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An Analysis on User Interfaces and Future User Interfaces

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Abstract: Many research studies have been conducted to analyze different types of user interfaces. Some decades ago, Graphical user interfaces (GUI) was thought the most user friendly user interface because it overcame the difficult Command Line Interface. But to make the human computer interaction comfortable, many types of user interfaces are developed. It is also crystal clear from the research that research and analyses on past tools has gigantic impact on today's developers, in other words future applications. Here the question arises that why we need to have change.
The present study is conducted to go through the history of user interfaces and resultantly the future of user interfaces will be analyzed. The objective of this study is to research on Past and Present user interfaces to analyze and predict for the future User interfaces.

Keywords: user Interfaces; Human computer interaction; ubiquitous computing; human computer interfaces.

1. INTRODUCTION

Various types of techniques are used to analyze the different types of user interfaces. It was a time when human wanted to get rid of difficult command line interfaces and this desire come true when Graphical user interfaces (GUI) developed. To make the interaction with computer easier and more easier, various types of user interfaces came into being. Research results from various institutes, academies and organization play vital role in development and improvement of user interfaces. It is seen that in 70's a huge amount of experiments were done for the variety of user interface styles. It can be said that almost all applications on Windows, Unix, or the Macintosh has look and function in same fashion, primarily using a small set of constructs **(**Myers, Hudson, and Pausch, 2000) .

The stability of the tools is another important factor. It is also an important factor for the end users that the consistency should be there because usability of an interface or any other application is essential as it is an International Standard Organization's recommended factor. But the history of user interfaces tells that the continuous evolution is in progress. Here the question is arisen why we need to have change or the human needs to have interfaces very near to the nature. The human needs to have the interfaces which should be able to communicate with them like human being. This thought needs to be satisfied.

The present study is conducted to go through the history of user interfaces to analyze the future of user interfaces; that human needs what after these marvelous types of user interfaces. This study is conducted to research on Past and Present user interfaces to analyze and predict for the future user interfaces.

2. MATERIALS AND METHOD

User Interfaces are the communication means between human and computer. The basic goal of this communication between human and computer is based on the control and operation of the machine. The basic design consideration for these machines should be based on technology and other factors like ergonomics etc also. The history of the user interfaces will tell that user interfaces are innovated on the basis to provide the highest degree of usability to its users in performing their tasks. According to (Myers, Hudson, and Pausch, 2000) the research on past tools is helpful for developers in design and implementation of present and future tools and applications. Therefore, the following factors should be considered:

- The reasons to step forward to better than present.
- Standards and requirements .
- Thought behind the word better in context of the User Interfaces.

The journey from past will lead us to think beyond the present. Now the computer devices are all portable and mobile devices and the World Wide Web provides connectivity to all computers everywhere that also affected user interfaces (Myers, Hudson, &Pausch, 2000). User donot want to be compelled to rely on screen based Text and graphics (Ullmer and Ishii, 2001).

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3. VIEWPOINT BEHIND THE 'BETTER'

When the things cannot stable their present shape, then it is the time to think about the thoughts, ideas and philosophy behind these changes. Is it for better. While analyzing the user interfaces, the following were found as the underpinning for change towards the better one (Myers, Hudson, and Pausch, 2000).

1. The success of any tool is based on the problem that is addressed accurately by the tool or application.
2. It is important that the learnability level of the system should be high enough to be learnt by the user easily.
3. It is proven from the past experiences that those automatic tools could not get success which was not being easily predictable by programmers.
4. Those tools are also poor at usability which was not consistent.

All above mentioned points concludes that the failure or success of any tools or application is directly proportional to the usability.

4. PAST RESEARCH ON USER INTERFACES

It is the area of user interfaces where research has a great impact on the present software development practices(Myers, Hudson, and Pausch, 2000 ;Ullmer, and Ishii, 2001; ISO/IEC 9126-1, 2001 andMyers, Stiel, and Gargiulo, 1998). It is analyzed from the past research most of the novel research work has been done in universities and academic institutions. History provides evidences that research has a great impact on human computer interaction (HCI) also research plays always a great role in changing the computing (Myers, 1998). All present concepts are just the implementation of any research previously done for example in the universities. For example the ubiquitous graphical user interface used by Microsoft Windows 95, is basically based on the Macintosh; the following Diagram shows that from where the roots of this GUI were started to groom.

