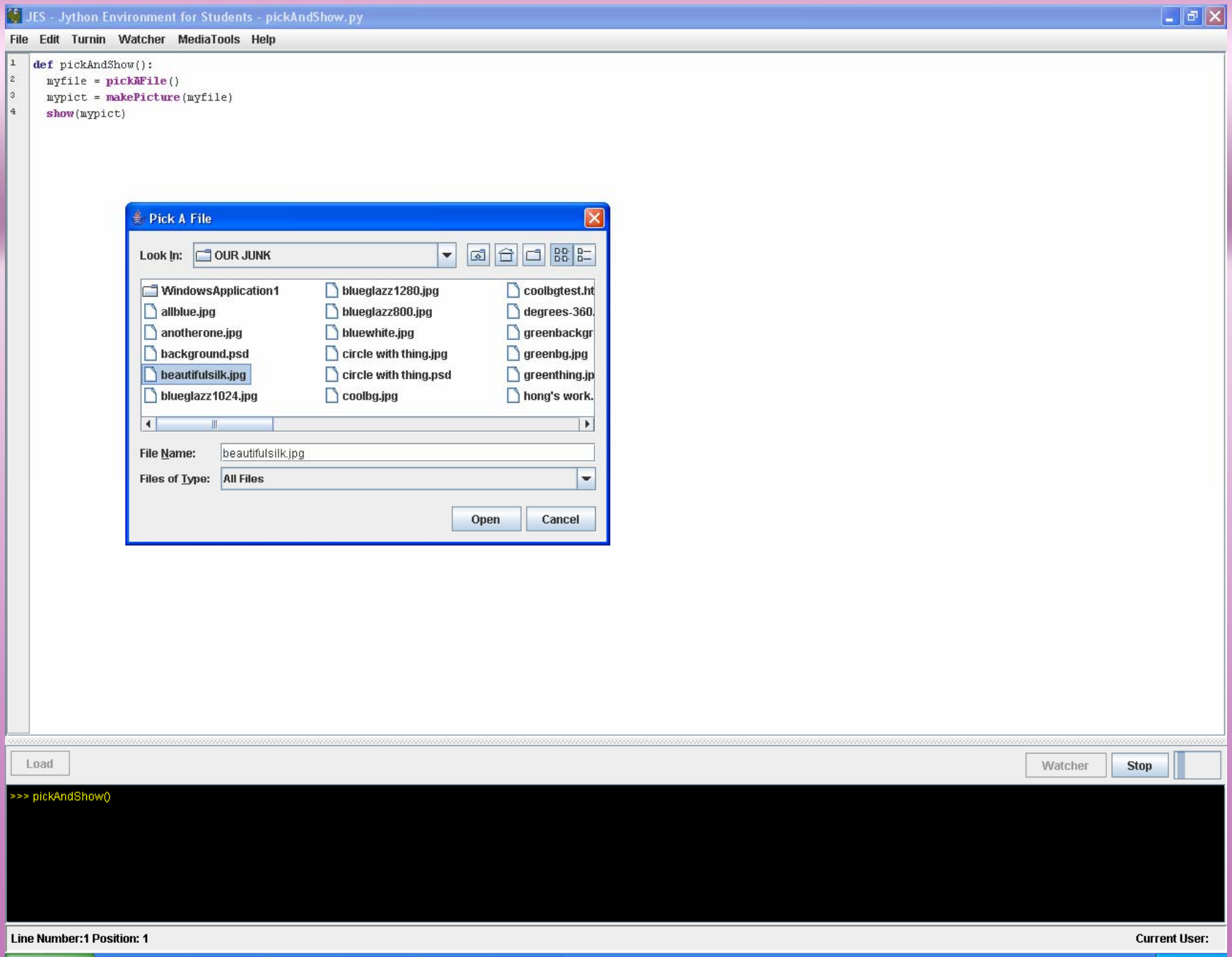
- As you can see above, the picture version of the file has also been stored as a variable

show()

- To show a picture, call the method, show() passing in the picture as a parameter:

Putting it all together

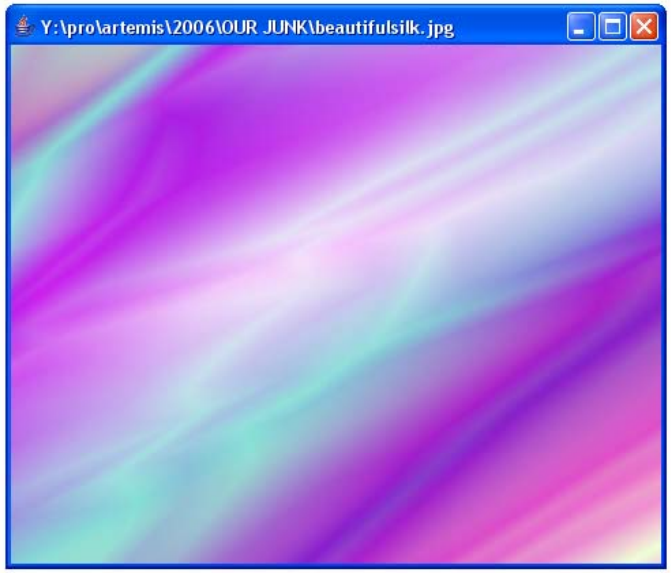
- Instead of picking a file, converting it into a picture and then showing it in the black screen over and over again, every time that you want to show a picture, you can write a method that will do everything at once and you can call that method from the black screen (don’t forget to save the method and then import it!).


