WINDOWS INTERFACE FOR DISABLED PERSON

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ABSTRACT*:* Technology is improving day by day, and playing a vital role in improving the quality of life. People with special needs like people who can't see (Blind), people who can't hear (Deaf) and people who are mentally not stable face challenges to communicate with these systems due to lack of user friendly nature of technology devices. This work focuses on the importance of building an interface for special persons who might not have the abilities of a normal person. This study was carried out to show, what kind of hardware and software support is currently available for the above mentioned disabled persons and its ease of use for them in current and past editions of Windows. At the end of this paper critical review in the current and past systems has been done. This review has highlighted the deficiencies and recommendations are suggested to overcome these deficiencies.

Key words*:* Accessibility, Disability, Special people, User Interface, Windows.

INTRODUCTION

If we observe last few decades the technology has grown very rapidly, this validates the law known as Moore's law about time and cost, which states that *"the number of transistors that can be used inexpensively in an electronic circuit will be doubled after every two years."* In other words, technology is grasping the world like a forest fire. At present digital technology has taken over the world. Most of daily usage machines are digitized. Moreover internet has grown at such a pace which allows to keep all of information at finger tips and has made this world a global village. These are the facts which have made every person's life incomplete without this technology.

In UN's convention on the rights of persons with disabilities, it was declared that there were 650 million disabled persons in the world. Pakistan also have total of 4.22 million disable persons (UN Treaty Collection, 2010). For those persons with disabilities, conventional computing devices are difficult and in some cases impossible to use.

This paper is about the utility and importance of computing in current and coming era and if you are somewhat incapable to use it due to any disability your survival within race will almost gets over. To overcome the problem of disabilities of usage computer operating system designers are in continuous effort to devise and improve means that support to alter their disability and also help them to stand with the others. Rest of paper contains some comparison of already existing windows interfaces and accessibilities for disable persons. A detail and in depth analysis of accessibilities exist in windows 98, windows vista, windows XP on the parameters that includes the interface required, extra cost, usefulness, practical implementation and technology limitations of this era.

Disabilities: A disability is a condition or function judged to be significantly impaired relative to the usual standard of an individual or group. Some common disabilities are:

Blindness: The physiological or neurological aspects causing condition of absence of visual sensitivity is blindness. Blindness characterizes various dimension extended to describe the degree of vision loss. The clinically documented as NLP, the acronym for "no light perception is absolute short of form and visual radiant acuity. The residual vision *Blindness* is often an exercise to describe serious visual injury. Those portray as having simply light perception comprise of no more sight than the ability to enlighten light from dark and the common route of a light source.

Deafness: The physiological or neurological aspects causing condition of absence of audio sensitivity is deafness. People who are partially deaf can often use hearing aids to assist their hearing. Deafness can be evident at birth or can occur later in life from several biologic causes. Deaf people use sign languages as a means of communication. Hundreds of sign languages are in use around the world. In linguistic terms, sign languages are as rich and complex as any oral language, despite the common misconception that they are not "real languages".

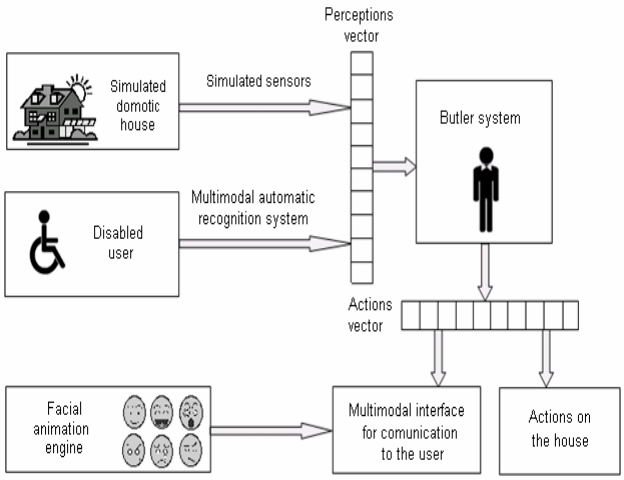
Physical or mental Disorder: Any impairment which limits the physical function of limbs or fine or gross motor ability is a physical disability. A mental disorder or mental illness is a psychological or behavioural pattern generally associated with subjective distress or disability that occurs in an individual, and perceived by the

majority of society as being outside of normal development or cultural expectations.

Related work: In this section a survey of state-of-art for disabled person is presented.

