

Web Interface Evaluation Design and Applications

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Abstract: In this study, we investigate the usability aspects of the website interface design by introducing the design and implementation of a system named Web Interface Evaluation (WIE). This system evaluates the web interface through a study on a number of web interface features about 55 features extracted from different HTML web pages, English and Arabic ones and then classify these pages to high, middle, low quality, this is done by the comparison of the extracted features with threshold values. These threshold values were extracted based on an extensive survey of design, recommendations from recognized experts and usability studies.

Key words: Usability, accessibility, HTML, web interface, web classification, Iraq

INTRODUCTION

Although, professional design companies create most prominent websites, people who having little design experience, build an enormous number of smaller sites, need to make information available online. The usability of websites such as non-profits and small businesses is often substandard. The goal of this research is to create a system to help non-professional website builders away from bad design and toward better ones, a kind of quality checker tool. The user interface of the website is an important issue that must be taken in the consideration. To make websites usable by others, we must apply the usability conditions on it that entails the guidelines of web design accessibility, this will lead users spend more time on these websites.

The proposed system WIE presented in this study evaluates HTML pages by extracting about 55 interface features categorized into graphics, navigation and information. The system classify the web page to high, middle or low, one according to some predefined measures.

Literature survey: Several approaches for evaluating website quality evaluate web pages interface according to a number of pre-determined guidelines such as whether all graphics contain ALT attributes. Other techniques compare quantitative web page measures such as the number of links or graphics to thresholds. The approach presented in this study is working on both guidelines and thresholds.

Ivory (2001) in her research computes a larger set of measures (157), over a larger collection of web pages. A

quantitative analysis of a large collection of expert-rated websites reveals that page-level metrics can accurately predict if a site will be highly rated. The analysis also provides empirical evidence that important metrics including page composition, page formatting and overall page characteristics, differ among website categories such as education, community, living and finance. Simulation has also been used for web interface evaluation. For example, web criteria's site profile attempts to mimic a user's information-seeking behavior within a model of an implemented site.

This tool uses an idealized user model that follows an explicit, pre-specified navigation path through the site and estimates several metrics such as page load and optimal navigation times. Another example, Chi, Pirolli and Pitkow (UIE, 1999) have developed a simulation approach for generating navigation paths for a site based on content similarity among pages, server log data and linking structure.

The simulation models hypothetical users traversing the site from specified start pages, making use of information scent (i.e., common key words between the user's goal and content on linked pages) to make navigation decisions. Neither of these approaches, account for the impact of various web page attributes such as the amount of text or layout of links.

Website usability: The effectiveness, efficiency and satisfaction with which specified user can achieve specified goals in particular environments (ISO definition of usability: ISO DIS9241-11). On the face of it, the ISO would seem to give a fair amount of guidance in helping us to decide whether or not a product can be described as fitting the criteria for usability. Systems should be:

- **Effective:** They should accomplish the task
- **Efficient:** They should accomplish the task in the least time and with as little effort as possible
- **Satisfying:** They should be a pleasure to use!

Website usability is what makes a website work according whether it intended to make a specific purchase, find a specific piece of information or simply browse (Nielsen, 2000). Designing a usable website design must be grounded in a solid understanding of the intended users and their objectives in using the site. Every design decision from functionality to visual design should be evaluated in terms of what solutions best serves the users ability to fulfill their objectives. Usability testing needs to explore many possible responses, seeking to find any barriers that might be inherent within website. Website interface is one of the most important issues that affect website usability.

Web interface structure: A web interface is a mix of many elements (text, links and graphics), formatting of these elements and other aspects that affect the overall interface quality. Web interface design entails a complex set of activities for addressing these diverse aspects. To gain insight into web design practices, Newman and Landay conducted a study wherein they observed and interviewed eleven professional Web designers (Ivory, 2001, 2002).

One important finding is that most designers viewed web interface design as being comprised of three components (information design, navigation design and graphic design) as shown in Fig. 1. Information design focuses on determining an information structure (i.e., identifying and grouping content items) and developing category labels to reflect the information structure.

Navigation design focuses on developing navigation mechanisms (e.g., navigation bars and links) to facilitate interaction with the information structure. Finally, graphic design focuses on visual presentation and layout. All of these design components affect the overall quality of the web interface.

