Introduction to Web Science

Assignment 4

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In this assignment we cover two topics: 1) **HTTP** & 2) **Web Content**

For all the assignment questions that require you to write code, make sure to include the code in the answer sheet, along with a separate python file. Where screen shots are required, please add them in the answers directly and not as separate files.

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1 Implementing a simplified HTTP GET Request (15 Points)

The goal of this exercise is to review the hyptertext transfer protocol and gain a better understanding of how it works.

Your task is to use the python programming language to create an HTTP client (http-client.py) that takes a URL as a command line argument and is able to download an arbitrary file from the World Wide Web and store it on your hard drive (in the same directory as your python code is running). The program should also print out the complete HTTP header of the response and store the header in a seperated file.

Your programm should only use the socket library so that you can open a TCP socket and and sys library to do command line parsing. You can either use urlparse lib or your code from assignment 3 in order to process the url which should be retrieved.

Your programm should be able to sucessfully download at least the following files:

1. http://west.uni-koblenz.de/en/studying/courses/ws1617/introduction-to-web-science
2. http://west.uni-koblenz.de/sites/default/files/styles/personen_bild/public/_IMG0076-Bearbeitet_03.jpg

Use of libraries like `httplib`, `urllib`, etc are not allowed in this task.

1.1 Hints:

There will be quite some challenges in order to finnish the task

- Your program only has to be able to process HTTP-responses with status 200 OK.
- Make sure you receive the full response from your TCP socket. (create a function handling this task)
- Sperated the HTTP header from the body (again create a function to do this)
- If a binary file is requested make sure it is not stored in a corrupted way

1.2 Example

```
1: python httpclient.py http://west.uni-koblenz.de/index.php
2:
3: HTTP/1.1 200 OK
4: Date: Wed, 16 Nov 2016 13:19:19 GMT
5: Server: Apache/2.4.7 (Ubuntu)
6: X-Powered-By: PHP/5.5.9-1ubuntu4.20
7: X-Drupal-Cache: HIT
8: Etag: "1479302344-0"
9: Content-Language: de
```

```
10: X-Frame-Options: SAMEORIGIN
11: X-UA-Compatible: IE=edge,chrome=1
12: X-Generator: Drupal 7 (http://drupal.org)
13: Link: <http://west.uni-koblenz.de/de>; rel="canonical",<http://west.uni-koblenz.de
14: Cache-Control: public, max-age=0
15: Last-Modified: Wed, 16 Nov 2016 13:19:04 GMT
16: Expires: Sun, 19 Nov 1978 05:00:00 GMT
17: Vary: Cookie,Accept-Encoding
18: Connection: close
19: Content-Type: text/html; charset=utf-8
```

The header will be printed and stored in index.php.header. The retrieved html document will be stored in index.php

Answer:
client - only compilable with Python 3.x (because of import statement for urlparse)

```
 1: # assignment 4 task 1
 2: # Andrea Mildes - mildes@uni-koblenz.de
 3: # Sebastian Blei - sblei@uni-koblenz.de
 4: # Johannes Kirchner - jkirchner@uni-koblenz.de
 5: # Abdul Afghan - abdul.afghan@outlook.de
 6:
 7:
 8: import socket
 9: import sys
10: from urllib.parse import urlparse
11:
12: #Get the command line argument
13: def get_url():
14:     args = sys.argv[1]
15:     return args
16:
17:
18: #Parse the url in its components,
19: #create a socket and connect to a webserver on port 80.
20: #Send a GET Request and wait till all chunks arrived. If the next chunk is empty,
21: def get_data(url):
22:     url_comps = urlparse(url)
23:     sock = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
24:     sock.connect((url_comps.netloc, 80))
25:     sock.sendall(b'GET ' + bytes(url_comps.path, encoding='utf-8') + b' HTTP/1.0'
26:     sock.sendall(b'Host: ' + bytes(url_comps.netloc, encoding='utf-8'))
27:     sock.sendall(b'\n\n')
28:     data = b""
29:     while True:
30:         chunk = sock.recv(4096)
31:         data += chunk
```

```
32:         if not chunk:
33:             break
34:         del chunk
35:     return data
36:
37: #Seperate the header from the content
38: def sep_data(data):
39:     i = data.find(b'\r\n\r\n')
40:     if i != -1:
41:         return data[:i], data[i:].strip()
42:     else:
43:         print('No Header found :(')
44:     return
45:
46: #Determine the Content-Type
47: def get_contenttype(header):
48:     pos = header.decode().find("Content-Type:")
49:     if pos != -1:
50:         #Find "Content-Type"
51:         #Remove "Content-Type: " from selection
52:         c_type = header[pos+14:]
53:         i = c_type.find(b";")
54:         if i != -1:
55:             return c_type[:i]
56:         else:
57:             return c_type
58:     else:
59:         print('No content type found :(')
60:         return
61:
62: #Write the header and content in files.
63: #If the content is an image, safe it with the correct name and file extension.
64: def write_file(header, content, url):
65:     headerfile = open('index.php.header', 'wb')
66:     headerfile.write(header)
67:     headerfile.close()
68:
69:     if get_contenttype(header) == b"text/html":
70:         contentfile = open('index.php', 'wb')
71:         contentfile.write(content)
72:         contentfile.close()
73:     elif b"image" in get_contenttype(header):
74:         url_comps = urlparse(url)
75:         i = url_comps.path.rfind('/')
76:         contentfile = open(url_comps.path[i+1:], 'wb')
77:         contentfile.write(content)
78:         contentfile.close()
79:     return
80:
```

```
81: #call all functions
82: def main_func(url):
83:     data = get_data(url)
84:     header, content = sep_data(data)
85:     write_file(header, content, url)
86:     print(header.decode())
87:
88:
89: if __name__ == '__main__':
90:     main_func(get_url())
```

