实验内容

一、文件上传网页前端的搭建

1.body部分

```
<div class="background">
<div class="box">
    <div class="title">
        <h1><a href="index.html">用户注册页面</a></h1>
    </div>
    <div class="system">
        <form enctype="multipart/form-data" method="post"
action="http://localhost:8000/cgi-bin/upload_server.py">
        <table>
            <tr>
                <td><span>请填写用户名：</span></td>
                <td><input type="text" name="username"/></td>
            </tr>
            <tr>
                <td><span>请简单介绍该文件：</span></td>
                <td><textarea name="fileintro" rows="10" cols="50"></textarea>
</td>
            </tr>
            <tr>
                <td><span>请选择你要上传的文件：</span></td>
                <td><input type="file" name="uploadfile"/></td>
            </tr>
            <tr>
                <td><input type="submit" value="上传文件"/></td>
            </tr>
        </table>
    </div>
</div>
</div>
```

2.环境渲染部分

设置背景图片

```
.background{
        height: 700px;
        width: 1280px;
        background: url(background.jpg);
```

文本框的渲染

```
.system input[type="text"]{
    height: 30px;
    width: 165px;
    background-color:rgba(255,255,255,0.4);
    border: 1px solid #000000;
    }
.system textarea{
    background-color:rgba(255,255,255,0.4);
    border: 1px solid #000000;
    }
```

提交按钮的渲染

```
.system input[type="submit"]
{
    height: 50px;
    width: 100px;
    background-color: #ffffff;
    border:3px solid #ffffff;
    font-size:16px;
}
```

二、文件上传及加密、数字签名

这里我的工作主要是完成文件上传的编码，并将米佳怡同学完成的加密、数字签名修改，与我的文件上传相适应。

1.文件上传的主体部分

```
import cgi,os
from email import message
import cgitb

cgitb.enable()
form = cgi.FieldStorage()
fileitem = form['uploadfile']

if fileitem.filename:
    fn = os.path.basename(fileitem.filename)
    open(os.getcwd()+'/files/'+fn,'wb').write(fileitem.file.read())
    message = '"' + fn + '" was uploaded successfully'

else:
    message = 'No file was uploaded'
```

2.限制文件大小在10M以内

限制文件大小

```
fsize = os.path.getsize(fn)
```

单位换算为MB

```
fsize = fsize / float(1024*1024)
```

当文件大小大于10M时，重复以上操作

```
while fsize > 10:
  print("选择的文件大于10MB请重新选择")
  cgitb.enable()
  form = cgi.FieldStorage()
  fileitem = form['uploadfile']
  fsize = os.path.getsize(fn)
  fsize = fsize / float(1024*1024)
```

3.限制文件类型

1.定义不同文件类型

```
def typeList():
    return {
    "3c68313ee689abe68f8f": 'html',
    "504b03040a0000000000": 'xlsx',
    '504b0304140008080800': 'docx',
    "d0cf11e0a1b11ae10000": 'doc',
    '2d2d204d7953514c2064': 'sql',
    'ffd8ffe000104a464946': 'jpg',
    '89504e470d0a1a0a0000': 'png',
    '47494638396126026f01': 'gif',
    '3c21444f435459504520': 'html',
    '3c21646f637479706520': 'htm',
    '48544d4c207b0d0a0942': 'css',
    '2f2a21206a5175657279': 'js',
    '255044462d312e350d0a': 'pdf',
    }
```

2.字节码转16进制字符串

```
def bytes2hex(bytes):
  num = len(bytes)
  hexstr = u""
  for i in range(num):
    t = u"%x" % bytes[i]
    if len(t) % 2:
        hexstr += u"0"
    hexstr += t
  return hexstr.upper()
```

3.获取文件类型

```
def filetype(fileitem):
  binfile = open(fileitem, 'rb')  # 必需二制字读取
  bins = binfile.read(20)  # 提取20个字符
  binfile.close()  # 关闭文件流
  bins = bytes2hex(bins)  # 转码
  bins = bins.lower()  # 小写
  print(bins)
  tl = typeList()  # 文件类型
  ftype = 'unknown'
  for hcode in tl.keys():
    lens = len(hcode)  # 需要的长度
    if bins[0:lens] == hcode:
        ftype = tl[hcode]
        break
  if ftype == 'unknown':  # 全码未找到，优化处理，码表取5位验证
    bins = bins[0:5]
  for hcode in tl.keys():
    if len(hcode) > 5 and bins == hcode[0:5]:
        ftype = tl[hcode]
        break
  return ftype
```

