WEB CRAWLER

A Report for the Evaluation 1 of Project 2

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Abstract-

The World Wide Web is an interlinked collection of billions of documents formatted using HTML. Ironically the very size of this collection has become an obstacle for information retrieval. The user has to shift through scores of pages to come upon the information he/she desires. Web crawlers are the heart of search engines. Web crawlers continuously keep on crawling the web and find any new web pages that have been added to the web, pages that have been removed from the web. Due to growing and dynamic nature of the web; it has become a challenge to traverse all URLs in the web documents and to handle these URLs. A focused crawler is an agent that targets a particular topic and visits and gathers only relevant web pages. In this dissertation I had worked on design and working of web crawler that can be used for copyright infringement. We will take one seed URL as input and search with a keyword, the searching result is based on keyword and it will fetch the web pages where it will find that keyword. This focused based crawler approach retrieve documents that contain particular keyword from the user's query; we are implementing this using breadth-first search. Now, when we retrieved the web pages we will apply pattern recognition over text. We will give one file as input and apply the pattern recognition algorithms. Here, pattern symbolizes text only and check how much text is available on the web page. The algorithms that I had used for pattern search are Knutt-Morri-Pratt, Boyer-Moore, finite automata algorithm.

Introduction

Overall Description-

A **Web crawler**, sometimes called a **spider** or **spiderbot** and often shortened to **crawler**, is an Internet bot that systematically browses the World Wide Web, typically for the purpose of Web indexing .

Web search engines and some other sites use Web crawling or spidering software to update their web content or indices of others sites' web content. Web crawlers copy pages for processing by a search engine which indexes the downloaded pages so users can search more efficiently.

Crawlers consume resources on visited systems and often visit sites without approval. Issues of schedule, load, and "politeness" come into play when large collections of pages are accessed. Mechanisms exist for public sites not wishing to be crawled to make this known to the crawling agent. For example, including a robots.txt file can request bots to index only parts of a website, or nothing at all.

The number of Internet pages is extremely large; even the largest crawlers fall short of making a complete index. For this reason, search engines struggled to give relevant search results in the early years of the World Wide Web, before 2000. Today, relevant results are given almost instantly.

A Web crawler starts with a list of URLs to visit, called the *seeds*. As the crawler visits these URLs, it identifies all the Hyperlinks in the page and adds them to the list of URLs to visit, called the crawl frontier. URLs from the frontier are recursively visited according to a set of policies. If the crawler is performing archiving of websites it copies and saves the information as it goes. The archives are usually stored in such a way they can be viewed, read and navigated as they were on the live web, but are preserved as ‘snapshots'.

The archive is known as the *repository* and is designed to store and manage the collection of web pages. The repository only stores HTML pages and these pages are stored as distinct files. A repository is similar to any other system that stores data, like a modern day database. The only difference is that a repository does not need all the functionality offered by a database system. The repository stores the most recent version of the web page retrieved by the crawler.

The large volume implies the crawler can only download a limited number of the Web pages within a given time, so it needs to prioritize its downloads. The high rate of change can imply the pages might have already been updated or even deleted.

Purpose-

A **web crawler** (also known as a web spider or webrobot) is a program or automated script which browses the World Wide web in a methodical, automated manner. This process is called web or spidering. Many legitimate sites, in particular search engines, use spidering as a means of providing up-to-date data.

Motivation and Scope

Motivations for Crawling There are several important motivations for crawling. The main three motivations are:

• Content indexing for search engines. Every search engine requires a web crawler to fetch the data from the web.

• Automated testing and model checking of the web application

• Identify the content of websites

• Determine how websites link to each other

• User friendly, efficient, fast, well-structured search results

• More accurate results.

• Prioritize highly relevant.

• Ranks sites URLs to prioritize potential deep sites.

• It provides personalize search to get result effectively.