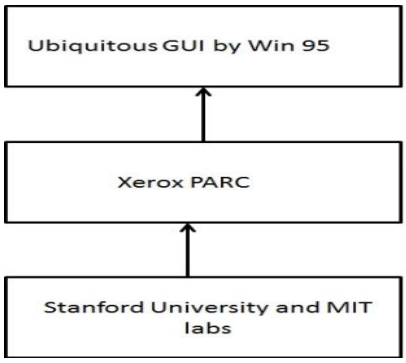


Fig. 1: Depicts the basis of Ubiquitous User Interface used by Micro soft Win 95.

Motivation for this work is to elaborate future of user Interfaces from the past and present literature review about the user interfaces.

Sutherland was the first person who confirmed present ubiquitous Direct Computing PhD Thesis at MIT (Myers, 1998; Hutchins, Hollan, and Norman, 1985 and Sutherland, 1963). Direct manipulation is basically a good representation as an interface design (Hutchins, Hollan, and Norman, 1985).According to the Shneiderman, the Direct manipulation systems have the following properties (Hutchins, Hollan, and Norman, 1985):

1. The objects of interest should be presented continuously.

2. Presence of physical buttons to avoid syntaxes.

3. The result of any operations must be visible without delay (Hutchins, Hollan, and Norman, 1985).

The basic goal of the Direct Manipulation interfaces is to remove the gulf of execution and gulf of evaluation.

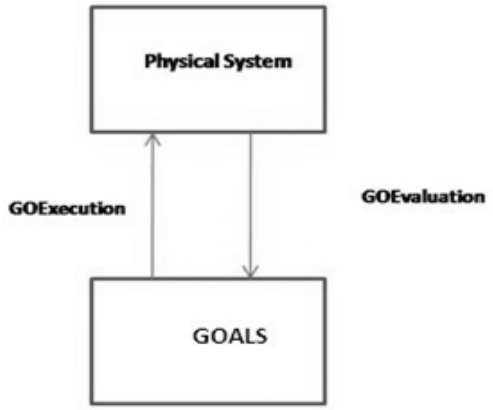


Fig. 2: Gulf of Execution and Gulf of Evaluation(Hutchins, Hollan, and Norman, 1985)

- The idea of "WYSIWYG" (what you see is what you get) originated at Xerox PARC with systems like Bravo text editor and the Draw drawing program (Myers, 1998 and Goldberg, 1988).

- "Direct Manipulation for everyone", this concept was incorporated by Alan Kay in 1977 in his article about the Dynabook (Myers, 1998and Kay and Goldberg, 1977).

The concept of HyperText introduced by Vannevar Bush's famous MEMEX idea from 1945 . The wide use of linking was introduced by Engelbart's NLS

system at the Stanford Research Laboratories in 1965 (Engelbart, and English, 1968).

Attentive User Interfaces (AUIs are sensible that they are in the foreground of user attention by observing the presence, activity, and eye-gaze behavior of the user. (Vertegaal, 2003).

5. ADVANCED USER INTERFACES

Primarily; the user interfaces are the complete system to the users (Scott, 2012).In this section, the user interfaces will be discussed in view of usability and what are the advance user interfaces. Listening and speaking are the fundamental natural characteristic of human being. This quality is followed by the Speech User Interfaces. To map these skills for a speech user interface is very difficult and needs an enormous programming (Lai, 2000). Only for a telephonic reservations system, many speaking interfaces and applications are being used (Lai,2000 and Cohen, Giangola and Balogh, 2004).Multimodal interface design is an emerging user interface which is an efficient, flexible and powerful communication tool for HCI (Oviatt, and Cohen, 2000).In the earliest examples of multimodal systems, the Bolt's (Bolt, 1980) is remarkable, which provided the pointing and conversation facility at the same time (Oviatt, and Cohen, 2000 and Bolt, 1980).Human is continuously struggling to use all his God gifted natural senses in the digital world (Ishii, 2009). These interfaces were first called as Graspable user interfaces. The GUI is rejected by the users because of its conventional keyboard and desktop knotting up. When the Tangibile user interface emerged then vision of Ubiquitous computing happens and the dream of interacting the digital world with physical world comes true (Ishii, 2009 and Shaer, and Hornecker, 2010). Urban Planning Workbench (URP) (Underkoffler, and Ishii, 1999) is an example for Tangible user Interfaces. Finally, know that ubiquitous computing contains the strong ground for Tangible user interfaces (Ullmer, and Ishii, 2000). Tangible interfaces are very advatageous for chidren's learning i.e., (Xu, 2005), i.e., I/O Brush (Ryokai, Marti, and Ishii, 2004) a drawing. It is a physical brush with sensors and video camera (Ryokai, Marti, and Ishii, 2004). Hence; Multitouch user interfaces, TUIs, spoken interfaces, multimodality style interaction are the interfaces which helped to remove the Gulf of execution and gulf of interaction (Millard, and Soylu, 2009).