Experience design encompasses information, navigation and graphic design. However, it also encompasses other aspects that affect the user experience such as download time, the presence of graphical ads, popup windows, etc., information, navigation, graphics and experience design can be further refined into the aspects shown in Fig. 2.

Figure 2 shows that text, link and graphic elements are the building components of web interfaces all other aspects are based on these. The next level of the Fig. 2

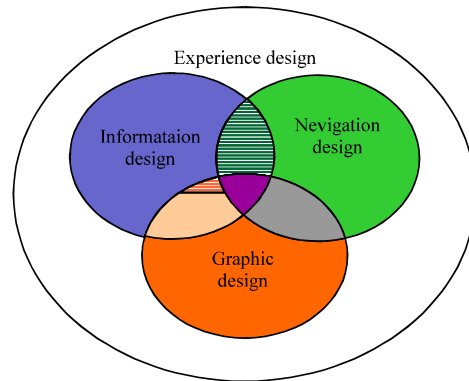


Fig. 1: Overview of web interface design

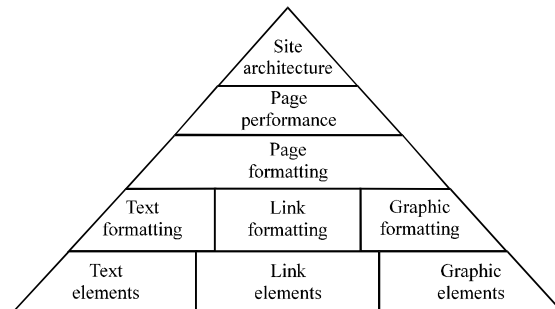


Fig. 2: Aspects associated with web interface structure

addresses formatting of these building blocks while the subsequent level addresses page-level formatting. The top two levels address the performance of pages and the architecture of sites including the consistency, breadth and depth of pages. The bottom three levels of Fig. 2 are associated with information, navigation and graphic design activities while the top two levels, page performance and site architecture associated with experience design (Ivory, 2002; Nielsen, 2006).

Web page measures: Web design can be characterized according to information, navigation, graphic and experience design. We conducted an extensive survey of web design literature including texts written by recognized experts (Nielsen, 2000; Berners-Lee, 1996) in order to identify key features that affect these design aspects and thus the overall quality of a website. We organize 55 of these features into the general classes summarized below; the number of features in each class is in parenthesis.

Text elements (11): Elements like the amount of text on a page, type, quality and complexity of text on a page. The measures are for both visible (e.g., all link text and heading words) and invisible words (e.g., meta tag keywords).

Text formatting (11): Elements regarding how body text is emphasized whether there is underlined text that is not in text links on the page; font styles and sizes if there is a variation in fonts and the number of text colors.

Link elements (9): Elements related to the number and type of links (e.g., graphic and text links) on a page.

Graphic elements (2): The number and type of images (e.g., animated and link images) on a page.

Graphic formatting (8): The minimum, maximum and average width and height of images as well as the amount of page area covered by them.

Page formatting and performance (14): These include color usage, fonts, use of interactive elements how the page style is controlled and other page characteristics.

MATERIALS AND METHODS

The analysis uses a collection of pages, all of them are informational websites in education, health, financial were selected for evaluation. Figure 3 explores the overall system activities and modules. The 1st step in the system is to download a page by giving the URL to a crawler module. HTML parser module enumerate frames, images, links that appear in a downloaded web page, support information about how element is formatted (e.g., bolded, colored, italicized, etc.) whether it is a link (internal or external one). The feature extraction module produces a set of features for comparison, page level measures assess many sides of web interfaces as we will show that in this study.

The extracted features are used to evaluate HTML pages. The Classifier module will classify pages to either (high, middle or low quality). The improvement stage is to improve the web page interface by providing the improvement list that guide the web designer to modify the web page interface to cope with the usability issues.