2 Download Everything (15 Points)

If you have successfully managed to solve the previous exercise you are able to download a web page from any url. Unfortionately in order to successfully render that very webpage the browser might need to download all the included images

In this exercise you should create a python file (downloadEverything.py) which takes two arguments. The first argument should be a name of a locally stored html file. The second argument is the url from which this file was downloaded.

Your program should

1. be able to find a list of urls the images that need to be downloaded for successful rendering the html file.
2. print the list of URLs to the console.
3. call the program from task 1 (or if you couldn't complete task 1 you can call wget or use any python lib to fulfill the http request) to download all the necessary images and store them on your hard drive.

To finnish the task you are allowed to use the 're' library for regualar expressions and everything that you have been allowed to use in task 1.

2.1 Hints

1. If you couldn't finnish the last task you can simulate the relevant behavior by using the program wget which is available in almost any UNIX shell.
2. Some files mentioned in the html file might use relative or absolut paths and not fully qualified urls. Those should be fixed to the correct full urls.
3. In case you run problems with constructing urls from relative or absult file paths you can always check with your web browser how the url is dereferenced.

Answer:
downloadEverything - only compilable with Python 3.x (because of import statement for urlparse)

```
1: # assignment 4 task 2
2: # Andrea Mildes - mildes@uni-koblenz.de
3: # Sebastian Blei - sblei@uni-koblenz.de
4: # Johannes Kirchner - jkirchner@uni-koblenz.de
5: # Abdul Afghan - abdul.afghan@outlook.de
6:
7:
8: import sys
9: import re
```

```
10: import client
11: from urllib.parse import urlparse
12:
13: #Parse filename and url
14: def get_args():
15:     filename = sys.argv[1]
16:     url = sys.argv[2]
17:     return filename, url
18:
19: #open the file
20: def get_file(filename):
21:     file = open(filename, 'br')
22:     return file.read()
23:
24: #Get all image urls from the file
25: def get_urls(data, url):
26:     domain = urlparse(url)
27:     pattern = re.compile("<img.+?src=[\"'](.+?)[\"'].*?>")
28:     images = pattern.findall(data.decode())
29:
30:     #Fix relative paths
31:     for i in range(0, len(images)):
32:         url_comps = urlparse(images[i])
33:         if url_comps.netloc == "":
34:             images[i] = domain.scheme + "://" + domain.netloc + images[i]
35:         else:
36:             images[i] = images[i]
37:     return images
38:
39:
40: #iterate over the list and call the function from task 01
41: def download_images(links):
42:     for i in range(0, len(links)):
43:         print('\n ' + str(i) + '\n')
44:         client.main_func(links[i])
45:
46: #call all functions
47: def main_func():
48:     filename, url = get_args()
49:     data = get_file(filename)
50:     links = get_urls(data, url)
51:     download_images(links)
52: #     print(links)
53:
54:
55: if __name__ == '__main__':
56:     main_func()
```

Important Notes

Submission

- Solutions have to be checked into the github repository. Use the directory name `groupname/assignment4/` in your group's repository.
- The name of the group and the names of all participating students must be listed on each submission.
- Solution format: all solutions as *one* PDF document. Programming code has to be submitted as Python code to the github repository. Upload *all* `.py` files of your program! Use `UTF-8` as the file encoding. *Other encodings will not be taken into account!*
- Check that your code compiles without errors.
- Make sure your code is formatted to be easy to read.
  - Make sure you code has consistent indentation.
  - Make sure you comment and document your code adequately in English.
  - Choose consistent and intuitive names for your identifiers.
- Do *not* use any accents, spaces or special characters in your filenames.

Acknowledgment

This latex template was created by Lukas Schmelzeisen for the tutorials of "Web Information Retrieval".

LaTeX

Currently the code can only be build using LuaLaTeX, so make sure you have that installed. If on Overleaf, there's an error, go to settings and change the LaTeXengine to `LuaLaTeX`.