Systems Helpful for Disable People

This system is a virtual house by demotic's system for disable persons. This virtual house provided a new mechanism to assign and facilitate domestic tasks, to assist disable people. Artificial intelligence techniques, virtual reality, multimodal interfaces, and digital networks were used to create a "Virtual Butler" , shown in Fig. 1.



(Fig. 1 Block diagram of working of virtual butler)

The function of the Virtual Butler System was to receive a vector of perception coming from the demotic sensors of the house, as well as requests and answers for the users, especially the disabled person. Using this vector, the butler can have knowledge about the house and the tasks that have to be done (agenda), and then he evaluates the state of the house and the user. From that evaluation, a vector with a set of actions was obtained, and the butler would be able to update the state of the house and the users. Much work has already been done (Bilal, et al, 2011) (Songmin, et al, 2012) in this domain.

Interface System for Speaking Disabled People: There are many techniques to interface tongue like, electrical contacts, Hall element techniques and pressure sensors. Commercially available tongue control systems are based on pressure sensitive buttons placed in the mouth cavity over the tongue. The limitation of electrical contact is that it may not function during eating and talking. The technique with the Hall element faces same limitation. Further, the use of pressure sensitive sensors does not seem optimal, since normal speech and swallowing generates tongue-palatal pressures in the range of 20-60% of maximal achievable pressure, which poses demands on the detection threshold and therefore may increase the risk of fatigue. The use of pressure-based sensors may limit the maximal number of sensors that can be placed in the oral cavity (Fig. 2), since the requirement of pressure increases the tongue-palatal contact area. Utilization of this selectivity would make a variety of electric aids, including wheelchairs and neural prostheses, controllable with a wide range of commands from the same interface, making the tongue-computer interface suitable for disable persons. The work done in this study is supported by (Xueliang, et al, 2007) (Hector, et al, 2008) (Lotte, et al, 2009) in this domain.

Figure 2. Left: The palatal plate (placed on a mould of the upper part of the mouth) with inductive coils and a silicone tube leading the wires out of the mouth. Right: The activation unit glued to the tongue.

Voice Activated Appliances for Severely Disabled Persons: In this work, researchers described a speech recognition interface for the control of powered wheelchair and home automation system severely disabled person's voices. In particular, they considered that their system can be operated by inarticulate speech produced by persons with severe cerebral palsy or quadriplegia in real environment (Soo Young and Heroaki, 2009)

The research was carried out for two purposes. One was for easy control of various home appliances by voice, and the second was is to serve severely disabled person's movement using voice activated powered wheelchair, as shown in Fig. 3.

The researchers have worked in the same area to show its importance and need. The no. of papers one can find in literature for further reading different voice control techniques and applications (Mardiana, et al, 2009) (Peter and Joe, 2002) (Yusuf and Kemal, 2009)

Examples In Operating Systems: The Operating System (OS) is the key parameter of software in computers, because this makes computer serviceable and therefore, it is mainstream. Thus, accessibility on the whole seems important for operating systems.

Windows 98: The concept of accessibility wizard was first given in Windows 98. It helped users to adjust their

computer's accessibility in a simple manner. Even though it was simple but it did rather at a higher price. All of the options within the wizard could be accomplished elsewhere in Windows and generally with more options.

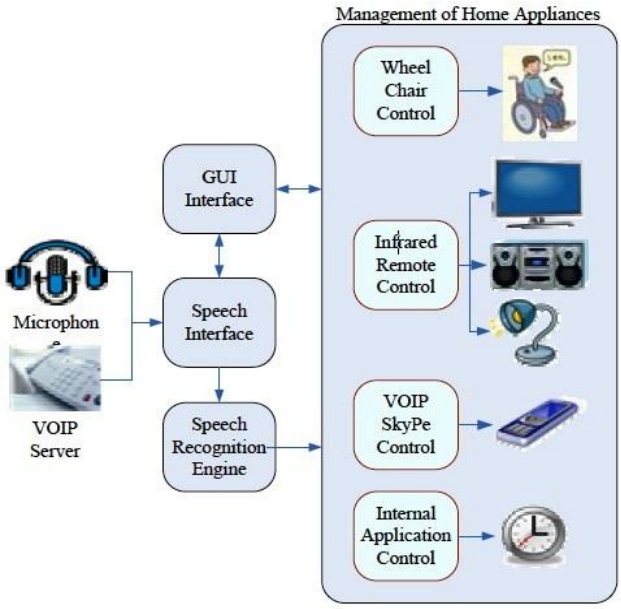


Fig. 3 Voice activated home appliance control system design

Navigation and devices alternatives: The persons with low visualization and color blindness can be benefited by variation of size/color of navigation elements, because they can alter the size, contrast or color of window titles, menu text, scroll bars and other fundamentals. Moreover, the mouse pointer properties can also be altered by making it more high-contrast, animated, and enlarged.

