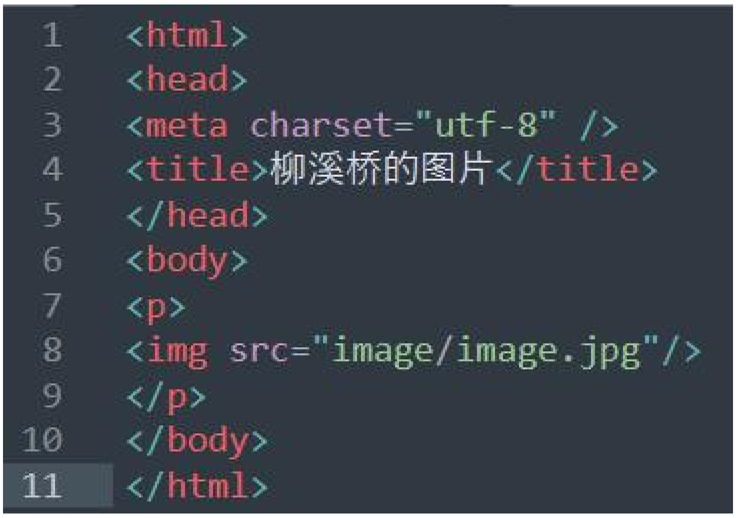
实现 Web 静态服务器

开发语言：python 3.6
集成开发环境：PyCharm
功能：利用 python 实现 Web 静态服务器，返回 HTML 页面

步骤：

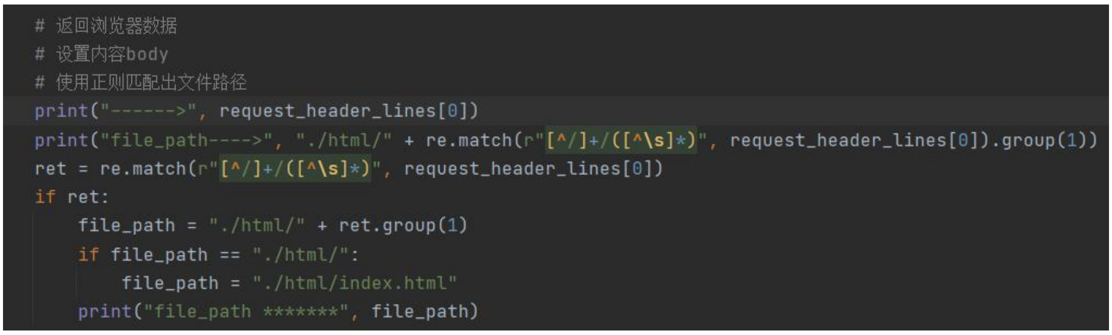
1、首先编写一个简单 HTML 文件，显示了一张图片



```html
<html>
<head>
<meta charset="utf-8" />
<title>柳溪桥的图片</title>
</head>
<body>
<p>
<img src="image/image.jpg"/>
</p>
</body>
</html>
```

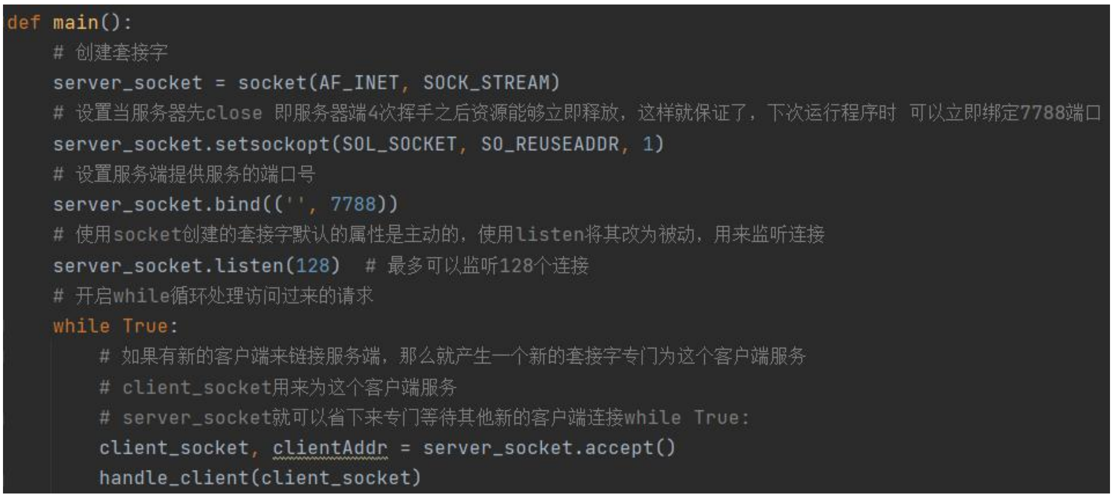
2、主机要访问一个网站，首先会与对方服务器进行三次握手，然后通过浏览器发送一个 http 请求报文。服务器接到报文后，解析要请求的页面目录，找到文件返回给主机，浏览器通过渲染就能得到网页。