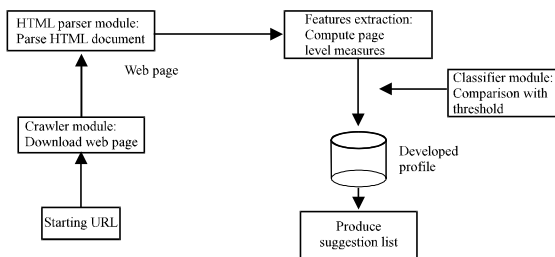


Fig. 3: Overview of the analysis methodology

System implementation:

```

k = InStr(1, st, "<a href")
if k > 0 then h = InStr(k, st, "<img")
If h > 0 Then
    If InStr(k, st, "border = 0") = 0 Then rb = 1 'Feature related to the
border of the image.
    imagelinkcount = imagelinkcount + 1 'Feature related to the
image link type.
    c2 = InStr(h, st, Chr(34))
    c3 = InStr(c2 + 1, st, Chr(34))
    imgname = Mid(st, c2, c3 + 1 - c2)
    Print #4, imgname 'Store the image name
in file number -4
    If InStr(1, imgname, ".mov") > 0 Or InStr(1, imgname, ".mpeg") > 0 Or
InStr(1, imgname, ".avi") > 0 Or InStr(1, imgname, ".qt") > 0 Then vedio
= vedio + 1 'Check for vedio.
    c2 = InStr(1, st, "alt") 'Check if the
image tag contains "alt" attribute.
    If c2 > 0 Then c3 = InStr(c2, st, ">")
    c2 = c2 + 4
    If c3 > 0 Then s = Mid(st, c2, c3 - c2)
    s = s + Space(1) : s = LTrim(s)
    For i = 1 To Len(s) k = InStr(i, s, " ")
    If k > 0 Then m = Mid(s, i, k - i)
    m = Trim(m)
    If Len(m) > 1 And i < k And m <> "&nbsp;" Then altcount = altcount
+ 1
    i = k
Else
    Exit For
End If
If Len(m) > 1 And m <> "&nbsp;" Then Print #3, m
Next
End If
End If
    
```

All WIE modules are implemented using Visual Basic. HTML page downloading module uses the windows API (WinInet) to download the web page of the given URL after that and by the aid of the crawler module that automatically retrieve the pages that have links in the current page, this process repeating itself until all pages of the given website are retrieved. HTML parser program check each line in the HTML page to extract the different characteristics. The following Visual Basic code section explains how we analyze the data inside the HTML file to extract the characteristics regarding to the images on a page: features are extracted from the previous characteristics according to the predefined categories (graphics, information, navigation) (Table 1).

Figure 4 shows a snapshot of WIE system. As shown, the system provides the abilities like webpage downloading, i.e., by the use of the crawler module, so we have to apply this function first. The downloaded page is from a website of a company that advertise it's experience in the field of civil engineering. Now, we have to choose the pre-processing option to analyze this page. The features are then extracted and evaluated using the classification option to produce the list of suggestions to modify the design of this page, some of these are related