4.文件扫描，如果是目录，就将遍历文件，是文件就判断文件类型

```
def filescanner(path):# 文件扫描，如果是目录，就将遍历文件，是文件就判断文件类型
  if type(path) != type('a'):  # 判断是否为字符串
    print('抱歉，你输入的不是一个字符串路径！')
  elif path.strip() == '':  # 将两头的空格移除
    print('输入的路径为空！')
  elif not os.path.exists(path):
    print('输入的路径不存在！')
  elif os.path.isfile(path):
```

```
    if path.rfind('.') > 0:
        print('文件名:', os.path.split(path)[1])
    else:
        print('文件名中没有找到格式')
    path = filetype(path)
    if (path == 'png' or path == 'jpg' or path == 'doc' or path == 'docx'):
        print("文件类型不符合请重新选择")
    else:
        print('解析文件判断格式：' + path)
  elif os.path.isdir(path):
    print('输入的路径指向的是目录，开始遍历文件')
    for p, d, fs in os.walk(path):
        print(os.path.split(p))
        for n in fs:
            n = n.split('.')
            print('\t' + n[0] + '\t' + n[1])
```

5.主函数，调用之前定义的函数

```
if __name__ == '__main__':
  fn = os.path.basename(fileitem.filename)
  ftype = filetype(fn)
```

4.输出文件是否上传成功的message

```
open(os.getcwd()+'/files/'+fn,'wb').write(fileitem.file.read())
message = '"' + fn + '" was uploaded successfully'

else:
message = 'No file was uploaded'
```

5.RSA加密

RSA加密

```
from Crypto import Random
from Crypto.PublicKey import RSA
```

获取一个伪随机数生成器

```
random_generator = Random.new().read
```

获取一个rsa算法对应的密钥对生成器实例

```
rsa = RSA.generate(1024, random_generator)
```

生成私钥并保存

```
private_pem = rsa.exportKey()
with open('rsa.key', 'wb') as f:
    f.write(private_pem)
```

生成公钥并保存

```
public_pem = rsa.publickey().exportKey()
with open('rsa.pub', 'wb') as f:
    f.write(public_pem)
```

生成的公钥：

cgi-bin > rsa.key

```
-----BEGIN RSA PRIVATE KEY-----
MIICXQIBAAKBgQC7dxexe+qpxnS0BrF5VeQZVvpX0oIptqZ3vYWHj1NPFIxhWTPX
QFVR/avkAzV13BHqNTGmmowXzbrlMQGbuP7usJNzHbTr493pTIo+E6FIYSKkbJNb
2Nifhz1EkQHhuOIAOM7FQRnVAlu/ZP+YzlnvVWZa0u0UEsG97pa5deknzQIDAQAB
AoGAAwLEnYyPLbZmjm9e0XZ/L4TeIbTkDQTbmNsPJVN0M9g+NVfIHv/v4P+IscbE
FWhoIR5WMXC2dgZ587oOM0HVeC6g/e5GNFqjiQ5+4NFltZQFVVa5rmKOheAxC122
U3HRqE7QJbiDI6dDHkabAqkgY0ZhrYxF8QvPLjF+lWfiLKMCQQDAg6708KhBseFU
WyV4Mm8u3l0xzQQT27sTkZVoeq+IRdd6UhEpaqafzJZCYPePP5358FXtfnbKRqRP
Rc/F90iPAkEA+UkmhgwYTFojQCrJtMDPSkkSQE6fLzS+LKOL+9flrgLareLtN6Li
A9/ZpZP8O3u7sLHshZFAaUi6yF5F/L2f4wJACOmPvfMuNuxfPCKEF45uK0NMGTQe
jjTL8ln5Cr8zRSHGmfkWpk4zrI4yHpySmWUekSWZNMd4BGFE1g6rUcTi7QJBAOiw
pWr+ozex87GTvxAf4d5fcs/gE6rGurWEO8hq8JOLSoCBkBgczIf9TXXHOuxzRPFc
Q4Ex4kPkhaU+immuvy0CQQCm5BPTLWDH7nqpM68XLAE6FZKkYGTAfrCoZTuxWLeh
wJ8LXZaofYbgoOZhcv29BRtywSxvY/J/OhvUnAr9Yy2i
-----END RSA PRIVATE KEY-----
```