JES - Jython Environment for Students - pickAndShow.py
File Edit Turnin Watcher MediaTools Help
1 def pickAndShow():
2 myfile = pickAFile()
3 mypict = makePicture(myfile)
4 show(mypict)
Pick A File
Look In: OUR JUNK
WindowsApplication1
allblue.jpg
anotherone.jpg
background.psd
beautifulsilk.jpg
blueglazz1024.jpg
blueglazz1280.jpg
blueglazz800.jpg
bluewhite.jpg
circle with thing.jpg
circle with thing.psd
coolbg.jpg
coolbgtest.ht
degrees-360.
greenbackgr
greenbg.jpg
greenthing.jp
hong's work.
File Name: beautifulsilk.jpg
Files of Type: All Files
Open
Cancel
Load
Watcher
Stop
>>> pickAndShow()
Line Number:1 Position: 1
Current User:

JES - Jython Environment for Students - pickAndShow.py

File Edit Turnin Watcher MediaTools Help

```
1 def pickAndShow():
2   myfile = pickAFile()
3   mypict = makePicture(myfile)
4   show(mypict)
```



Load Watcher Stop

```
>>> pickAndShow()
>>>
```

Line Number:1 Position: 1 Current User:

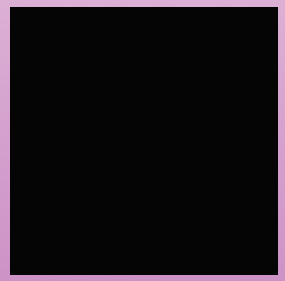
Changing Colors

- As mentioned before, each image is made up of pixels
- Each pixel stores a value for the colors Red, Blue and Green
- What if you wish to change one of the values of the colors?
- That would change the color of the pixel.

Changing Colors: One by One

- In order to change the color of one pixel, first you have to know which pixel exactly you want to change (the pixel's coordinates), you need to be able to get that actual pixel so that you can make the change, and then you need to set its new color

ORIGINAL PICTURE:



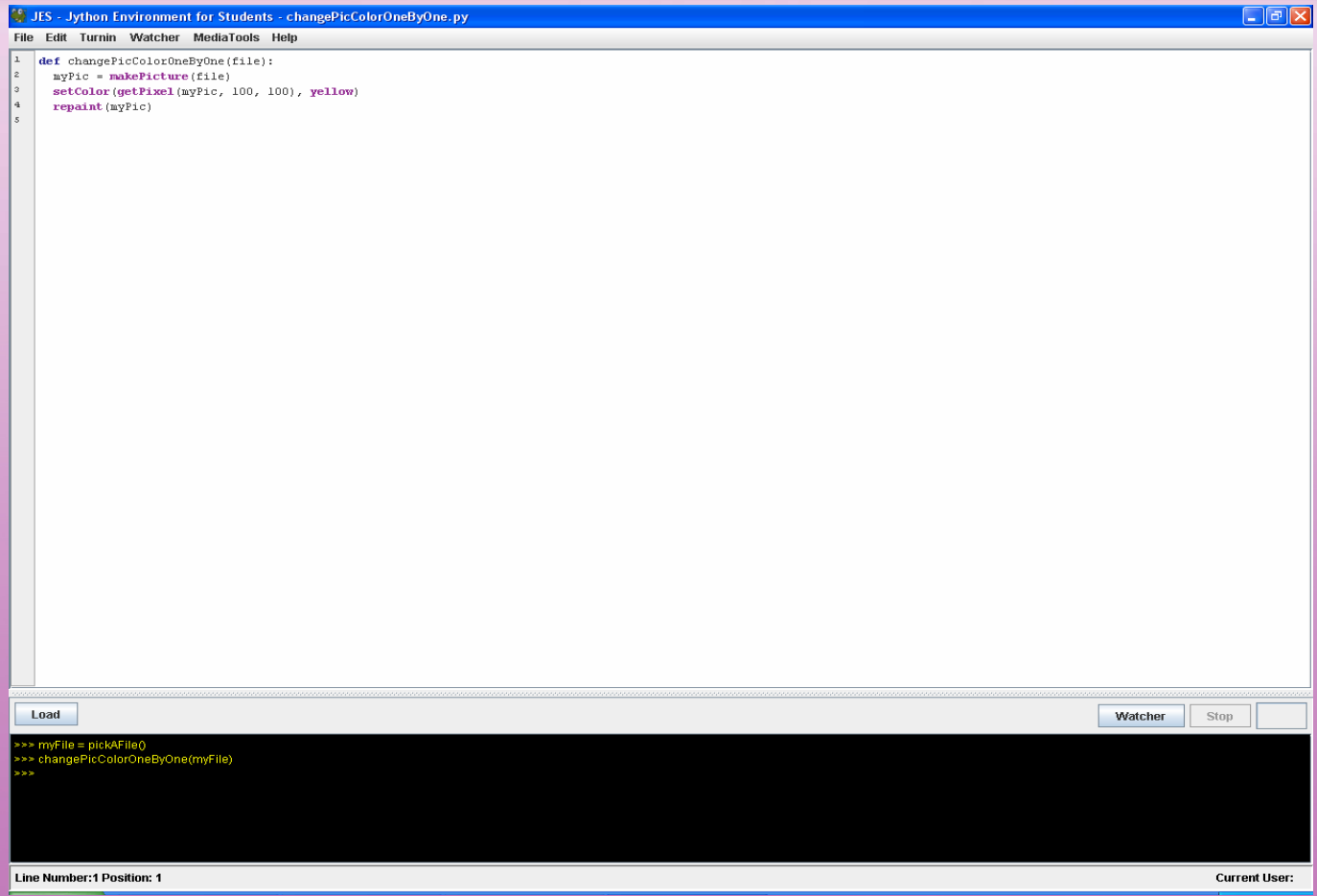
RESULT:

Well of course you can't see the change. Why? Because you just changed one pixel! Changing one pixel won't make a difference because pixels are so small.

How'd ya do it?

- To change one pixel…

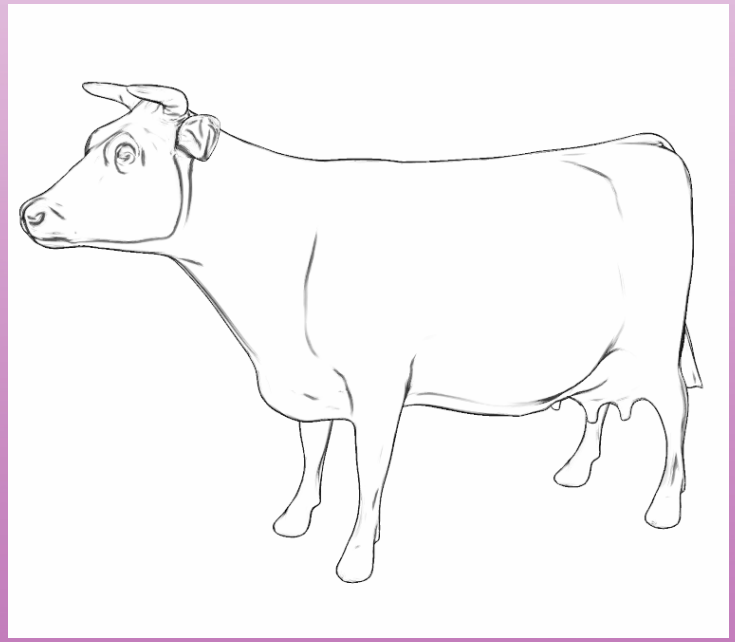
1. Write the method to change one pixel (shown to the right)
2. Save it
3. Load it
4. Pick a file and pass it in as a parameter!