返回浏览器数据，匹配文件路径



```python
# 返回浏览器数据
# 设置内容body
# 使用正则匹配出文件路径
print("------>", request_header_lines[0])
print("file_path---->", "./html/" + re.match(r"[^/]+/([^\s]*)", request_header_lines[0]).group(1))
ret = re.match(r"[^/]+/([^\s]*)", request_header_lines[0])
if ret:
    file_path = "./html/" + ret.group(1)
    if file_path == "./html/":
        file_path = "./html/index.html"
    print("file_path *******", file_path)
```

3、写出 main 函数，socket 提供函数接口，端口号设置为 7788



```python
def main():
    # 创建套接字
    server_socket = socket(AF_INET, SOCK_STREAM)
    # 设置当服务器先close 即服务器端4次挥手之后资源能够立即释放，这样就保证了，下次运行程序时 可以立即绑定7788端口
    server_socket.setsockopt(SOL_SOCKET, SO_REUSEADDR, 1)
    # 设置服务端提供服务的端口号
    server_socket.bind(('', 7788))
    # 使用socket创建的套接字默认的属性是主动的，使用listen将其改为被动，用来监听连接
    server_socket.listen(128)  # 最多可以监听128个连接
    # 开启while循环处理访问过来的请求
    while True:
        # 如果有新的客户端来链接服务端，那么就产生一个新的套接字专门为这个客户端服务
        # client_socket用来为这个客户端服务
        # server_socket就可以省下来专门等待其他新的客户端连接while True:
        client_socket, clientAddr = server_socket.accept()
        handle_client(client_socket)
```

4、运行 webserver.py 文件，访问 http://localhost:7788/里可以看到显示的图片，terminal 里可以看出运行情况

```
GET / HTTP/1.1
Host: localhost:7788
Connection: keep-alive
sec-ch-ua: " Not;A Brand";v="99", "Google Chrome";v="91", "Chromium";v="91"
sec-ch-ua-mobile: ?0
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/91.0.4472.114 Safari/537.36
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.9
Purpose: prefetch
Sec-Fetch-Site: none
Sec-Fetch-Mode: navigate
Sec-Fetch-User: ?1
Sec-Fetch-Dest: document
Accept-Encoding: gzip, deflate, br
Accept-Language: zh-CN,zh;q=0.9

------> GET / HTTP/1.1
file_path----> ./html/
file_path ******* ./html/index.html
GET /image/image.jpg HTTP/1.1
Host: localhost:7788
Connection: keep-alive
sec-ch-ua: " Not;A Brand";v="99", "Google Chrome";v="91", "Chromium";v="91"
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/91.0.4472.114 Safari/537.36
```

```
Accept: application/signed-exchange;v=b3;q=0.9,*/*;q=0.8
Purpose: prefetch
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: image
Referer: http://localhost:7788/
Accept-Encoding: gzip, deflate, br
Accept-Language: zh-CN,zh;q=0.9

------> GET /image/image.jpg HTTP/1.1
file_path----> ./html/image/image.jpg
file_path ******* ./html/image/image.jpg
Traceback (most recent call last):
  File "D:\大二下\计算机网络\大作业\源代码\webserver.py", line 70, in <module>
    main()
  File "D:\大二下\计算机网络\大作业\源代码\webserver.py", line 66, in main
    handle_client(client_socket)
  File "D:\大二下\计算机网络\大作业\源代码\webserver.py", line 18, in handle_client
    print("------>", request_header_lines[0])
IndexError: list index out of range
```

5、再用 cx_Freeze 把 Python 代码打包成单个独立的 exe 可执行文件，保存在 disk 目录下，将 exe 文件转移到 webserver.py 的同一个目录