• Automated security testing and vulnerability assessment. Many web applications use sensitive data and provide critical services. To address the security concerns for web applications, many commercial and open-source automated web application security scanners have been developed. These tools aim at detecting possible issues, such as security vulnerabilities and usability issues, in an automated and efficient manner. They require a web crawler to discover the states of the application scanned.

• Keen Crawler experiences an assortment of website pages amid a creeping procedure and the way to proficiently slithering and wide scope is positioning diverse destinations and organizing joins inside a webpage.

• The substantial volume of web assets and the dynamic idea of profound web, accomplishing wide scope and high productivity is a testing issue.

Literature Survey

Crawling Traditional Web Applications-

Web crawlers were written as early as 1993. This year gave birth to four web crawlers: World Wide Web Wanderer, Jump Station, World Wide Web Worm , and RBSE spider. These four spiders mainly collected information and statistic about the web using a set of seed URLs. Early web crawlers iteratively downloaded URLs and updated their repository of URLs through the downloaded web pages. The next year, 1994, two new web crawlers appeared: WebCrawler and MOMspider. In addition to collecting stats and data about the state of the web, these two web crawlers introduced concepts of politeness and black-liststo traditional web crawlers. WebCrawler is considered to be the first parallel web crawler by downloading 15 links simultaneously. From World Wide Web Worm to WebCrawler, the number of indexed pages increased from 110,000 to 2 million. Shortly after, in the coming years a few commercial web crawlers became available.

Crawling Deep Web As server -

side programming and scripting languages, such as PHP and ASP, got momentum, more and more databases became accessible online through interacting with a web application. The applications often delegated creation and generation of contents to the executable files using Common Gateway Interface (CGI). In this model, programmers often hosted their data on databases and used HTML forms to query them. Thus a web crawler can not access all of the contents of a web application merely by following hyperlinks and downloading their corresponding web page. These contents are hidden from the web crawler point of view and thus are referred to as deep web . In 1998, Lawrence and Giles estimated that 80 percent of web contents were hidden in 1998. Later in 2000, BrightPlanet suggested that the deep web contents is 500 times larger than what surfaces through following hyperlinks (referred to as shallow web) . The size of the deep web is rapidly growing as more companies are moving their data to databases and set up interfaces for the users to access them.

Site Locating-

• In this module, starts with a seed set of sites in a site database.

• When the number of unvisited URLs in the database is less than a threshold during the crawling process, Smart Crawler performs reverse searching of known deep websites for center pages (highly ranked pages that have many links to other domains) and feeds these pages back to the site database.

• Site Frontier fetches homepage URLs from the site database, which are ranked by Site Ranker to prioritize highly relevant sites.

• The Site Ranker is improved during crawling by an Adaptive Site Learner, which adaptively learns from features of deep-web sites (web sites containing one or more searchable forms) found.

• To achieve more accurate results for a focused crawl, Site Classier categorizes URLs into relevant or irrelevant for a given topic according to the homepage content.

In-Site Exploring-

• After the most relevant site is found in the site locating module, the in-site exploring module performs efficient in-site exploration for excavating searchable forms.

• Links of a site are stored in Link Frontier and corresponding pages are fetched and embedded forms are classified by Form Classier to and searchable forms.

• Additionally, the links in these pages are extracted into Candidate Frontier. To prioritize links in Candidate Frontier, Smart Crawler ranks them with Link Ranker.