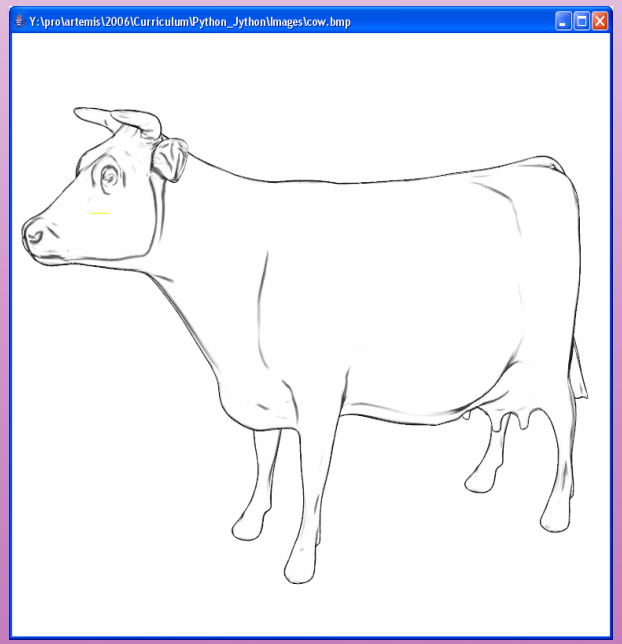
Changing Colors: A Complete Row

- If you want to see results, change more than one pixel. Change a whole row!

ORIGINAL PICTURE:



RESULT:



How'd ya do it?

JES - Jython Environment for Students - changePicColorOneByOne.py

File Edit Turnin Watcher MediaTools Help

```
def changePicColorOneByOne(file):
  myPic = makePicture(file)
  setColor(getPixel(myPic, 100, 200), yellow)
  setColor(getPixel(myPic, 101, 200), yellow)
  setColor(getPixel(myPic, 102, 200), yellow)
  setColor(getPixel(myPic, 103, 200), yellow)
  setColor(getPixel(myPic, 104, 200), yellow)
  setColor(getPixel(myPic, 105, 200), yellow)
  setColor(getPixel(myPic, 106, 200), yellow)
  setColor(getPixel(myPic, 107, 200), yellow)
  setColor(getPixel(myPic, 108, 200), yellow)
  setColor(getPixel(myPic, 109, 200), yellow)
  setColor(getPixel(myPic, 110, 200), yellow)
  setColor(getPixel(myPic, 111, 200), yellow)
  setColor(getPixel(myPic, 112, 200), yellow)
  setColor(getPixel(myPic, 113, 200), yellow)
  setColor(getPixel(myPic, 114, 200), yellow)
  setColor(getPixel(myPic, 115, 200), yellow)
  setColor(getPixel(myPic, 116, 200), yellow)
  setColor(getPixel(myPic, 117, 200), yellow)
  setColor(getPixel(myPic, 118, 200), yellow)
  setColor(getPixel(myPic, 119, 200), yellow)
  setColor(getPixel(myPic, 120, 200), yellow)
  setColor(getPixel(myPic, 121, 200), yellow)
  setColor(getPixel(myPic, 122, 200), yellow)
  setColor(getPixel(myPic, 123, 200), yellow)
  repaint(myPic)
```

Load Watcher Stop

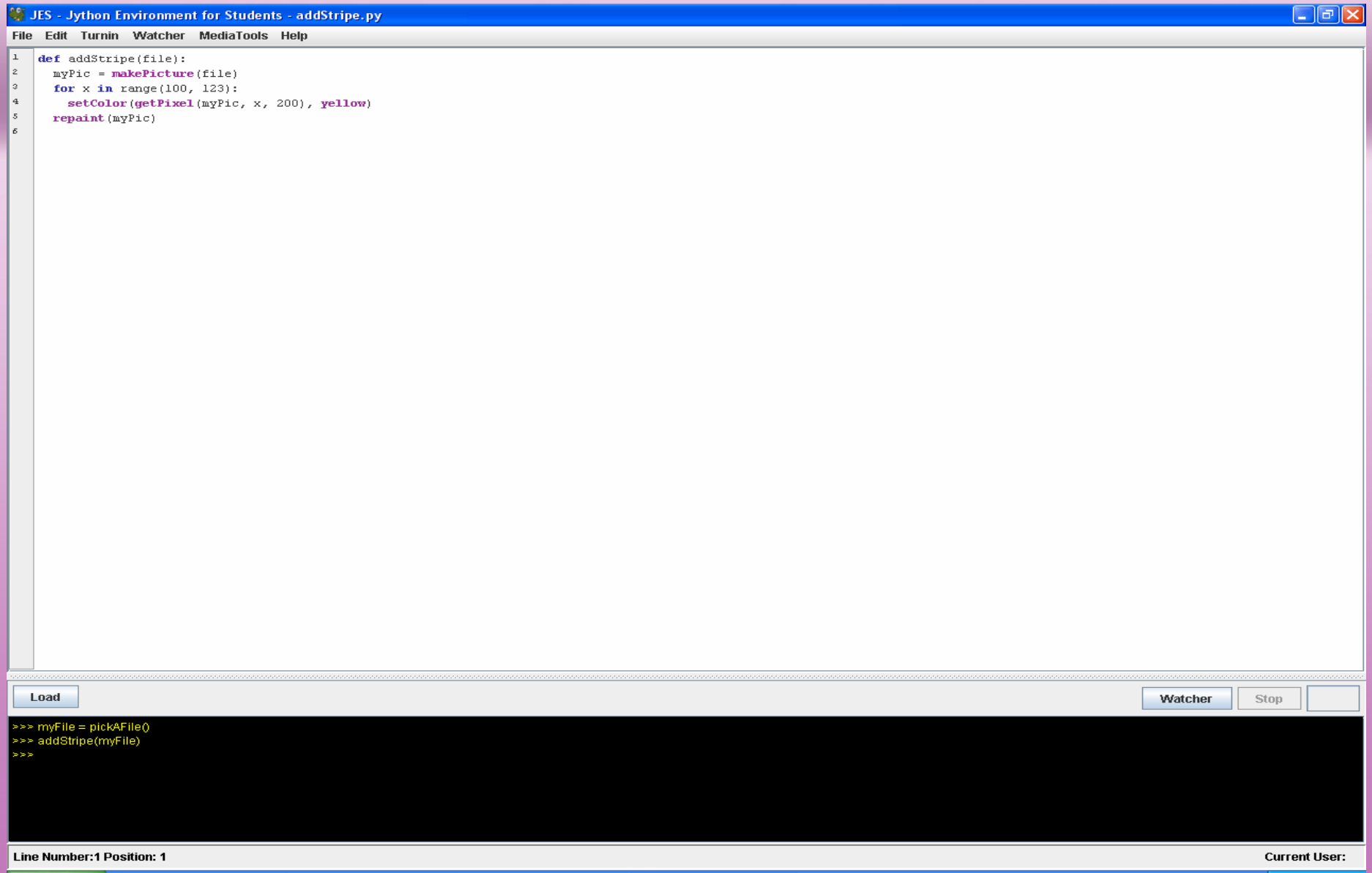
```
>>> myFile = pickAFile()
>>> changePicColorOneByOne(myFile)
>>>
```