Narrator: Sound Enhancements are available in the form of Show Sounds and Windows Chat. Captions are displayed with the help of Show Sounds applications whenever an application has supplementary caption. The Windows Chat utility facilitates up to eight users to be in the conversation via networked computers, which can be useful for people who are deaf, so others may help him understand.

Other systems: Special Keys allow users with limited mobility to access a range of helpful features in Windows 98. Sticky Keys make possible for users who type with one finger or a head-or-mouth-stick to press two or more keys simultaneously. Filter Keys ignore keystrokes not helding for a specified length of time. ToggleKeys make the computer produce a beep every time the Caps Lock, Num Lock or Scroll Lock keys are pressed. And Serial Keys permit users to control a PC using different or augmentative communication devices.

Windows Vista: There are a number of systems to improve accessibility to disabled people in Windows Vista. Brief descriptions of these are accessible on Microsoft website. There are also guidelines and tutorials offered, to be able to set up the accessibility systems.

Navigation and devices alternatives: Windows Vista include a on-screen keyboard, which can swap the real keyboard. It also includes shortcuts, which allow to use arrow keys instead of the mouse, or to open various windows and services via a combination of keys. The OS has also a feature of "filtering keys": it ignores keystrokes that go on too quickly, to prevent accidental strikes. This last thing can be attention-grabbing for some disabilities where people shake.

Narrator: An appealing system to help blind or visually impaired persons is called Narrator. This is a system which holds recorded sentences, and plays some of these sentences as an event occurs. For example, it can notify the user that he has just opened a window, or that there was just an error (unfolding the error), and so forth.

Other systems: There are speech recognition systems, of which we have discussed before (cf. subsection 3.1.1). There is also a visual system of notification, with blinking screens, which can take the place of sound notifications. Finally, there is a centralized control panel, to allow manage plenty of parameters from a single point.

WINDOWS XP: Accessibility features provided in Windows XP Professional are very helpful in providing ease for users to deal with variety of particular problems. Table 1 recapitulates some common complexities and the solutions that are put together into Windows XP Professional.

Narrator: Narrator provides text-to-speech utility in Windows XP Professional that reads objects that are on the screen, moreover it also reads out their properties, and their spatial associations. The execution of Narrator can be done from the start menu or by using Utility Manager. Narrator automatically reads certain information when it alters on the screen. Narrator come in package within the operating system but a user can install any alternative solution as per his /her convenience.

Narrator privileges provide the users and administrator to customize their view to the application the way they feel comfortable. With speech option, user is allowed to adjust the pitch, speed or volume of the voice. The reading option can provide assistance to Narrator to read aloud, such as DELETE, ENTER, printable characters, or modifiers. The move mouse pointer option initiates the mouse pointer to follow the dynamic object on the screen. To configure Narrator to announce new windows, menus, or shortcut menus when it displays them, the announce events on screen option will help you.

Table 1- User Disabilities and Windows XP features

User Disabilities	Windows XP Professional features
Features provided in a multiple user network.	Accessibility Wizard, Accessibility Options in Control Panel, Utility Manager.
Looking which accessibility features are activated.	Status indicators on the notification area of the taskbar.
Searching for some feature.	Windows XP Professional Help.
Detection keyboard navigation shortcuts.	In Accessibility Options, on the Keyboard tab, select Show extra keyboard help in programs.
Sound Disability	Show Sounds, Sound Sentry, and Notification options.
Setting keyboard configurations.	Dvorak keyboards, On-Screen Keyboard, MouseKeys.
Using a keyboard because of unintentional repeating of keys.	Filter Keys and Sticky Keys in Accessibility Options.
Making configuration of a mouse.	MouseKeys in Accessibility Options, keyboard shortcuts.
Making cursor flashing.	Cursor Options in Accessibility Options.
Disability in watching screen elements.	Narrator; Magnifier; in Accessibility Wizard, select I am blind or having difficulty seeing things on screen, third-party assistive technology.
Built-in accessibility features.	Serial Keys in Control Panel for third-party assistive technology.

