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Analyzing Download time Performance of University Websites in India

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Abstract— The download time of website depends on various web components such as multimedia size, document size, program size and so on. The main objective of this paper is to Analyze Download time of University Websites in India and evaluating the quality of Website Download time Performance based on Download time Performance metric. The Download time of websites is measured in various grades viz., A, B, C, D, E, F etc., A 10 point metric for Download time performance is investigated based on Download time performance grades.

Keywords— *Download time; Website size; 10 point metric; Download time performance grade*

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1. Introduction

A Website is a collection of Web pages containing text, images, audio and video etc. Thus Web is a vast collection of completely uncontrolled documents. Today, Web is not only an information resource but also becoming an automated tool in various applications. Due to the increasing popularity of Web, one can be very cautious in designing the Website. Poor and careless web design leads to hard ship to public utility and does not serve the purpose. To design a Website with high quality, one has to follow certain guidelines for achieving the quality Web design. Despite of many recommendations, ideas and guidelines, designing a quality Web design is still a burning problem. The authors Flanders, Vincent and Michel Wills [1] insist that always design should be improved into good by looking from a bad design. It [1] [2] is suggested that always Web design is continuous process.

2. Related Work

The quality of website can be assessed mainly in functionality and usability. Every guideline provides a technique for accessing the content of Website. The qualitative measures [4], [5] are used to achieve quality in functionality of website. The notion of usability is a key factor to interact a website. The efficiency of usability is depended on website structure. The structure of website [6] should be in such a way that user can easily interact website without any formal training. An effective web design [7] is one that makes it easier for users to navigate through the different pages on the site. The website structure [8] is represented by directed graph where each node represents a web page and edges represent link to corresponding web pages. It is already investigated that web link structure can also be used for page ranking [9] and web page classification [10]. World Wide Web Consortium (W3C) [11] defines a set of guidelines for quality of Web design. These works stress on the navigational relationship among web pages. The present work focuses on discovering key elements which play major role in website size and in ultimately in website download time.

3. Methodology

The procedure for analysing downloads time of website initially starts with a web program. The program consists of two parts: extracting components of website with download time and download time performance grades. In the web program, all the components of website with corresponding downloading time are extracted using a web tool namely Web Page Analyzer [12] (fig. 1).

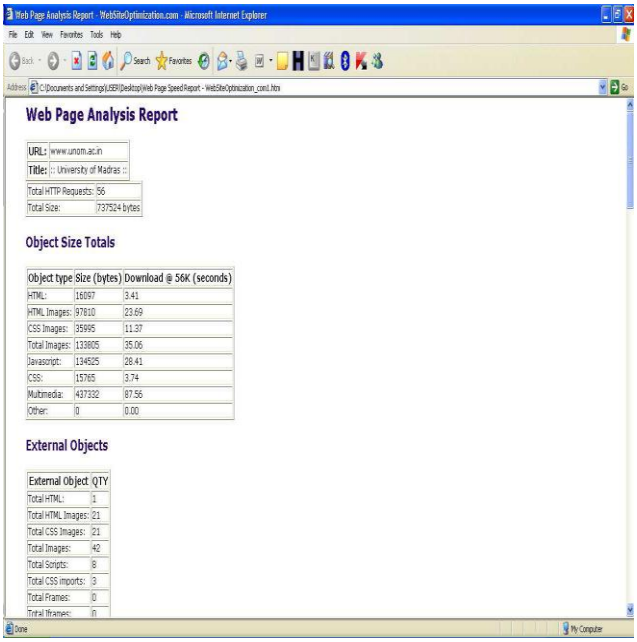

Figure 1: Website Analysis

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The Download time performance grade is obtained using the web tool GTMetrix [13] (fig. 2).

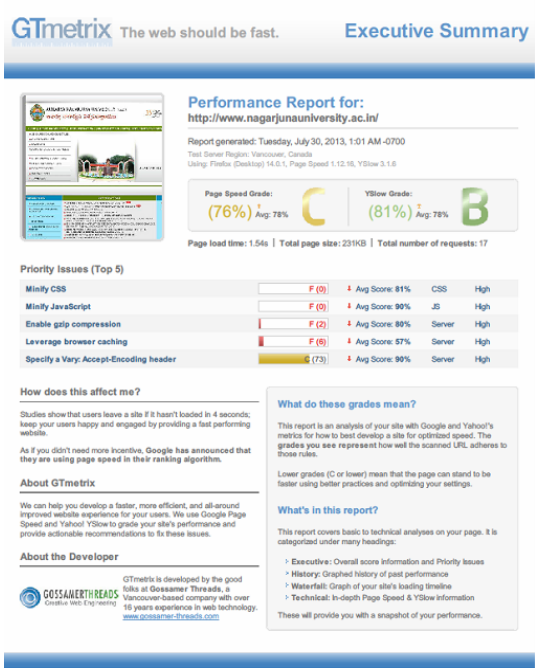

Fig. 2: Download time Performance of University Website

The GTMetrix web tool analyses the website download time and evaluates the download time performance in A, B, C, D, E and F grades as described in table 1.