6、运行 webserver.exe，再访问 http://localhost:7788/

运行结果如下

```
GET / HTTP/1.1
Host: localhost:7788
Connection: keep-alive
sec-ch-ua: " Not;A Brand";v="99", "Google Chrome";v="91", "Chromium";v="91"
sec-ch-ua-mobile: ?0
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/91.0.4472.114 Safari/537.36
Accept:
text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.9
Sec-Fetch-Site: none
Sec-Fetch-Mode: navigate
Sec-Fetch-User: ?1
Sec-Fetch-Dest: document
Accept-Encoding: gzip, deflate, br
Accept-Language: zh-CN,zh;q=0.9
```

```
------> GET / HTTP/1.1
file_path----> ./html/
file_path ******* ./html/index.html
GET /image/image.jpg HTTP/1.1
Host: localhost:7788
Connection: keep-alive
sec-ch-ua: " Not;A Brand";v="99", "Google Chrome";v="91", "Chromium";v="91"
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/91.0.4472.114 Safari/537.36
Accept: image/avif,image/webp,image/apng,image/svg+xml,image/*,*/*;q=0.8
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: image
Referer: http://localhost:7788/
Accept-Encoding: gzip, deflate, br
Accept-Language: zh-CN,zh;q=0.9

------> GET /image/image.jpg HTTP/1.1
file_path----> ./html/image/image.jpg
file_path ******* ./html/image/image.jpg
```

7、根据这个思路，用一个 html 模板，然后使用正则匹配出所有的文件路径，这样的话，就可以返回浏览器关于 css、js、image 的图片。

```
GET / HTTP/1.1
Host: localhost:7788
Connection: keep-alive
sec-ch-ua: " Not;A Brand";v="99", "Google Chrome";v="91", "Chromium";v="91"
sec-ch-ua-mobile: ?0
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/91.0.4472.114 Safari/537.36
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.9
Sec-Fetch-Site: none
Sec-Fetch-Mode: navigate
Sec-Fetch-User: ?1
Sec-Fetch-Dest: document
Accept-Encoding: gzip, deflate, br
Accept-Language: zh-CN,zh;q=0.9
```

```
------> GET / HTTP/1.1
file_path----> ./html/
file_path ******* ./html/index.html
GET /css/style.css HTTP/1.1
Host: localhost:7788
Connection: keep-alive
sec-ch-ua: " Not;A Brand";v="99", "Google Chrome";v="91", "Chromium";v="91"
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko)
Chrome/91.0.4472.114 Safari/537.36
Accept: text/css,*/*;q=0.1
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: style
Referer: http://localhost:7788/
Accept-Encoding: gzip, deflate, br
Accept-Language: zh-CN,zh;q=0.9

------> GET /css/style.css HTTP/1.1
file_path----> ./html/css/style.css
file_path ******* ./html/css/style.css
GET /css/base.css HTTP/1.1
Host: localhost:7788
Connection: keep-alive
sec-ch-ua: " Not;A Brand";v="99", "Google Chrome";v="91", "Chromium";v="91"
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko)
Chrome/91.0.4472.114 Safari/537.36
Accept: text/css,*/*;q=0.1
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: style
Referer: http://localhost:7788/css/style.css
Accept-Encoding: gzip, deflate, br
Accept-Language: zh-CN,zh;q=0.9

------> GET /css/base.css HTTP/1.1
file_path----> ./html/css/base.css
file_path ******* ./html/css/base.css
GET /css/skeleton.css HTTP/1.1
Host: localhost:7788
Connection: keep-alive
sec-ch-ua: " Not;A Brand";v="99", "Google Chrome";v="91", "Chromium";v="91"
sec-ch-ua-mobile: ?0
```

```
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko)
Chrome/91.0.4472.114 Safari/537.36
Accept: text/css,*/*;q=0.1
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: style
Referer: http://localhost:7788/css/style.css
Accept-Encoding: gzip, deflate, br
Accept-Language: zh-CN,zh;q=0.9

------> GET /css/skeleton.css HTTP/1.1
file_path----> ./html/css/skeleton.css
file_path ******* ./html/css/skeleton.css
GET /css/superfish.css HTTP/1.1
Host: localhost:7788
Connection: keep-alive
sec-ch-ua: " Not;A Brand";v="99", "Google Chrome";v="91", "Chromium";v="91"
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko)
Chrome/91.0.4472.114 Safari/537.36
Accept: text/css,*/*;q=0.1
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: style
Referer: http://localhost:7788/css/style.css
Accept-Encoding: gzip, deflate, br
Accept-Language: zh-CN,zh;q=0.9

------> GET /css/superfish.css HTTP/1.1
file_path----> ./html/css/superfish.css
file_path ******* ./html/css/superfish.css
GET /css/jquery.fancybox.css HTTP/1.1
Host: localhost:7788
Connection: keep-alive
sec-ch-ua: " Not;A Brand";v="99", "Google Chrome";v="91", "Chromium";v="91"
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko)
Chrome/91.0.4472.114 Safari/537.36
Accept: text/css,*/*;q=0.1
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: style
Referer: http://localhost:7788/css/style.css
Accept-Encoding: gzip, deflate, br
```

```
Accept-Language: zh-CN,zh;q=0.9

------> GET /css/jquery.fancybox.css HTTP/1.1
file_path----> ./html/css/jquery.fancybox.css
file_path ******* ./html/css/jquery.fancybox.css
GET /css/shortcodes.css HTTP/1.1
Host: localhost:7788
Connection: keep-alive
sec-ch-ua: " Not;A Brand";v="99", "Google Chrome";v="91", "Chromium";v="91"
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko)
Chrome/91.0.4472.114 Safari/537.36
Accept: text/css,*/*;q=0.1
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: style
Referer: http://localhost:7788/css/style.css
Accept-Encoding: gzip, deflate, br
Accept-Language: zh-CN,zh;q=0.9

------> GET /css/shortcodes.css HTTP/1.1
file_path----> ./html/css/shortcodes.css
file_path ******* ./html/css/shortcodes.css
GET /js/superfish.js HTTP/1.1
Host: localhost:7788
Connection: keep-alive
sec-ch-ua: " Not;A Brand";v="99", "Google Chrome";v="91", "Chromium";v="91"
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko)
Chrome/91.0.4472.114 Safari/537.36
Accept: */*
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: script
Referer: http://localhost:7788/
Accept-Encoding: gzip, deflate, br
Accept-Language: zh-CN,zh;q=0.9

------> GET /js/superfish.js HTTP/1.1
file_path----> ./html/js/superfish.js
file_path ******* ./html/js/superfish.js
GET /js/jquery.flexslider.js HTTP/1.1
Host: localhost:7788
Connection: keep-alive
```