Table 1: Web interface features

Feature ID	Names	Description	Categories	Aspects
Imgc count	Image count	Total images	Graphics elmenets	Graphics
Minimgght	Minimum image height	Minimum image height(in pixels)	Graphics formatting	Graphics
Maximgght	Maximum image height	Maximum image height(in pixels)	Graphics formatting	Graphics
Minimgwdt	Minimum image width	Minimum image width(in pixels)	Graphics formatting	Graphics
Maximgwdt	Maximum image width	Maximum image width(in pixels)	Graphics formatting	Graphics
ImgRb	Image Border	Check if the link image contains border	Graphics formatting	Graphics, N
Ads	Graphic Ad count	Number of images that possibly indicate ads	Graphics element	Graphics
Vedio	Vedio images	Check if the web page contains vedio images	Graphics formatting	Graphics
Imgpixels	Image pixels	Total area of page covered by images	Graphics formatting	Graphics
Hrco	Horizontal rule count	Number of horizontal rules	Graphics formatting	Graphics, I
Lnko	Link count	Total number of links in a page	Link elements	Navigation
Textlco	Text link count	Number of text links	Link elements	Navigation, I
Imglo	Image link count	Number of links that are images	Link elements	Navigation, G
Nbar	Navigation bar	If the page contains navigation bar	Link elements	Navigation, E
pagelco	Page link count	Number of links to other sections(i.e., anchors) within the page	Link elements	Navigation
Sitelco	Site link count	Number of links that point to destination pages within the site	Link elements	Navigation
Externallco	External link count	Number of links that point to destination pages outside the site	Link elements	Navigation
Arch	Link to archive contents	Check if the page contains link to archive contents	Link elements	Navigation
Homelink	Link to home page	Check if the page contains link to home page	Link elements	Navigation
Colorco	Color count	Total number of colors in a page	Page formatting	Graphics
Interactiveco	Interactive objects count	Number of text fields,radio boxes, buttons and other form objects	Page formatting	Experience
Marquee	Marquee	Check if the page contains a marquee	Page formatting	Experience
Externalcss	External style sheets	Number of .css files used in a page	Page formatting	Experience
Frame	Frame	Check if the page contain frames	Page formatting	Experience
Styleco	Internal style sheets	Number of internal style sheets	Page formatting	Experience
Bgnoise	Background noise	Check if there is background noise not for disabilities	Page formatting	Experience
Serif	Serif font count	Number of serif font faces used	Page formatting	Experience
Pagetype	Page Type	Functional type (0-home, 1-information, 2-research, 3-form, 4-others)	Page formatting	Experience
Psize	Page size	Page size in words (small <100, 100<middle<500, 500>large)	Page formatting	Experience
Sm	Site map	Check if the page contains site map	Page formatting	Experience
Spamuse	Spamming use	If number of title characters>64 then spamming = 1	Page formatting	Experience
Tbl	Table count	Number of tables in a page	Page formatting	Experience
E-mail	Email contact	Check if the page contains contact information	Page formatting	Experience
Wcount	Word count	Total number of visible words	Text element	Information
invisiblewco	Invisible word count	Total number of invisible words	Text element	Experience
Titlewcount	Title word count	Total number of title words	Text element	Information, N
Metawco	Meta word count	Total number of meta tag words (key words and description)	Text element	Experience
Headerwco	Header word counts	Total number words that are headers	Text element	Information
Lnkwco	Link word count	Total number words that are links	Text element	Information, I
Lnkhwco	Links that are headers	Number of header words that are links	Text element	Information, N
Avlwco	Average link word count	Average number of words link text	Text element	Navigation
Altwco	Alt word count	Number of words from image "alt" text tags	Text element	Information
Commwco	Comment word count	Number of words that are comments	Text element	Experience
Address	Address word count	Number of words in the address tag	Text element	Experience
Exclco	Exclamation count	Number of words near !	Text formatting	Information, N
Fbold	Font bold count	Number of words that are bolded	Text formatting	Information, G
Fitalic	Font italic count	Number of words that are italic	Text formatting	Information, G
Funderline	Font underline	Number of words that are underlined	Text formatting	Information, G
Emphwco	Emphasized word count	Fbold+Fitalic+Funderline+Exclco	Text formatting	Information, G
Capcount	Capital letters word count	Number of words that are capital letters	Text formatting	Information, G
Smallfont	Small font count	Number of words that are small size	Text formatting	Information, G
Lnkxtcluster	Link text cluster count	Number of link text areas that are highlighted in lists	Text formatting	Information, G, I
Fstrike	Font strike count	Number of words that are strike	Text formatting	Information, G
Fbig	Font big count	Number of words that are big	Text formatting	Information, G
Fontvar	Font variation	Check if there is font variation	Text formatting	Information, G