Line Number:1 Position: 1 Current User:

Annoying?

- How tedious is it to have to change *each and every single* pixel
- How can we write one line and change a whole row?
- Use a for loop!

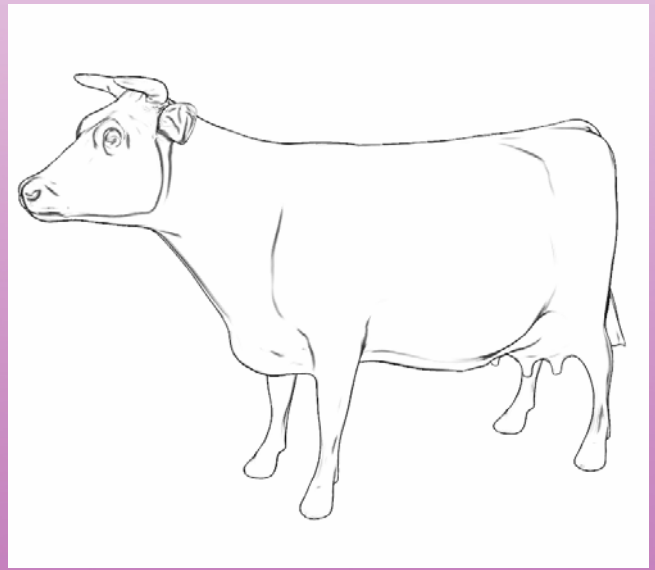
Now *this* is better!



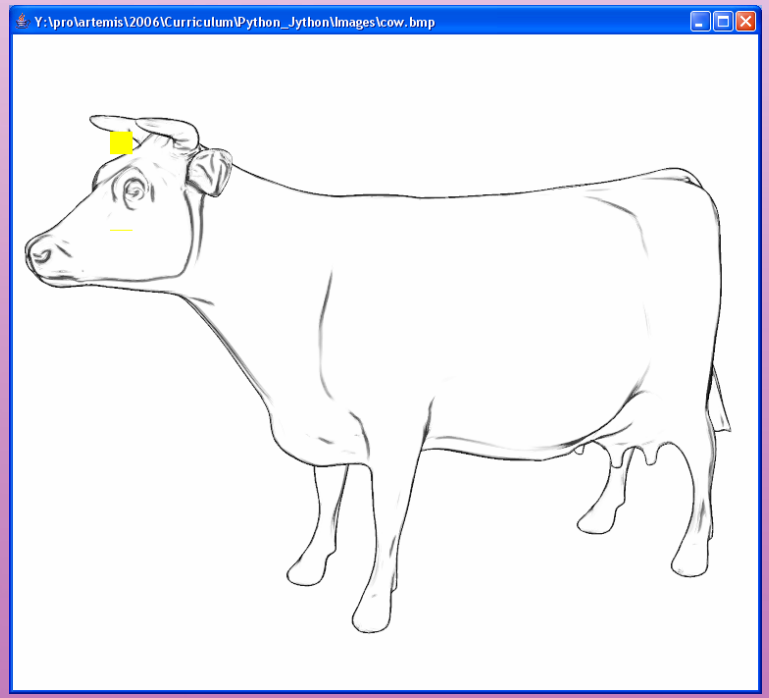
Changing Colors: A Block

- What if instead of a line, you want to change a whole block of the picture?