rsa.pub

```
-----BEGIN PUBLIC KEY-----
MIGfMA0GCSqGSIb3DQEBAQUAA4GNADCBiQKBgQC3FlTOvtzO21MXME5SLgNHsVF5
c6bT9ykB04EbQo18lEcEcTIRF5aIMcqPdbmRE28Ah7gNHsLQryZTXIQTrJy8cE6L
kHclNQM4OpOU/segzh9BEcjE75JdJqdJKLPbFM4Iu8xDUaGHcm6BWTH6JFZEfA+I
46nz8VwqAl/4lnVzdQIDAQAB
-----END PUBLIC KEY-----
```

6.数字签名

创建RSA密钥步骤说明：

1、从 Crypto.PublicKey 包中导入 RSA，创建一个密码

2、生成 1024/2048 位的 RSA 密钥

3、调用 RSA 密钥实例的 exportKey 方法，传入密码、使用的 PKCS 标准以及加密方案这三个参数。

4、将私钥写入磁盘的文件。

5、使用方法链调用 publickey 和 exportKey 方法生成公钥，写入磁盘上的文件。

生成随机数

```
random_gen = Random.new().read# 伪随机数生成器
rsa = RSA.generate(1024, random_gen)# 生成秘钥对实例对象：1024是秘钥的长度
```

Server的秘钥对的生成

```
private_pem = rsa.exportKey()
with open("rsa.key", "wb") as f:
    f.write(private_pem)

public_pem = rsa.publickey().exportKey()
with open("rsa.pub", "wb") as f:
    f.write(public_pem)
```

Client的秘钥对的生成

```
private_pem = rsa.exportKey()
with open("rsa.key", "wb") as f:
    f.write(private_pem)

public_pem = rsa.publickey().exportKey()
```

```
    with open("rsa.pub", "wb") as f:
        f.write(public_pem)
```

Server使用自己的私钥对内容进行签名

:param data: 明文数据

:return: 签名后的字符串sign

```
    def signature(self,data:str):
        # 读取私钥
        private_key = RSA.import_key(open("rsa.key").read())
        # 根据SHA256算法处理签名内容data
        sha_data= SHA256.new(data.encode("utf-8")) # b类型

        # 私钥进行签名
        signer = Signature_PKC.new(private_key)
        sign = signer.sign(sha_data)

        # 将签名后的内容，转换为base64编码
        sign_base64 = base64.b64encode(sign)
        return sign_base64.decode()
```

Client使用Server的公钥对内容进行验签

:param data: 明文数据,签名之前的数据

:param signature: 接收到的sign签名

:return: 验签结果,布尔值

```
    def verify(self,data:str,signature:str) -> bool:
        # 接收到的sign签名 base64解码
        sign_data = base64.b64decode(signature.encode("utf-8"))

        # 加载公钥
        piblic_key = RSA.importKey(open("rsa.pub").read())

        # 根据SHA256算法处理签名之前内容data
        sha_data = SHA256.new(data.encode("utf-8"))  # b类型

        # 验证签名
        signer = Signature_PKC.new(piblic_key)
        is_verify = signer.verify(sha_data, sign_data)

        return is_verify
```

主函数：

```
if __name__ == '__main__':

mrsa = HandleRSA()
# mrsa.create_rsa_key()
cgitb.enable()
form = cgi.FieldStorage() # 获取网页提交的数据
fileitem = form['uploadfile']

# 一次性读取文本内容
with open(fileitem, 'r', encoding='utf-8') as banks:
# print(text) 测试打印读取的数据
# 待加密文本
    mystr = banks.read()
    message = base64.b64encode(mystr.encode('utf-8')).decode('ascii')

sign_data = mrsa.signature(message)
is_verify = mrsa.verify(data=message,signature=sign_data)
print("签名: \n",sign_data)
print("验签: \n",is_verify)
```