Table 1: Shows different Multimodal systems and their characteristics (Oviatt, and Cohen, 2000)

Multimodal System	QuickSet	HumanCentric Word Processor	VR AirCraft Maintenance Training
Recognizing the various modes	Simultaneous and individual mode	Simultaneous and individual mode	Simultaneous and individual mode
Type and size of Gesture Vocublary	Pen Input,Multiple Gestures,Large Vocublary	Pen input	3D manual Input, VR environment
Type of signal fusion	Late semantic fusion, unification, MTC Framework	Late semantic Fusion, Frame Based	Late semantic Fusion, Frame Based
Type and Platform of application	Wireless handheld,VR Applications, Digital Applications	Desktop computer processing systems	VR systems
Evaluation Status	Proactive user centered design and iterative system evaluations	Proactive user centered design	Planned for future

6. RESEARCH RESULTS AND FINDINGS

In this section, the research findings and analysis will be discussed:

All the human struggle for better is the actual struggle for improving the human computer interaction.

Human needs always the natural interaction between computer and him since the birth of computer, i.e. according to Norman, Shneiderman, the good interface must remove the gaps between the user perception and the systems response. In (Hutchins, Hollan, and Norman, 1985), the authors discussed the two characteristics of directness feel which are:

- There should not be any gulf between the perception of user, and the system response.

• The gap will be removed or short if the user can translate his thoughts into some actions and the system on the other hand should be able provide the expected response to user.

• The user should directly involve with system. According to (Hutchins, Hollan, and Norman, 1985).

• The target or the targeted object's representation should be incessant for interaction.

• No complex syntaxes should be entertained.

• Rapid reversible operations should be allowed.

From all this study it is come to know that human need the user interfaces which can be able to make human computer interaction natural.

Furthermore; the user interaction moves towards the easy, direct and physical interaction with computer. But it is seen that computing is directly involved in daily life. Now, the main issue is to access the information directly anywhere the user needs.

Human desires the right to use information of his interest anywhere and anytime.

Ubiquitous Computing (Ubicomp) is the requirement of this era because of the involvement of computing into our real world everywhere (Alan, Janet, Gregory, and Russell, 2004)

Changing Relationship between human and computer

Affordance is one of the social issues and technical issue as well; that ubiquitous computing fulfils the requirements On the other hand these computer interfaces are not just the personal computers but pervasive and omnipresent computing everywhere and every time (Weiser, 1993).The following table will show the user interfaces and their related interaction themes:

Table 2:User Interfaces and Interaction Themes

User Interface	Interaction Theme
Speech Interfaces	Ubiquitous Computing
Multimodal	Ubiquitous Computing
Multimedia	Ubiquitous Computing
MultiTouch	Ubiquitous Computing
Tangible User Interfaces	Ubiquitous Computing
Wearable	Ubiquitous Computing

It is analyzed from the current study that future of the user interfaces and their sustainability depends upon the accessibility of information of users' interest anywhere and anytime because, the current challenges to the computing community are:

• Human's struggle for natural interaction with computer.

• Human always endeavors to access information any time anywhere he wants.

• Only those user interfaces will be sustainable which will be able to support the varying relationship between human and computers.

7. CONCLUSION

In view of challenges discussed in section 6, it is analyzed from the current study that ubiquitous computing is the only way where human can be satisfied for all his desires. It is therefore concluded that whatsoever be the names of user interfaces or human computer interfaces, i.e., multimodal, multimedia, multi-touch, tangible user interfaces etc. but the future sustainability is hidden in following the golden rules suggested by (Shneiderman, 1987) and guidelines for interface designs discussed already in previous sections. From all these facts it is found that ubiquitous computing will be most sustainable theme for user interfaces in future.

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