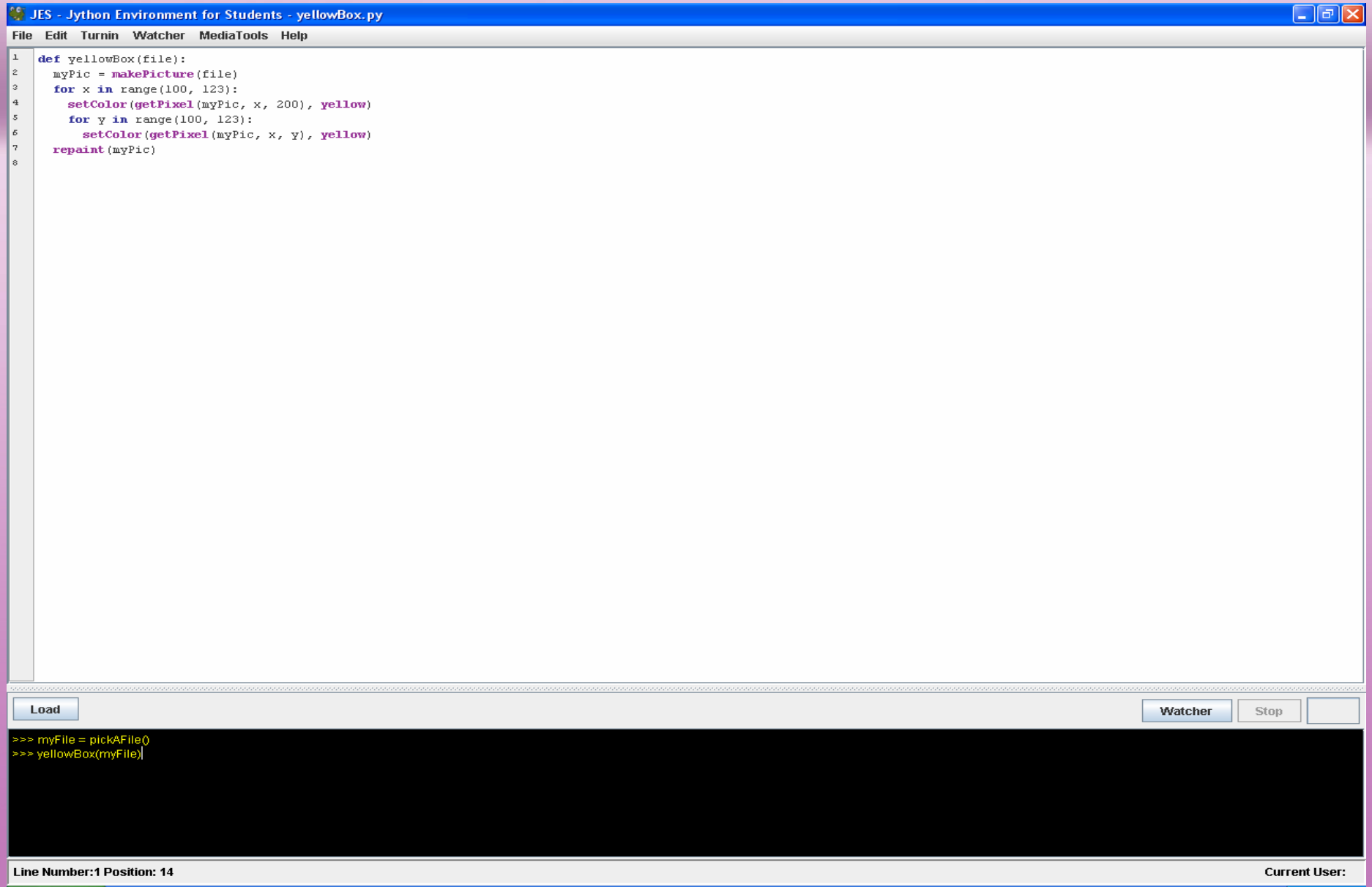
ORIGINAL PICTURE



RESULT



How'd ya do it?


JES - Jython Environment for Students - yellowBox.py
File Edit Turnin Watcher MediaTools Help
def yellowBox(file):
myPic = makePicture(file)
for x in range(100, 123):
setColor(getPixel(myPic, x, 200), yellow)
for y in range(100, 123):
setColor(getPixel(myPic, x, y), yellow)
repaint(myPic)
Load
Watcher
Stop
>>> myFile = pickAFile()
>>> yellowBox(myFile)
Line Number:1 Position: 14
Current User:

Altering Colors Directly

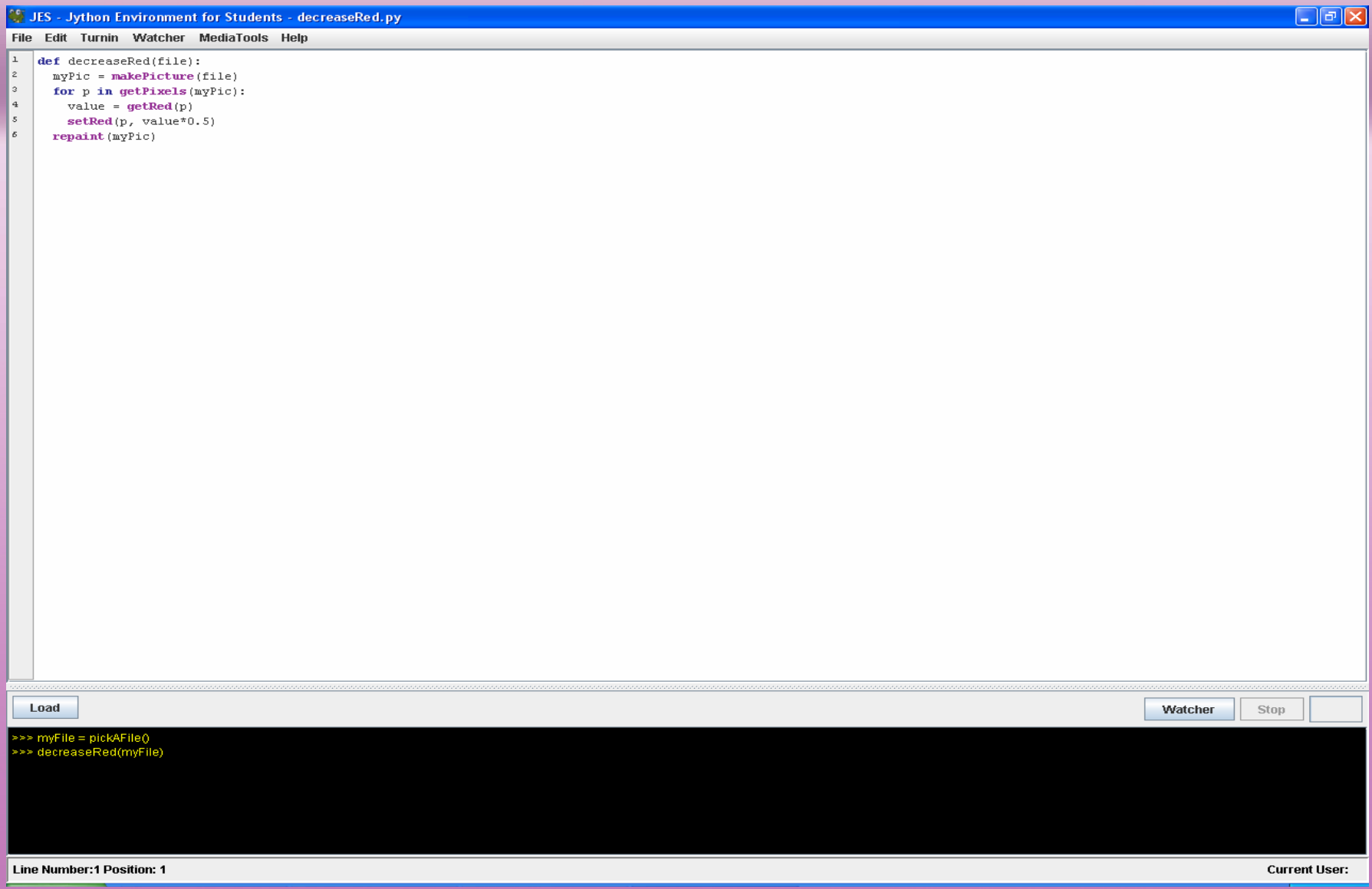
- Notice how changing colors just changes a color to a whole new color
- What if you want to slightly change it?
- You would alter the color by altering each pixel
- You would have to alter each of the RGB values
- Let’s say you want to decrease the red in your image
- You would have to loop through each of the pixels in your image and change each red value to a lower amount
- Let’s say you want to decrease it by half