PROPOSED MODEL

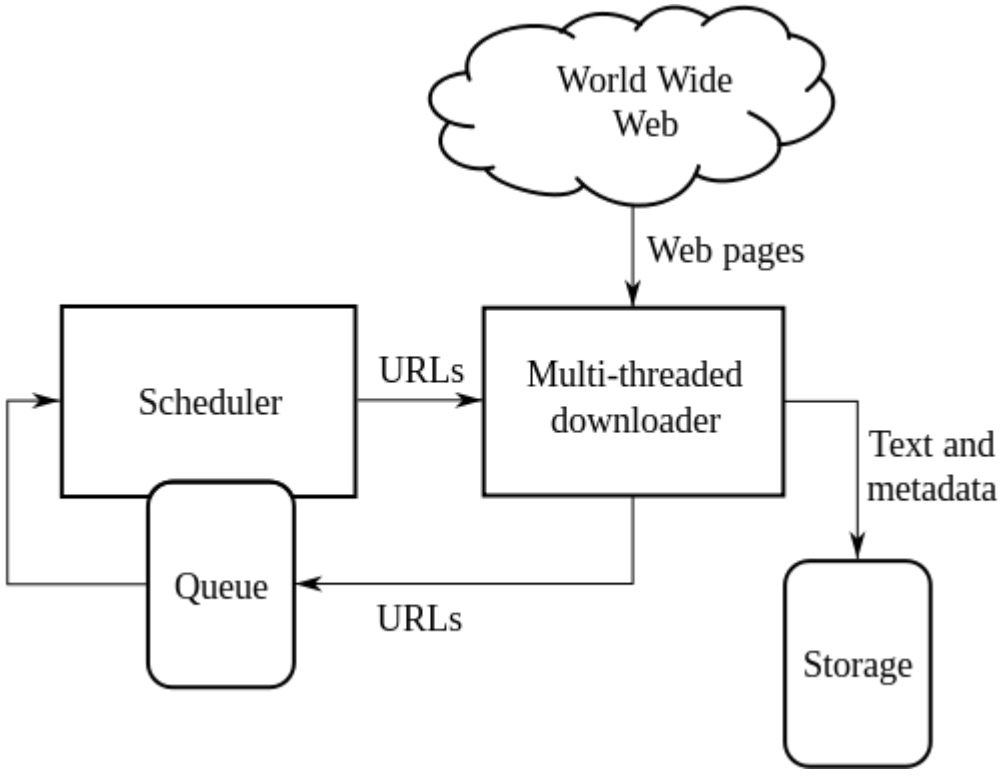
System Architecture-

Web search engine and some other sites use Web crawling or spidering software to update their web content or indices of others sites' web content. Web crawlers copy pages for processing by a search engine which indexes the downloaded pages so users can search more efficiently.

Crawlers consume resources on visited systems and often visit sites without approval. Issues of schedule, load, and "politeness" come into play when large collections of pages are accessed. Mechanisms exist for public sites not wishing to be crawled to make this known to the crawling agent. For example, including a robot.txt file can request bots to index only parts of a website, or nothing at all.

The number of Internet pages is extremely large; even the largest crawlers fall short of making a complete index. For this reason, search engines struggled to give relevant search results in the early years of the World Wide Web, before 2000. Today, relevant results are given almost instantly.

Crawlers can validate hyperlinks and HTML code. They can also be used for web scrapping (see also data-driven programming).



Implementation :

Steps I used while working on Scrapy :

– Download Anaconda from https://www.anaconda.com/
– Install Scrapy using command: $sudo -H pip install scrapy
– In Anaconda created a new Environment called ScrapyEnvironment
– In Terminal used command: $scrapy activate ScrapyEnvironment
– In Terminal used command: $scrapy startproject MyScraper
– This command creates a folder to work with. In that folder navigate to the “spider” folder, that’s where we will be working.
– Open Anaconda app > Open Spyder.
– Navigate to File Explorer and open MyScraper > Spider.
– Create a new file with name FirstSpider.py.
– Write code in file.

```
import scrapy
class QuotesSpider(scrapy.Spider):
    name = "quotes"
    def start_requests(self):
        urls = [
            'http://quotes.toscrape.com/page/1/',
            'http://quotes.toscrape.com/page/2/',
        ]
        for url in urls:
            yield scrapy.Request(url=url, callback=self.parse)
    def parse(self, response):
        page = response.url.split("/")[-2]
        filename = 'quotes-%s.html' % page
        with open(filename, 'wb') as f:
```

```
        f.write(response.body)
    self.log('Saved file %s' % filename)
```

– After writing code open the terminal.
– To exit the zsh we use $exec bash --login
– Type the following command:
$source activate ScrapyEnvironment
– Then navigate to the folder where we have our file which is inside the spider folder, using cd Desktop/.....
– Use command: $scrapy crawl quotes
– Remember that in above command quotes is used because we set the “name” variable in our FirstSpider.py file to “quotes”, see the above code.
– This will generate two files named “quotes-1.html” and “quotes-2.html”.
– We have successfully downloaded the website data and now can work on that data.