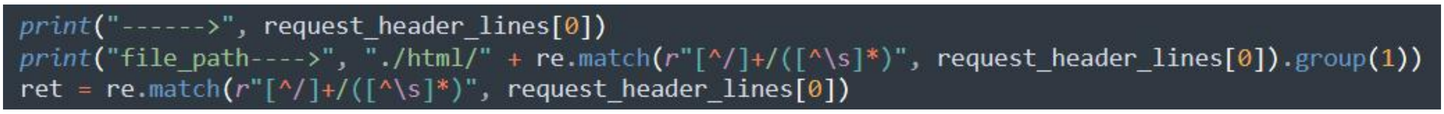
sec-ch-ua: " Not;A Brand";v="99", "Google Chrome";v="91", "Chromium";v="91"
sec-ch-ua-mobile: ?0
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/91.0.4472.114 Safari/537.36
Accept: */*
Sec-Fetch-Site: same-origin
Sec-Fetch-Mode: no-cors
Sec-Fetch-Dest: script
Referer: http://localhost:7788/
Accept-Encoding: gzip, deflate, br
Accept-Language: zh-CN,zh;q=0.9

------> GET /js/jquery.flexslider.js HTTP/1.1
file_path----> ./html/js/jquery.flexslider.js
file_path ******* ./html/js/jquery.flexslider.js
（省略部分）

8、可以从上面的结果来看，需要匹配出以下的内容：

GET / HTTP/1.1
GET /css/style.css HTTP/1.1
GET /css/base.css HTTP/1.1
GET /css/skeleton.css HTTP/1.1
GET /css/superfish.css HTTP/1.1
GET /css/jquery.fancybox.css HTTP/1.1
GET /css/shortcodes.css HTTP/1.1
GET /js/superfish.js HTTP/1.1
GET /js/jquery.flexslider.js HTTP/1.1
（部分）