What it looks like...

ORIGINAL PICTURE

RESULT

How'd ya do it?


JES - Jython Environment for Students - decreaseRed.py
File Edit Turnin Watcher MediaTools Help
1 def decreaseRed(file):
2 myPic = makePicture(file)
3 for p in getPixels(myPic):
4 value = getRed(p)
5 setRed(p, value*0.5)
6 repaint(myPic)
Load
Watcher
Stop
>>> myFile = pickAFile()
>>> decreaseRed(myFile)
Line Number:1 Position: 1
Current User:

Altering Colors Indirectly

- Let’s say you wanted to darken all the reds
- You would increase each of the values of red in the entire picture by a certain amount
- Let’s say this amount is 20
- You would have to loop through each and every single pixel and do this

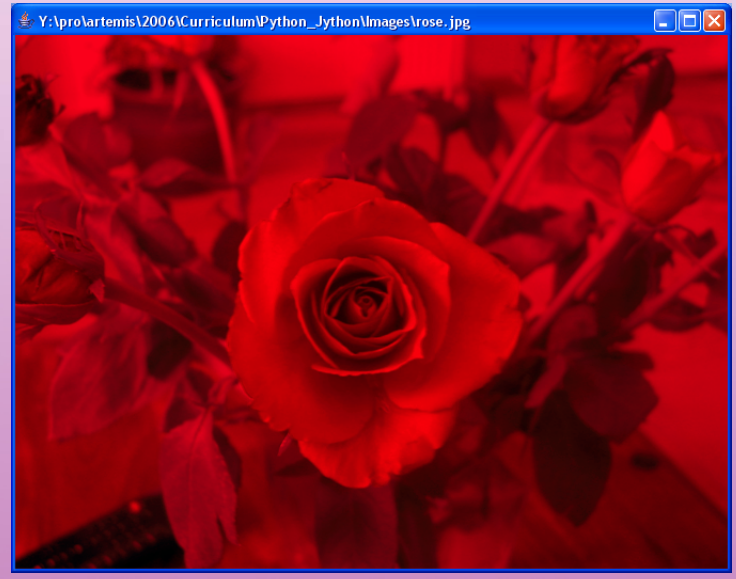
Altering Colors Indirectly

- What if one pixel has an extremely high value of red? Such as 240?
- If you darken it by 20, it would become 260
- But, remember that the values can only be between 0 and 255
- Instead of the value becoming 260, it would wrap around back to 0 and become 5
- How do we solve this problem?
- Instead of darkening the value of the red by increasing it, lighten the values of the green and blue by decreasing them
- This gives the appearance that the amount of red in each pixel was increased!