Keyboard Audio Cues: People having vision disability face some difficulties in noticing lights on the keyboard which indicates caps lock, num lock, and scroll lock conditions. ToggleKeys prompt audio helps them to understand whether these keys are on or off. When ToggleKeys is turned on, it creates a high-pitched beep. In turning off, it produces a beep that is an octave lower. ToggleKeys option can be turned on in Accessibility Options in Control Panel. Shortcut key to control ToggleKeys can be used for this purpose.

ToggleKeys is also helpful to healthy persons, like for those who have a habit of pressing the caps lock key instead of the TAB key because it intimates them. For keyboards which do not have display lights for the caps lock, num lock, and scroll lock keys, ToggleKeys provides means for tracking that position of these keys.

Magnifier: Increasing a portion of the display can help understand things better for many users with low visualization. The function of Magnifier is to displays an enlarged portion of the monitor in a split window. As Magnifier can be accommodating for special use, need a magnification service with a higher utility for day by day use.

The functions of Magnifier are:

- Standard display size can be magnified. To an area of the screen up to nine times.
- Select, chase the mouse pointer, the keyboard focus, the text editing focus, or any arrangement of these three. To have in the magnified area.
- Color inversion for contrast.
- Relocate and resize the Magnifier display area.

Keyboard Options: It is difficult for a disable person to use ordinary keyboard. The feature keyboard filters, developed into Windows XP Professional sometimes helps user by adjusting irregular motion tremors, slow response time, and conditions like wise. There are filters present for typing aids, such as abbreviation spreading out tools, word prediction and add-in spelling checkers.

The solution for the disable person to use input devices is to provide them input device that are different from the standard keyboard. These include alternative and easy to use layouts, simple shortcuts, and specialized and precise filters that operate on the standard keyboard but modify the behavior of keys to specific accessibility needs.

Tables-2 through 6 indicates vital keyboard shortcuts for the user who has some difficulties in using the mouse or other input methods and should rely on the keyboard to navigate through Windows XP Professional.

Table -2 Shortcut Keys for Accessibility

Feature	Shortcut
Filter Keys on or off.	Press SHIFT for 8 seconds
High Contrast on and off.	Press ALT+ SHIFT+PRINT SCREEN
MouseKeys on and off.	Press ALT+ SHIFT+NUM LOCK
StickyKeys on and off.	Press SHIFT 5 times
ToggleKeys on and off.	Press NUM LOCK for 5 seconds
To open Utility Manager.	Press WINDOWS LOGO key+U

Table -3 Shortcuts for Accessibility Wizard

Accessibility Wizard	Key String
Open Accessibility Wizard.	WINDOWS LOGO key, All Programs, Accessories, Accessibility, RIGHT ARROW, ENTER
Scroll into settings.	UP ARROW, SPACEBAR; or DOWN ARROW, SPACEBAR; or TAB, SPACEBAR for setting
For next screen or for saving settings.	ENTER
For closing Accessibility Wizard.	ALT+F4

Table -4 Narrator and Magnifier

Action	Key String
Begin Utility Manager.	Press WINDOWS LOGO key+U
Begin Magnifier.	Press WINDOWS LOGO key+U, ALT+TAB, down-arrow to Magnifier
Begin Narrator.	Press WINDOWS LOGO key+U, ALT+TAB, down-arrow to Narrator

Table -5 Shortcuts for Help Topics

Topics in Help	Key String
To Display Help.	Press WINDOWS LOGO key, H
To Select "Accessibility for People with Disabilities."	Press TAB repeatedly to topic, ENTER
To Enter a topic content area.	Press ENTER
To Select a link.	Press TAB repeatedly, ENTER
To Return to Help table of contents (move between panes).	Press F6
To Close Help.	Press ALT+SPACEBAR, C

Recommendations and shortcomings

Blind Persons Interface Lacking and Proposals: The important constriction for blind persons on the use of computers is lack of sight and for this they have to rely on the sense of hearing. Why is it a problem? First, blind persons have to examine and understand the structure before exploring. But this is problem with unusual and new interfaces. Second, for gaining just the same amount of information as that of person with sight, the impaired user has to listen to a long speech for it. Going through a document, chapter or article A sighted person will simply identify the desired word or phrase in just a glimpse, as they have sense of vision supporting them which is quite difficult visual impaired persons as they have to go through entire document to find either it is the desired one or not and how much of it is relevant to them and where is it. A blind user, even jumping from heading to heading, has to wait because of slower screen reader to listen the heading: even turning the speech settings to fast will still not be as fast as for a person of vision.