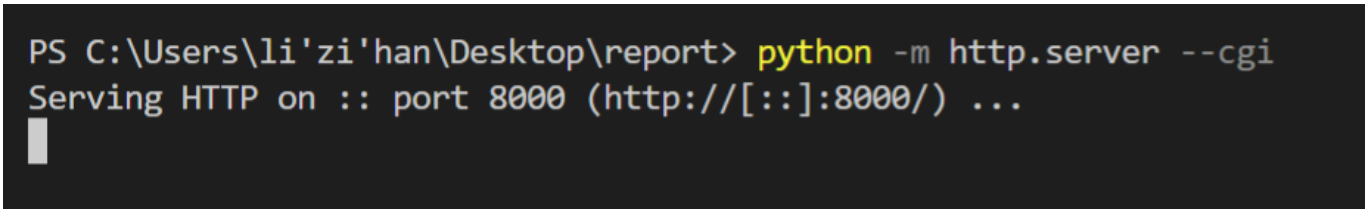
7.输出

```
print('Content-type:text/html \n\n')
print('file_size = %fMB,file_type = %s,file %s' % (fsize,ftype,message))
```

实验结果

1.建立HTTP连接

```
python -m http.server --cgi
```



2.输入网址

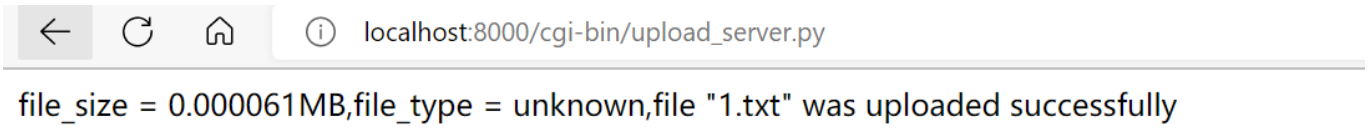
输入网址，查看输出是否正常

```
http://localhost:8000/upload.html
```

网页页面

选择需要上传的文件

得到文件大小、文件类型，及文件上传成功的语句



密钥的生成

cgi-bin > rsa.key

```
-----BEGIN RSA PRIVATE KEY-----
MIICXQIBAAKBgQC7dxexe+qpxnS0BrF5VeQZVvpX0oIptqZ3vYWHj1NPFIxhWTPX
QFVR/avkAzV13BHqNTGmmowXzbrlMQGbuP7usJNzHbTr493pTIo+E6FIYSKkbJNb
2Nifhz1EkQHhuOIAOM7FQRnVAlu/ZP+YzlnvVWZa0u0UEsG97pa5deknzQIDAQAB
AoGAAwLEnYyPLbZmjm9e0XZ/L4TeIbTkDQTbmNsPJVN0M9g+NVfIHv/v4P+IscbE
FWhoIR5WMXC2dgZ587oOM0HVeC6g/e5GNFqjiQ5+4NFltZQFVVa5rmKOheAxC122
U3HRqE7QJbiDI6dDHkabAqkgY0ZhrYxF8QvPLjF+lWfiLKMCQQDAg6708KhBseFU
WyV4Mm8u3l0xzQQT27sTkZVoeq+IRdd6UhEpaqafzJZCYPePP5358FXtfnbKRqRP
Rc/F90iPAkEA+UkmhgwYTFojQCrJtMDPSkkSQE6fLzS+LKOL+9flrgLareLtN6Li
A9/ZpZP8O3u7sLHshZFAaUi6yF5F/L2f4wJACOmPvfMuNuxfPCKEF45uK0NMGTQe
jjTL8ln5Cr8zRSHGmfkWpk4zrI4yHpySmWUekSWZNMd4BGFE1g6rUcTi7QJBAOiw
pWr+ozex87GTvxAf4d5fcs/gE6rGurWEO8hq8JOLSoCBkBgczIf9TXXHOuxzRPFc
Q4Ex4kPkhaU+immuvy0CQQCm5BPTLWDH7nqpM68XLAE6FZKkYGTAfrCoZTuxWLeh
wJ8LXZaofYbgoOZhcv29BRtywSxvY/J/OhvUnAr9Yy2i
-----END RSA PRIVATE KEY-----
```

rsa.pub

```
-----BEGIN PUBLIC KEY-----
MIGfMA0GCSqGSIb3DQEBAQUAA4GNADCBiQKBgQC3FlTOvtzO21MXME5SLgNHsVF5
c6bT9ykB04EbQo18lEcEcTIRF5aIMcqPdbmRE28Ah7gNHsLQryZTXIQTrJy8cE6L
kHclNQM4OpOU/segzh9BEcjE75JdJqdJKLPbFM4Iu8xDUaGHcm6BWTH6JFZEfA+I
46nz8VwqAl/4lnVzdQIDAQAB
-----END PUBLIC KEY-----
```