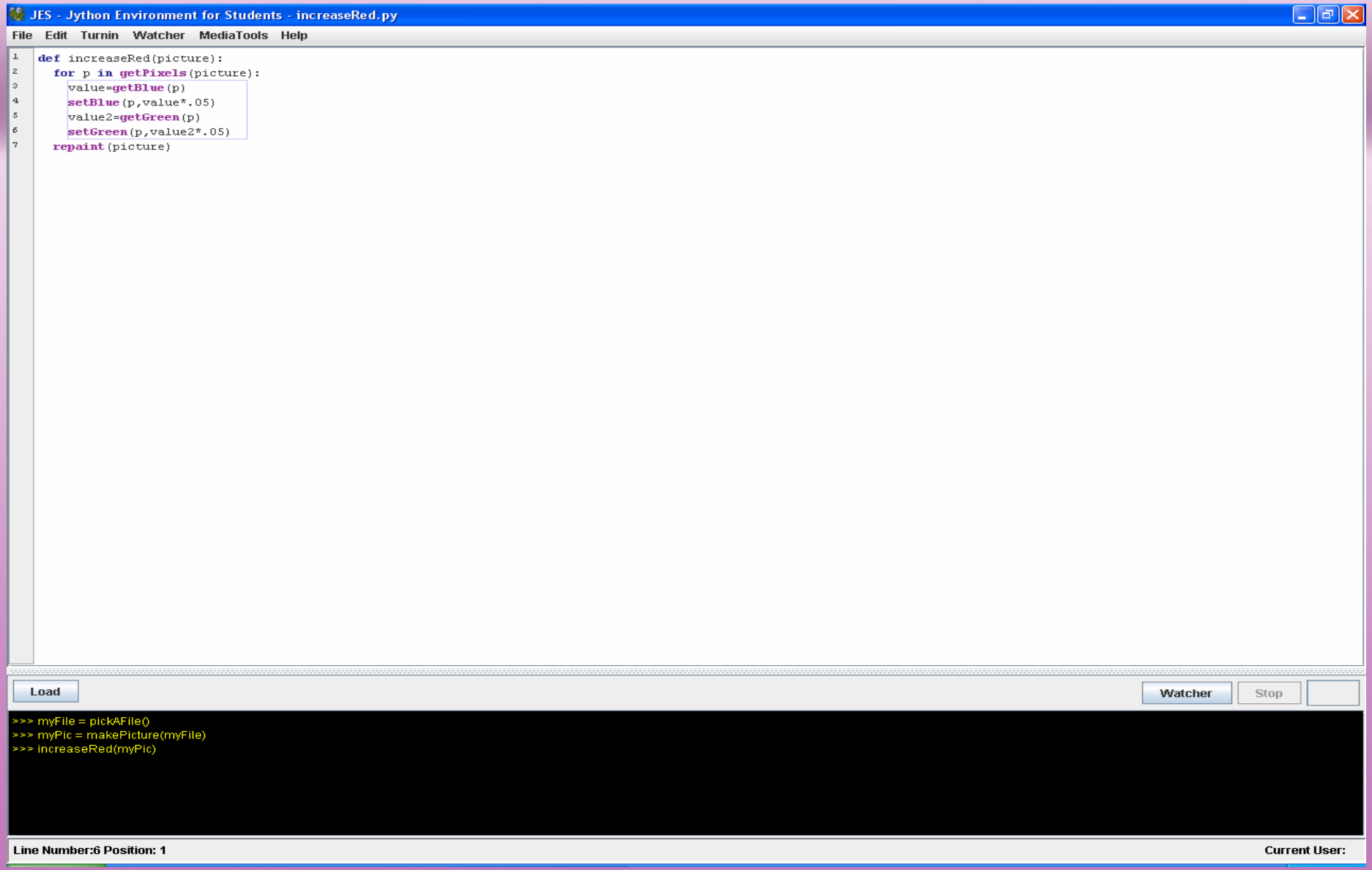
What it looks like...

ORIGINAL PICTURE

RESULT



How'd ya do it?


JES - Jython Environment for Students - increaseRed.py
File Edit Turnin Watcher MediaTools Help
def increaseRed(picture):
for p in getPixels(picture):
value=getBlue(p)
setBlue(p,value*.05)
value2=getGreen(p)
setGreen(p,value2*.05)
repaint(picture)
Load
Watcher
Stop
>>> myFile = pickAFile()
>>> myPic = makePicture(myFile)
>>> increaseRed(myPic)
Line Number:6 Position: 1
Current User:

Grayscaling

- Grayscaling involves changing an image from color to black and white (remember how we did this in Photoshop?)
- As you might remember from Andy's lecture, when each of the RGB values of a pixel are equal, you get the color…
- GRAY!
- We use this important fact when changing an image to grayscale

Say what?

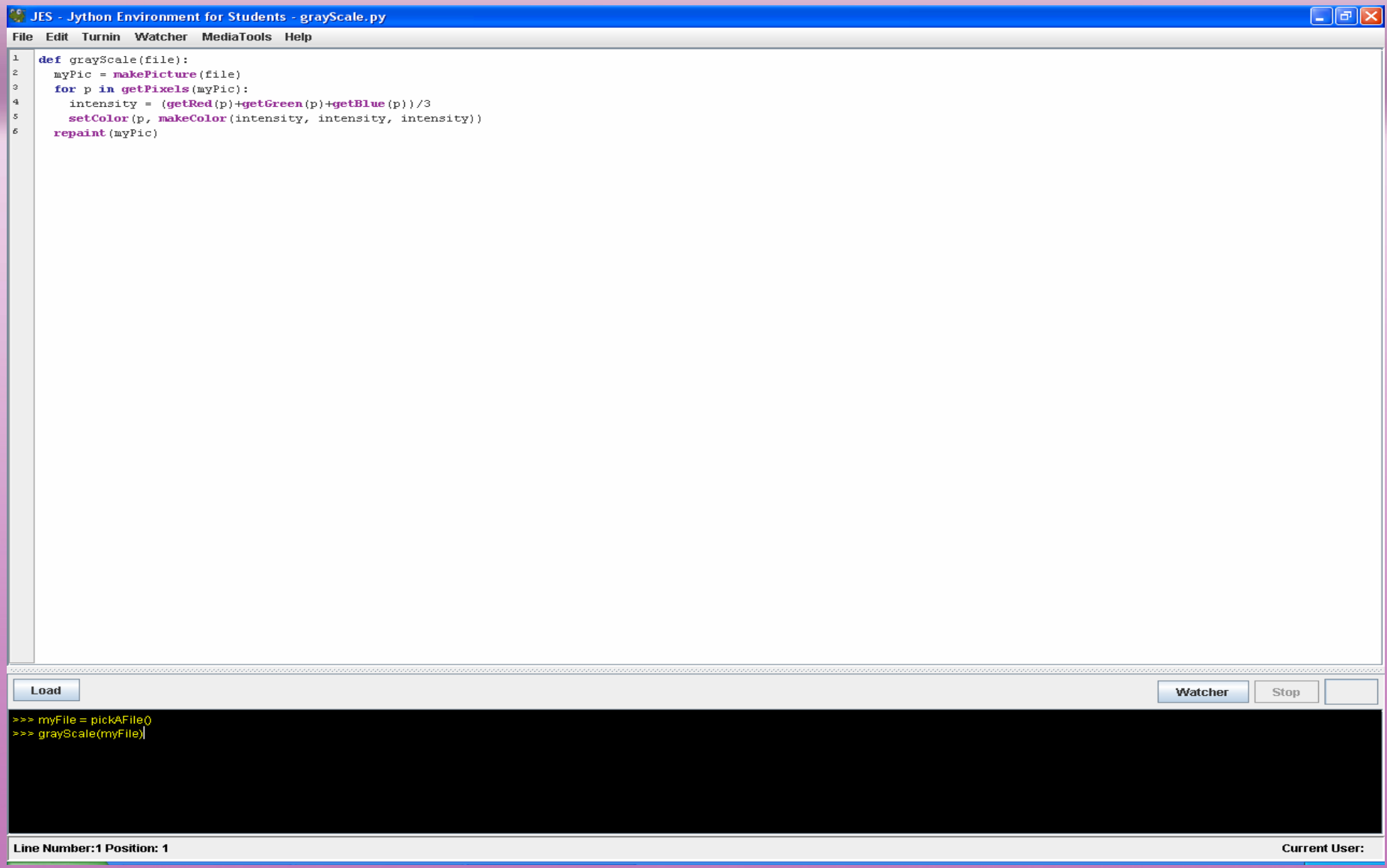
- To change an image to grayscale, take each of the RGB values and find the average
- Reset each of the RGB values to the average of the original values
- Now that they’re the same value, you get a shade of gray!