For the described above limitations, order and time is to be fixed to illustrate we can consider of using principle such as of less speech to generate maximum output. This will increase utilization: extra amount of information it not only creates a diversion as this amount of information might not be that disturbing to the sighted person but it is definitely a distraction for the impairing person as of using the interface. Unsighted users should not be asked for use of a complex interface with many options. If a user somehow is unable to grasp or misses some of the speech, user will have to go through again, thus requiring an explicit way to repeat them. Importantly user must have control on whatever is being said: sighted persons are out of bound to look wherever and whatever in the documents such kind of control of focus should also be provided to those users using interfaces for impaired person. Means to navigate through the document, go back, stop, repeat, skip items and explore the available text.

Requirements for Using Web: The realizing feature about the web pages is that they are not completely in standard arrangements as well as full of rich features. A way has to be described to accommodate blind users for such complex graphical interface by the usage of hotkeys and making them understand of such an interactive interface. If you surf through different WebPages it wouldn't take much time to understand that no such interface exists that which is consistent enough for web pages. If we go through an interactive webpage you will find that it cosmetics as an independent application. Imagine of accessing a book selling webpage which is full of different links and images. You will came through that there is no direct short key for getting in contact with the owner of the webpage or searching that website whose links might be available on the page, as the different pages have different interfaces so it requires to be explored and therefore a lot of time and effort of the blind person is put into this to reach their desired data.

Short Comings of Window Browser: In case of blind persons using the web, the thing comes across the mind is to use screen reader with conventional browser such as Internet Explorer. The problem is that web pages are not of standard interface and that every application has its own demands to be fulfilled on screen reader. This creates considerable complications for screen reader. Navigate through a complex web page and try to access it without visualizing it. In Particular with internet explorer there is a cursor blinking showing the place where to delete, enter or edit in a text editor. Sighted user can see different areas simultaneously and can move the cursor accurately to the desired location for editing. This is difficult task with screen readers. As the readers focus has to be diverted to that point which is the area of interest and this is normally done by moving cursor to that point. In browsing windows most of the data is not alterable. The only items you can select are the links or form items. The screen reader reads from top to bottom and causing a lot of time to be consumed where as the tables, frames and forms add complexity to this. Some advance screen readers do provide special navigation for web browsing with some success but the mechanism is quite complex and helpful for skilled and experienced users but they are not easily accommodating to the newly blind users who are adapting this technology late in life.

Deaf Personals: Computer usage is not that complicated as in the case of blind persons as most of computer operations require visual contact with it. So fewer adaptations are required. Certain problems do sustain whose compensation should be taken into account.

Requirements: On many occasions, the computer tasks can be easily be completed without hearing aid such as editing a document, sending an e-mail browsing the web pages, computing the mathematical equations however certain operations do involve sound such as creating an alert or indicating of an error for instance we hear a sound on receiving an e-mail or hear an annoying sound on encountering an error. Therefore there should be some alternative of alerting or conveying computer messages to the user without using the sound.

It becomes thornier when they try to go through lectures, videos, audio presentations on computer systems. As these require that the speech should be understood in order to understand the text. The only solution is to provide the speech in written form to deaf persons so that they can understand what the voiced is trying to convey. Moving a bit further, captioning was developed which not helps the deaf to see the spoken text but also informs the reader about the sounds that are creating intentionally or not any might be of concern to them.

Shortcomings: In current era, creating and uploading a video on internet is not a big deal. But it is hard to keep tracking of it and providing equivalent captioning and unfortunately creating subtitles is reasonably costly and time consuming. And this is definitely a dilemma which needs to be addressed. In many countries it has become legal requirement. Also some public agencies have made captioning associated to their company and audible information and public notices have captioning in them.

The agitations of the deaf can be seen if a person simply switches off its speakers attached to its system and attempts to manage the daily routine as it was. Attempting to access an online radio web page or online video site with speakers off, will create the same pain as it is for deaf.

Conclusion: Creating the essence of all whatever is surveyed in this paper is that an ideal system is required which have the properties to learn from the life routine of the person as well as able to understand the person for whom it is designed for, in that way it will be able to overcome the areas of deficiencies . And of course this wouldn't be able without the hard ware support. Every person has the severity of disability of its own so a hard lined system is not effective. A system that is flexible to the consumer needs is viable. In addition the cost of such system wouldn't of normal as it is designed for normal persons in bulk. So a person may not be able to afford to buy such a system. This survey paper shows that a lot of work is done but still much more is required to understand and accommodate these people in their cause of distress.

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