6.009: Fundamentals of Programming

Python, Sockets, and the Web
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CAT-SOOP
CAT-SOOP

An “automatic tutor”: collect and assess online exercises
Written in Python, 2011-now, rewritten completely multiple times

Based on xTutor (written in SCHEME!!!)

Today: make CAT-SOOP lite (“kitten-soop”? and, time permitting,
some other web applications, “from the ground up”

What does CAT-SOOP do?

- Receive request from user (show me a page, submit an answer, etc)
- Find relevant information (page content, user info, history of submissions, etc)
- Parse specification format to generate response
- Send response (typically, HTML to be displayed in the browser)
Most of the implementation of the inversion filter has been completed for you (it is invoked by calling the method called `inverted()`), but some pieces have not been implemented correctly. Your task in this part of the lab is to fix the implementation of the inversion filter.

Before you do that, however, let's add a simple test case so that we can test whether our code is working.

Let's start with a 1x4 image that is defined with the following parameters:

```python
python

cutout int random()

img10 = c cutout.random.randint(0, 255)

imgmid = c cutout.random.randint(51, 127)

imgmid2 = c cutout.random.randint(128, 255)

img100 = c cutout.random.randint(128, 255)

imgpixels = [img10, imgmid, imgmid2, img100]
</python>

* height: 1
* width: 4
* pixels: [10, 120, 210, 100]

**Question**: python literal

```python

c def check_function(sub, sol):
    if not isinstance(sub, list):
        return False, (f'Please enter a Python list.')
    if len(sub) != len(sol):
        return False, (f'Double-check the length of the list you provided.')
    if not all(isinstance(i, int) for i in sub):
        return False, (f'Make sure that all of the elements in the given list are integers.')
    return True, 1.0
</python>
```

**Exercise 3.1.1. Blood filtering via per-pixel transformations**

As our first task in manipulating images, we will look at an inversion filter, which reflects pixels about the middle gray value (0 black becomes 255 white and vice versa). For example, here is a photograph of Adam H’s cat. On the left side is the original image, and on the right is an inverted version.

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Let's start with a 1x4 image that is defined with the following parameters:

- height: 1
- width: 4
- pixels: [10, 120, 210, 100]
The World Wide Web

https://www.ntu.edu.sg/home/ehchua/programming/webprogramming/HTTP_Basics.html
What is a Server?
What is a Server?
Sockets

Sockets allow communication across processes (on the same machine or on different machines).

Typically, a server will wait for a client to make a connection on a designated port (a virtual endpoint for a connection).

Once a client connects, the socket allows for communication between the server and the client (even if on different machines).

Client and server can each send/receive data via the socket.

Example: yelling echo server
The World Wide Web

https://www.ntu.edu.sg/home/ehchua/programming/webprogramming/HTTP_Basics.html
HTTP Request and Response

GET /doc/test.html HTTP/1.1
Host: www.test101.com
Accept: image/gif, image/jpeg, */*
Accept-Language: en-us
Accept-Encoding: gzip, deflate
User-Agent: Mozilla/4.0
Content-Length: 35

bookId=12345&amp;author=Tan+Ah+Teck

HTTP/1.1 200 OK
Date: Sun, 08 Feb xxxx 01:11:12 GMT
Server: Apache/1.3.29 (Win32)
Last-Modified: Sat, 07 Feb xxxx
ETag: "0-23-4024c3a5"
Accept-Ranges: bytes
Content-Length: 35
Connection: close
Content-Type: text/html

<h1>My Home page</h1>

https://www.ntu.edu.sg/home/ehchua/programming/webprogramming/HTTP_Basics.html