What it looks like...

ORIGINAL PICTURE

RESULT

How'd ya do it?


JES - Jython Environment for Students - grayScale.py
File Edit Turnin Watcher MediaTools Help
1 def grayScale(file):
2 myPic = makePicture(file)
3 for p in getPixels(myPic):
4 intensity = (getRed(p)+getGreen(p)+getBlue(p))/3
5 setColor(p, makeColor(intensity, intensity, intensity))
6 repaint(myPic)
Load
Watcher
Stop
>>> myFile = pickAFile()
>>> grayScale(myFile)
Line Number:1 Position: 1
Current User:

Negatives

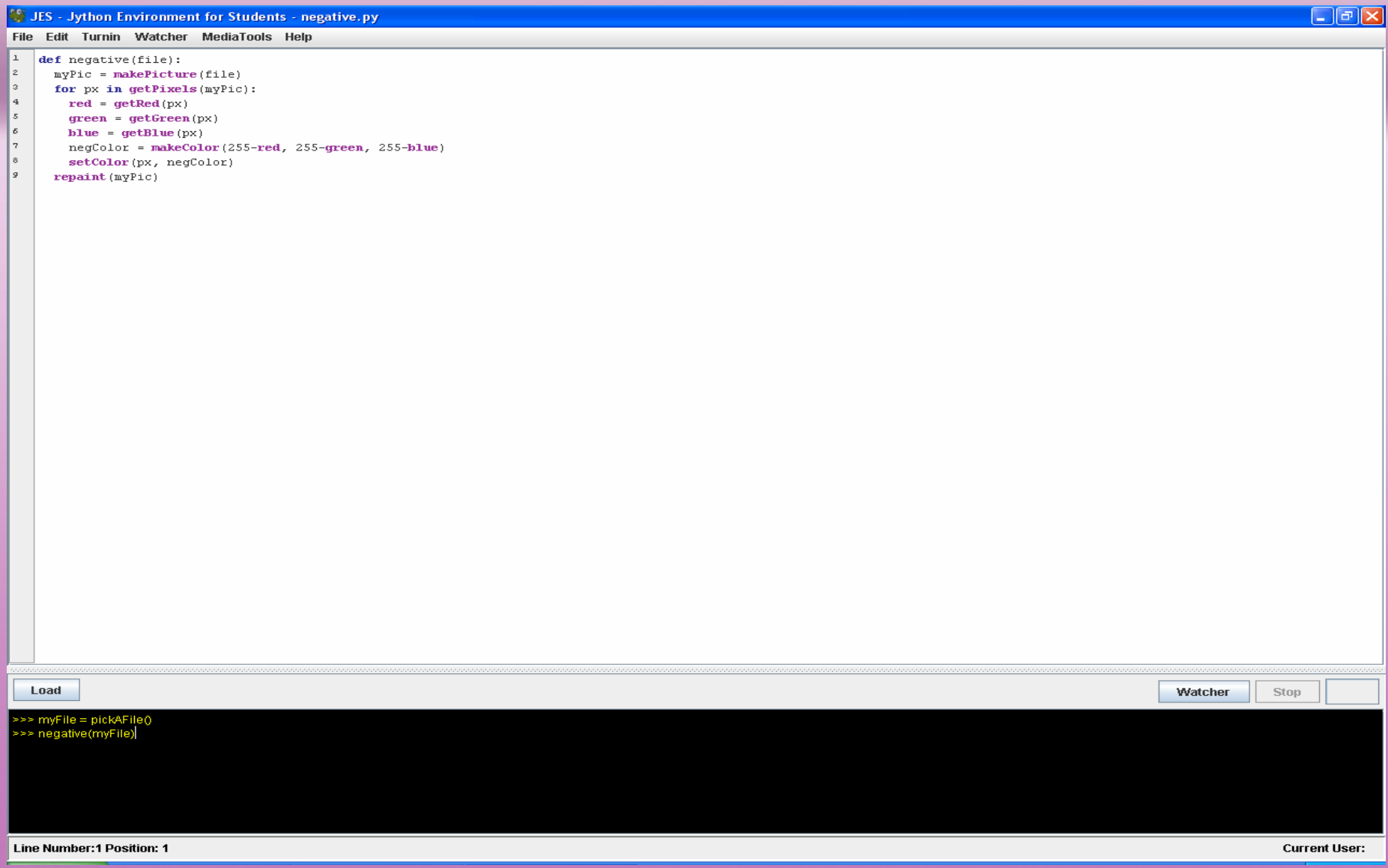
- To create a negative version of an image using Photoshop, the program would simply invert the colors for you
- You can do this using Jython by inverting each of the RGB values for each and every pixel
- How would you invert the RGB values (get its opposite)?
- Subtract it from 255!

What it looks like...

ORIGINAL PICTURE

RESULT

How'd ya do it?


JES - Jython Environment for Students - negative.py
File Edit Turnin Watcher MediaTools Help
def negative(file):
myPic = makePicture(file)
for px in getPixels(myPic):
red = getRed(px)
green = getGreen(px)
blue = getBlue(px)
negColor = makeColor(255-red, 255-green, 255-blue)
setColor(px, negColor)
repaint(myPic)
Load
Watcher
Stop
>>> myFile = pickAFile()
>>> negative(myFile)
Line Number:1 Position: 1
Current User:

That's all folks!

- Now, its your turn!