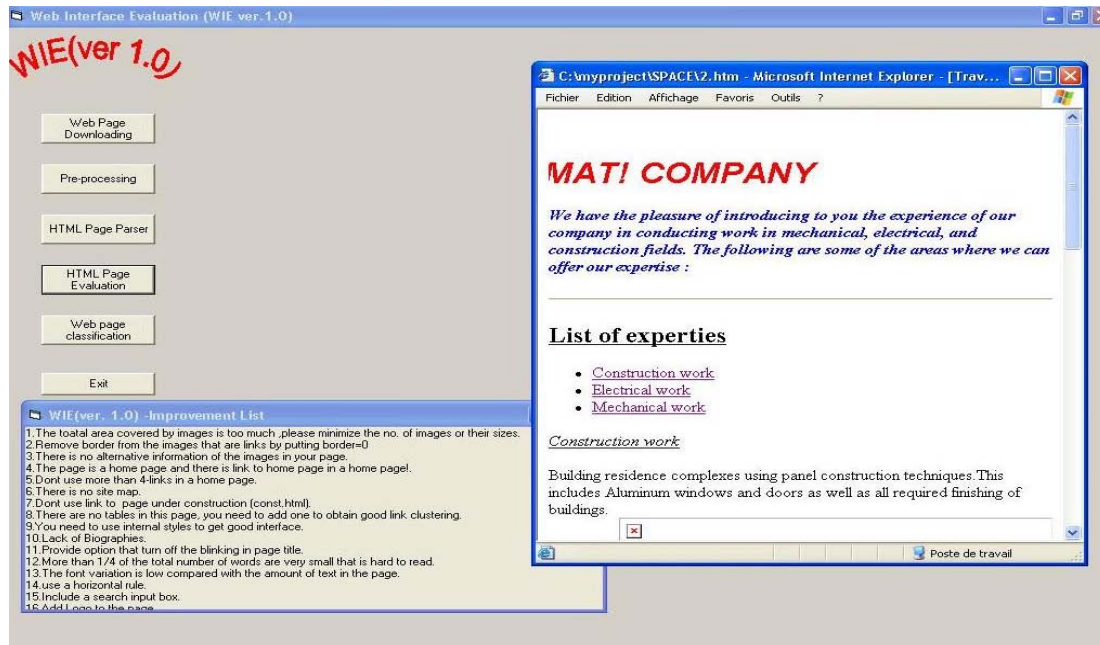


Fig. 4: WIE system main window

to the total area of the web page that covered by images in comparison with the amount of text, the lack of sitemap in this website, there is no option to turn off the blinking of the page title or lack of style sheets in this site. As we can see, it is large list of suggestions that gives an indication about the little experience of this site designer, WIE can help in modifying the bad designs.

RESULTS AND DISCUSSION

We examined guidelines for several aspects of web interfaces including the amount of text, fonts, colors and links and provide thresholds for these aspects. We are not suggest that these are the only important aspects of web interfaces, rather we highlight aspects that are relevant to many web pages and can be assessed with the tools. WIE demonstrates how novice web designers might apply the derived thresholds to improve the usability of their designs.

Amount of text on a page: The literature contains contradictory heuristics about the ideal amount of text for a web page. Some researches describes that users prefer all relevant content to appear on one page while others suggest that content should be broken up into smaller units across multiple pages. Furthermore, there is no concrete guidance on how much text is enough or too much. We can suggest that the text in one page not exceed 200 or 250 words is reasonable for information pages.

Font styles and sizes: The analysis on some Arabic web pages revealed that Arabic transparent is the predominant font style used on good pages; questionnaire with some people have shown these fonts to be more readable than Kuffi fonts online. Variation in font style (i.e., combinations of font face, size, bolding and italics) is acceptable to a certain degree and finally, the font size between 12-14 pts is suitable for information pages.

Use of graphical ads: Most texts suggest that graphical ads should be minimized or avoided. The measures of the number of graphical ads (animated and nonanimated) suggest that good pages are likely to contain no more than two graphical ads.

Length and quality of link text: Some researchers suggest that web designers use 2-4 words in text links; however others suggest that they use links with 7-12 useful words (i.e., words that provide hints about the content on a destination page).

The average link words measure suggests that text links on good pages contain from 2-3 words that is because our Arabic language have a possibility to express things in a small number of words as it is rich enough in comparison with other languages.

Colors combinations: The literature offers various recommendations on using a small number of colors, browser-safe colors, default link colors, color

combinations with suitable contrast and so on. The analysis revealed that good pages tend to use from 1-3 colors for body text as well as 1-2 colors for headings.

CONCLUSION

The researchers summarized about 55 interface design features extracted from web pages, all representing page level features. We gathered from books and articles the guidelines of web usability that almost all experts in this field are agree on. Thresholds for some measures are then computed based on these guidelines. In some cases such as the number and types of links and graphical ads what is done in practice contradicts the literature; perhaps these areas need to be examined with further empirical studies.

RECOMMENDATIONS

Future research entails validating the new prediction models, providing designers with more guidance on

interpreting model predictions and implementing design changes and building an integrated web site design and evaluation environment.

REFERENCES

- Berners-Lee, T., 1996. The world wide web: Past, present and future. *IEEE Comput.*, 29: 69-77.
- Ivory, M.Y., 2001. An empirical foundation for automated web interface evaluation. Ph.D. Thesis, University of California, Berkeley, Computer Science Division.
- Ivory, M.Y., 2002. Statistical Profiles of Highly-Rated Web Sites. University of California Press, Berkeley.
- Nielsen, J., 2000. *Designing Web Usability: The Practice of Simplicity*. New Riders, Indianapolis.
- Nielsen, J., 2006. *Alertbox: Current Issues in Web Usability*. Nielsen Norman Group Publisher, USA.
- UIE, 1999. *Designing information-rich web sites*. User Interface Engineering Report Series.