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Evolution of User Interfaces for the Visually Impaired- Part 2

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Evolution of User Interfaces
For the Visually Impaired
(Part-2)*

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[This article is divided into two parts. This is the second part of the article.]

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9. **Inventions on Adaptive Techniques**

As we discussed earlier, it’s a great challenge for the inventors to visualize the difficulties of the visually impaired user and design such interfaces which would be helpful to them. If we look at the patent database, the numbers of such patents are very few. Still there are some patents assigned to IBM, Microsoft and other companies, which are great inventions on user interfaces for the visually impaired. We will discuss on six such patents in the following pages.

9.1 **Invention-1: US patent 5223828**

Conventionally the message boxes (on software user interfaces) are displayed in a box with options as “yes”, “no” etc. This method is quite convenient for the normal user but does not help the visually impaired. There is a need to enable the visually impaired user to interact with such message boxes.

US patent 5223828 discloses a method of enabling the blind users to handle the message boxes. As per the invention, initially when the message box first appears, the text contents are audibly announced (using TTS or so). Then a homing signal is given by using a tone. The pitch of the homing sound changes according to the distance between the buttons and the mouse pointer. When the mouse pointer moves closer to the options there is an increase in the pitch of the homing sound which gives a feedback to the user whether the pointer is moving closer to or going away from the option buttons. When the pointer moves on to a push button, the caption of the push button is re-announced. Thus the user moves the mouse from button to button to hear the options and finally selects the one desired.
9.2 Invention-2: US patent 5287102

The previous invention although helps the blind user to handle a message box, it does not help her to locate other icons on the desktop. There is a need for her to locate different icons on the desktop and visualize their positions on the screen.

US patent 5287102 discloses a method of enabling a blind user to locate icons on a graphical user interface. According to the invention the system will provide audio information about the position of the pointer on the screen. When the pointer is located in the background the system generates one type of sound and when the pointer is on an icon, it generates a different type of sound. When the pointer is positioned in the background it gives a stereophonic sound to inform about the location of the pointer whether positioned towards the left or right side of the screen. Besides, when the pointer is on an icon positioned in the left side there is more sound from the left speaker and when the pointer is on an icon positioned in the right side there will be more sound from the right speaker. This stereophonic effect helps the user to know the position of icons on the screen.

9.3 Invention-3: US patent 5461399

In previous invention the blind user knows about positions of different icons on the desktop. But in case of a GUI environment having multiple windows, the blind user cannot know whether the pointer is on window-1 or on window-2, or the pointer is on an icon in window-1 or is on an icon in window-2. There is a need to develop a method for the blind users to differentiate the icons in one window from another.
US Patent 5461399 discloses a method to solve this problem. The blind user can differentiate the icons of one window from another by hearing the sound associated with the icons. According to the invention, two different sounds will be associated with each object on the screen. The first sound is common among all objects in the class (i.e., same for all icons in a window) but unique among other classes (i.e., different for icons in different windows). The second sound is unique to the object in the class (i.e., different sounds for each individual icon in the window). By listening to their audio signals of the objects the visually impaired user can identify different objects inside the class and distinguish them from the objects in other classes.

9.4 Invention-4: US patent 6445364
When the user has a very low vision he can see only the large objects. The conventional GUI does not help him. There are certain mechanisms to enlarge the display on a conventional screen; the enlargement displays only part of the page or object or worksheet and the rest extends beyond the screen. One may go for large monitors or projectors but those are expensive, space consuming and not suitable for individual use.

US Patent 6445364 addresses this problem by inventing a virtual monitor for enlarged display. The invention is a head mounted display, which allows enlarged virtual display of the computer output. The user can move his head to view the desired direction. This enlarged computer output is found to be beneficial for the visually impaired users.

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9.5 Invention-5: US patent 6459364

There are devices for Braille output from a computer in a dot matrix pattern. But the device is not very much suitable for internet browsing. Although the device can organize the output in Braille form, the user cannot quickly view the hyperlinks as he has to serially read through the entire text to find a link of his interest. Besides there should be a mechanism to select hyperlinks to move from one page to other.

US Patent 6459364 solves this problem of browsing by disclosing a internet browser for the visually impaired users. As per the invention the display is provided in the Braille format through a matrix of movable tactile elements. The hyperlinks in the web page are displayed in one side of the screen for easy access, and the normal web page is displayed on the other side of the screen for reading.

The display is made by movable dots on the surface and displays in Braille format. The dots are down when inactive and raised when active. The images can also be displayed in this device by using different patterns of dot matrix. The display includes a touch sensor to detect the pressure of the finger to take input in case of hyperlinks. This is used as a special hardware for browsing World Wide Web.
9.6 Invention-6: US patent 6489951 and 6496182

A touch sensitive screen displays the information and also receives the input by sensing a user’s touch on the touch sensitive screen. This mechanism is helpful for users having limited sight but does not benefit the users who have completely lost their sight.

US Patent 6489951 and 6496182 discloses a touch sensitive screen which is helpful for users having very limited sights or no sights. When the visually impaired user touches an object, the system announces the text associated with that area through audio output. The touch sensitive screen has two modes, the scroll mode and explore mode. In scroll mode, the user can use a scroll thumb to scroll through a list, in explore mode the user can drag the finger on to a control and lift the finger of the touch sensitive screen.
10. Scope for future improvements and inventions

There is enough scope for improving user interfaces for visually impaired users. Some possible areas of improvements and inventions are as below.

- Magnifying GUIs, which includes magnifying fonts and icons in the GUI.
- Dual mode GUIs to have normal mode and magnified mode.
- Scalable icons— which can grow bigger or smaller depending on user preference.
- Automatic re-alignment and re-positioning of icons when the size is altered.
- Voice enabled components to build the application. The application built with voice enabled components will be voice enabled.
- Implementing different Language in screen reading and speech recognition.
- Special visual with voice both integrated.
- Using vibrations on the Braille screen for animations, warnings and special events.
- Periodic announcement of computer status, when the user is not interacting for long time.
- Simple Braille input and Braille output computers without conventional display unit.

Let’s hope that the future will see much more inventions on the user interface for visually impaired users. The designers and manufacturers will take the challenge of improving the assistive technology for visually impaired and other users having physical challenge.
11. Summary of Findings

- The number of inventions for visually impaired users is very few. One of the reasons is the difficulty of invention, the other probably commercial viability.
- As the visual capability of the blind users are week or nil, the assistive technologies give more importance on the other two organs, i.e., hearing and touching.
- There is scope for further improvements in assistive technologies. Hopefully, the inventors will take the challenge of reducing the difficulties of the visually impaired users and users having other physical challenge.

Reference:

About the author

After working for more than 18 years in various fields of Information Technology, Umakant is currently doing independent research on TRIZ and IT since 2004. He last worked as Director and Chief Technology Officer (2000-2004) in CREAX Information Technologies (Bangalore). Before that he worked as IS/IT manager (1996-2000) for ActionAid India (Bangalore).

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