9、根据匹配到的文件，然后拼接路径，到 html 文件路径中去查找文件，再返回浏览器中。这里要 import re

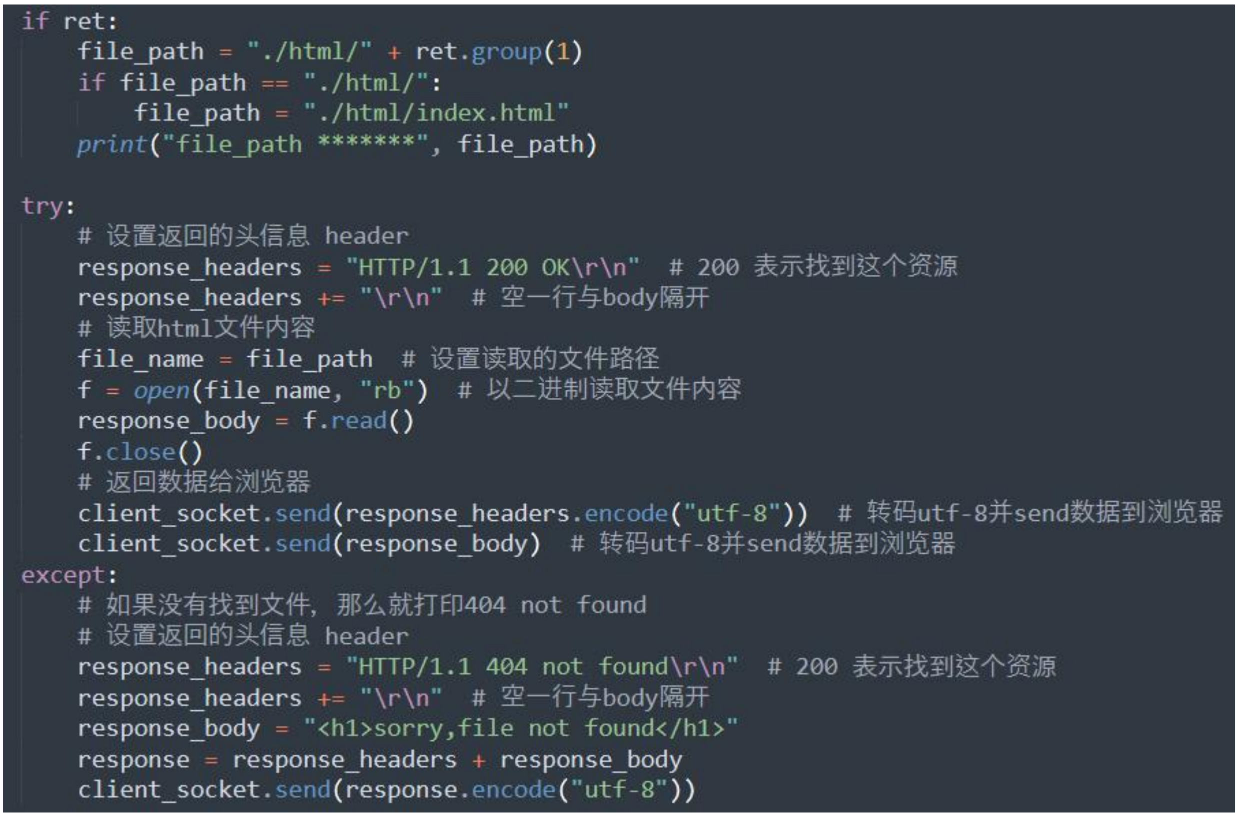


```
print("------>", request_header_lines[0])
print("file_path---->", "./html/" + re.match(r"[^/]+/([^\s]*)", request_header_lines[0]).group(1))
ret = re.match(r"[^/]+/([^\s]*)", request_header_lines[0])
```