实验问题及解决

1、print输出的换行问题

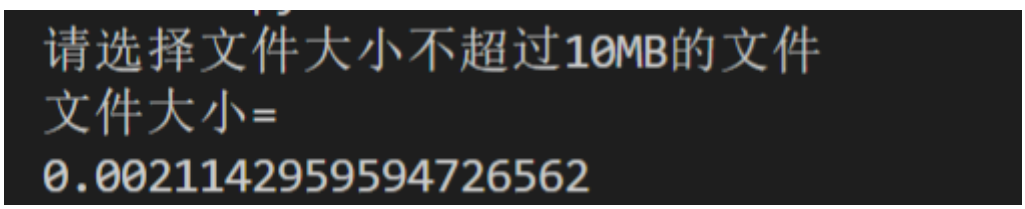
代码改为：

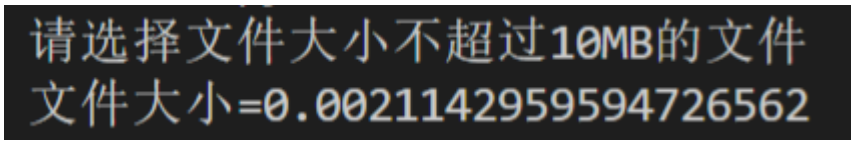
print('文件大小=',end='')

print(fsize)

可以做到输出不换行

修改前：



修改后： 

2、获取html表单提交数据的地址问题

为了获取文件大小，从而限制文件在10M以内，应该获取表单上传文件的地址。

刚开始，我试了很多种方法获取html表单上传文件的地址，但这与获取本地文件大小的方法不同。

最后，解决方法为：

```
fn = os.path.basename(fileitem.filename)
```

3、在制作前端网页的背景问题

在制作前端网页时，想要将背景替换掉，在csdn上查询之后获得解决方法。

解决方法为：

```
background: url(background.jpg)
```

使用url()，将背景设置为本地图片。

4、Crypto库

运行程序之后报错：No module named “Crypto”

但当pip install Crypto后仍提示：No module named “Crypto”，解决方案如下：

```
pip uninstall crypto pycryptodome
pip install pycryptodome
```

pycrypto和crypto是同一个库，crypto在 python 中又被称为pycrypto，它是一个第三方库，但是已经停止更新了。pycryptodome是crypto的延伸版本，用法和crypto一样，可以完全替代crypto。

参考文献

https://edu.csdn.net/skill/python/python-3-136?category=7&typeId=17454

https://www.runoob.com/python/python-cgi.html

https://blog.csdn.net/qq_45927266/article/details/120223355

https://blog.csdn.net/weixin_41298678/article/details/103136768#:~:text=%E5%9C%A8%E7%BB%88%E7%AB%AF%EF%BC%8C%E8%BF%9B%E5%85%A5www%E7%9B%AE%E5%BD%95%EF%BC%8C%E8%BE%93%E5%85%A5python%20-m%20http.server,--cgi%20%EF%BC%8C%E5%90%AF%E5%8A%A8%E6%9C%8D%E5%8A%A1%20%E6%89%93%E5%BC%80%E7%BD%91%E9%A1%B5%EF%BC%8C%E8%BE%93%E5%85%A5http%3A%2F%2Flocalhost%3A8000%2Findex.html%205%E3%80%81%E7%82%B9%E5%87%BB%E9%80%89%E6%8B%A9%E6%96%87%E4%BB%B6%EF%BC%8C%E5%9C%A8%E6%9C%AC%E5%9C%B0%E9%80%89%E6%8B%A9%E6%96%87%E4%BB%B6%EF%BC%8C%E7%82%B9%E5%87%BBsubmit%E4%B8%8A%E4%BC%A0%E6%96%87%E4%BB%B6%E5%8D%B3%E5%8F%AF%E3%80%82