We can use Scrapy Shell (provides interactive testing) in terminal which could come handy in many ways. For example if we want to run a quick command or view a webpage.

```
$scrapy shell
fetch("https://www.xyz.com")
view(response)
print(response.text)
```

Now we are going to create a new file with name “SecondSpider.py”. SecondSpider.py will be more interactive than the first file we created.

We are going to add more features to it. We will be interacting with some html elements in this file to go in depth of a HTML document.
Let's take a look at the code here:

```
import scrapy
from MyScraper.items import NewItem
class SecondScrapy(scrapy.Spider):
    name = "SecondSpider"
    allowed_domains = ['www.superdatascience.com']
    start_urls = [
            'https://superdatascience.com/artificial-intelligence',
            ]

    def parse(self, response):
        item = NewItem()
        item['main_headline'] = response.xpath('//span/text()').extract()
        item['headline'] = response.xpath('//title/text()').extract()
        item['url'] = response.url
        item['project'] = self.settings.get('BOT_NAME')
        item['spider'] = self.name

        return item
```

Now to run this code we follow the same steps as we did before. For running the file there is a little tweak that we have to make in order to save the output of the file in .csv format.
$scrapy crawl SecondSpider -o example.csv

We create an item.py file to keep all the items :

```
import scrapy
from scrapy.item import Item, Field


class NewItem(scrapy.Item):
    # define the fields for your item here like:
    # name = scrapy.Field()

    #Main fields
    main_headline = Field()
    headline = Field()

    #Separate Fields
    url = Field()
    project = Field()
    spider = Field()
    server = Field()
    date = Field()

    #Location Fields
    #location = Field()
##################################################
class TestItem(scrapy.Item):
    id = scrapy.Field()
    name = scrapy.Field()
    description = scrapy.Field()
##################################################
```

```
class MovieItem(scrapy.Item):

    #defining our item fields

    title = scrapy.Field()
    popularity = scrapy.Field()
```

We create a final file called ThirdSpider.py and we write code to crawl the imdb website's top chart page to gather the information about a movie title and it's popularity.
The code is as follows:

```
import scrapy
from MyScraper.items import MovieItem
class ThirdSpider(scrapy.Spider):
    name = "ThirdSpider"
    allowed_domains = ["imdb.com"]
    start_urls = [
            "https://www.imdb.com/chart/top",


        ]
    def parse(self, response):
                        links = response.xpath('//tbody[@class="lister-list"]/tr/
td[@class="titleColumn"]/a/@href').extract()
            i = 1

            for link in links:
                abs_url = response.urljoin(link)
```

```
                url_next = '//*[@id="main"]/div/span/div/div/div[2]/table/
tbody/tr['+str(i)+']/td[3]/strong/text()'
            rating = response.xpath(url_next).extract()
            if(i <= len(links)):
                i = i+1
                yield scrapy.Request(abs_url, callback = self.parse_indetail,
meta={'rating' : rating})

    def parse_indetail(self, response):
        item = MovieItem()
            item['title'] = response.xpath('//div[@class="title_wrapper"]/h1/
text()').extract()[0][:-1]
                        item['popularity'] = response.xpath('//
div[@class="titleReviewBarSubItem"]/div/span/text()').extract()[2]
[21:-8]

        return item
```

We run this code in terminal
$scrapy crawl ThirdSpider -o imdb.csv -t csv

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