Download Time Performance Grade	Description
A	Very Good
B	Good
C	Better than Average
D	Average
E	Poor
F	Very Poor

Table 1: Description of Download time Performance Grades

The size of a web page is measured considering all its images, sounds, videos and textual components. For each page, the size in bytes can be obtained. The size of pages is an important issue in order to appreciate the site efficiency. The download time (T) is related with the size of a page (τ) and the speed in the established connection line (c) and this relation is shown in equation (1).

$$T_{Download} = f(\tau, c) \quad \ldots \quad (1)$$

This download time is directly proportional to the page size and inversely proportional to the speed of a given connection line and it is shown in equation (2). A function may be created in order to classify pages as quick or slow access pages, according to a minimum threshold of time (e.g. 10 seconds) for a given speed of a connection line.

$$g(T_{Download}) = \begin{cases} QuickAccess & T_{Download} < T_{max} \\ SlowAccess & T_{Download} \geq T_{max} \end{cases} \quad \ldots \quad (2)$$

The website size is dependent on various components of the website. These components include Images Size, Documents size, Media Size, Programs or Scripts Size, CSS Size and other objects. As the components sizes increase then automatically the size of website is also increases. The relation between website size and web components is shown in equation (3).

$$WEBSIZE = f(IMAGESIZE, DOCSIZE, MEDIASIZE, CSSSIZE, SCRIPTSIZE, OTHEROBJSIZE) \quad \ldots \quad (3)$$

Where *WEBSIZE = Website Size*

IMAGESIZE = Images Size

DOCSIZE = Documents Size

MEDIASIZE = Multimedia Size

SCRIPTSIZE = Scripts or Programs Size

CSSSIZE = Cascading Style Sheet Size

OTHEROBJSIZE = Other Objects Size like Active X Control Objects, Applets etc.

A regression analysis is carried out to analyse the relationships among these variables. The analysis is carried out through the estimation of a relationship using equation. The results serve the following two purposes.

- Answer the question of how much web size changes with changes in each of the web component's size and
- Forecast or predict the value of web size based on the values of the web component's size

Thus the 10-point metric for evaluating download time of website is developed based on the download time performance grades and the metric is derived using equation (4).

$$10_{PDT} = \begin{cases} 10 & if\ Grade = A \\ 8 & if\ Grade = B \\ 6 & if\ Grade = C \\ 4 & if\ Grade = D \\ 2 & if\ Grade = E \\ 0 & otherwise \end{cases} \quad \ldots \quad (4)$$

where PDT : Performance Download Time

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4. Evaluation

In analyzing the download time performance of the websites, the websites of 10 university websites are considered in evaluation process. The download time of each university websites is analyzed using web program and the corresponding download time performance grade is derived using GTMetrix web tool. The 10_{PDT} metric evaluates the website download time and produces the value to describe the performance of university website. The list of 10 university websites with download time performance grades and 10_{PDT} metric values are shown in table 2.

S. No	University	Download time Performance Grade	10 PDT
1	English and Foreign Languages University	F	0
2	Moulana Azad National Urdu University	A	10
3	University of Hyderabad, Hyderabad	E	2
4	Rajiv Gandhi University	E	2
5	Assam University	F	0
6	Tezpur University	F	0
7	Central University Bihar	F	0
8	Nagaland University	F	0
9	Central University of Haryana	B	8
10	Central University of Himachal Pradesh	B	8

Table 2: Download time Performance Description

5. Conclusion

This paper aims to evaluate various elements required for optimizing the web design. In this paper a focused approach has been made to identify all possible parameters in the web design with specific reference to some of the major Universities in India. This would enable to adjudge the status of web design of the various universities and would indicate the necessity of improvement in the design of the Website. We can further extend this work to identify other components of web site design as a process of web mining. The various web mining techniques can be used in quality assessment process which would further enable to improve the design as a part of the ideology of TQM which emphasizes the continuous improvement of Design aspect and promote Excellence of Web Design.

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