10、然后就是修复 bug，思路是：

第一，就是当匹配到 / 的时候，需要设置 file_path = index.html

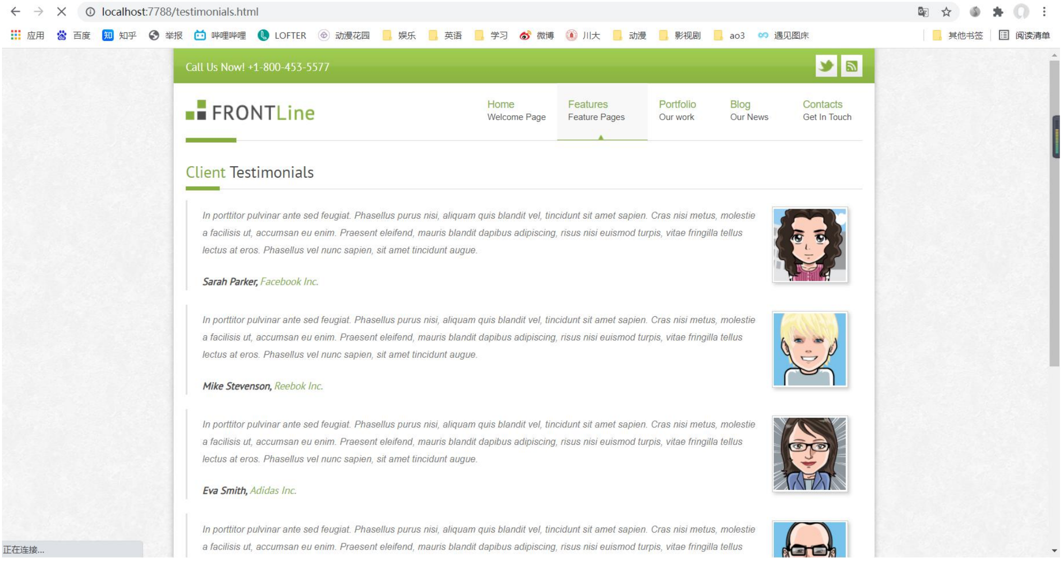
第二，需要给文件打开的内容部分，做一个异常的捕获，避免直接服务端终止



```
if ret:
    file_path = "./html/" + ret.group(1)
    if file_path == "./html/":
        file_path = "./html/index.html"
    print("file_path *******", file_path)

try:
    # 设置返回的头信息 header
    response_headers = "HTTP/1.1 200 OK\r\n"  # 200 表示找到这个资源
    response_headers += "\r\n"  # 空一行与body隔开
    # 读取html文件内容
    file_name = file_path  # 设置读取的文件路径
    f = open(file_name, "rb")  # 以二进制读取文件内容
    response_body = f.read()
    f.close()
    # 返回数据给浏览器
    client_socket.send(response_headers.encode("utf-8"))  # 转码utf-8并send数据到浏览器
    client_socket.send(response_body)  # 转码utf-8并send数据到浏览器
except:
    # 如果没有找到文件，那么就打印404 not found
    # 设置返回的头信息 header
    response_headers = "HTTP/1.1 404 not found\r\n"  # 200 表示找到这个资源
    response_headers += "\r\n"  # 空一行与body隔开
    response_body = "<h1>sorry,file not found</h1>"
    response = response_headers + response_body
    client_socket.send(response.encode("utf-8"))
```

11、运行结果，随便点开一个页面选项，可以加载出来



Client Testimonials

In porttitor pulvinar ante sed feugiat. Phasellus purus nisi, aliquam quis blandit vel, tincidunt sit amet sapien. Cras nisi metus, molestie a facilisis ut, accumsan eu enim. Praesent eleifend, mauris blandit dapibus adipiscing, risus nisi euismod turpis, vitae fringilla tellus lectus at eros. Phasellus vel nunc sapien, sit amet tincidunt augue.

Sarah Parker, Facebook Inc.

In porttitor pulvinar ante sed feugiat. Phasellus purus nisi, aliquam quis blandit vel, tincidunt sit amet sapien. Cras nisi metus, molestie a facilisis ut, accumsan eu enim. Praesent eleifend, mauris blandit dapibus adipiscing, risus nisi euismod turpis, vitae fringilla tellus lectus at eros. Phasellus vel nunc sapien, sit amet tincidunt augue.

Mike Stevenson, Reebok Inc.

In porttitor pulvinar ante sed feugiat. Phasellus purus nisi, aliquam quis blandit vel, tincidunt sit amet sapien. Cras nisi metus, molestie a facilisis ut, accumsan eu enim. Praesent eleifend, mauris blandit dapibus adipiscing, risus nisi euismod turpis, vitae fringilla tellus lectus at eros. Phasellus vel nunc sapien, sit amet tincidunt augue.

Eva Smith, Adidas Inc.

In porttitor pulvinar ante sed feugiat. Phasellus purus nisi, aliquam quis blandit vel, tincidunt sit amet sapien. Cras nisi metus, molestie a facilisis ut, accumsan eu enim. Praesent eleifend, mauris blandit dapibus adipiscing, risus nisi euismod turpis, vitae fringilla tellus