Universal Design for All - Language Learning

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Abstract— **Universal Design for Language Learning (UDLL) provides a structure for utilizing the possibility of digital technologies such as graphic organizers. It is helpful to make the curriculum more supportive to diverse learners. Since most of the software products are useful only for normal adults, it is necessary to develop them for people of all ages and also for the physically challenged. The aim of the paper is to present concepts used in the design and implementation of language learning for children, older people and visually challenged in an interactive fashion on an experimental basis. A web based Graphical User Interface (GUI) for children of age below 8 years and for older people of age above 60 years is the main concern of this work on language learning. The software is implemented for two languages. One is for children for English language and the other one for older people for Telugu language learning. Both are implemented in HTML.**

Index Terms— **Universal Design, Graphical User Interface, Web Design, User Interface**

I. INTRODUCION

At present, Human Computer Interaction (HCI) is gaining a lot of importance in the development of any software. Since much progress has been taken place in software development, software designers are blending towards principles of HCI. For any software design, the aspects such as efficiency, consistency, scalability, ease to use etc. are mandatory. However, most of the software products which are being developed currently are only useful to normal and middle aged people. At least now it should be realized to design and develop a software which is useful to all people including the physically challenged and people of all ages. HCI is concerned with the design, implementation and evaluation of interactive computer-based systems [1].

This also includes multi-disciplinary study of various issues affecting this interaction. Language learning is designed in such a way that without the assistance of others, users can learn on their own. For children, language learning is effective and easy to learn with pictures.

II. OVERVIEW OF USER INTERFACE DSIGN FOR ALL

It is very important to design an interface supporting which is simple and easy for navigation. The term *User Interfaces for All* [2] denotes an effort to unfold and reveal the aforementioned challenges, as well as to provide insights and instrument appropriate solutions in the HCI field. *Design for All* [3] *or Universal Access* to computer-based applications and services implies more than direct access or access through add-on (assistive) technologies, because it emphasizes on the principle that accessibility should be a design concern, as opposed to an afterthought.

III. DESIGN

Web based learning and the interface design had the following advantages [4]: (1) enhancing cooperation, (2) improving hospitality knowledge, (3) promoting cognitive skills, and (4) raising computer literacy. However, negative comments were classified as follows: (1) the time consuming nature of group work, (2) preference for traditional paperwork, and (3) problems with using the platform.

A learner-based software design should remember the type of end users and their learning requirements. Systematic design is essential to the development of systems that are accessible, usable and adaptable to all [5]. It is a fundamental, purposeful and continuing human activity, driving towards a pre-conceived idea of a desired state. Designers use past experience, domain knowledge and current technology to define, predict and hopefully deliver some future systems. However, design should also take into account the needs of the entire community of potential users and their varied levels of abilities to ensure that the results are widely available for the entire community.

A. Design factors – Children

The design principles for high-level goals of the performed design activity is to consider "*easy for them to understand and use*" [6]. Other important aspect is to be considered is that a physically challenged need not have any assistance while using such software. This facilitates the understanding of the concepts and on the other hand promotes and support exploratory styles of interaction. Since the end users are children, the interaction techniques like double-click are avoided and input devices like keyboard and mouse is used.

B. Design factors - Old people

Sight is very important to use computer. However with age usually it degrades. Colour can be used to draw attention to important parts of a text and image/picture which can increase the user's visual quality. Highly legible text can be assembled using large easy-to-read fonts with high contrast [7]. Illegible text can cause eyestrain as well as make a site completely unusable to a large segment of the older

population. In designing language learning software for older people, it is necessary to minimize usage of input devices and options should be provided for different font sizes. Also the care should be taken for legibility and visibility of information. During presentation it is always recommended that contrasting colours (Light vs. dark or vice versa) should be used.

C. Design factors - Visually impaired people

In the present generation, the computer can be considered as an effective tool for visually impaired students. It helps to overcome their disability and allows them to perform their activities without other's
 assistance. In order to a learn language by such people with a computer, it is necessary for them to be trained to use the computer. No time constraint should be kept to access the contents, since this may cause mistakes and other problems. The commands, buttons and menus etc. are provided at the top of the screen for menus. If the user press wrong command, a non-speech sound alerts the user. Non-speech sound is used to provide awareness of element positioning [8].

D. Design factors

The internet should provide visually impaired users with the same experience that it offers to sighted users. However, numerous studies have shown current web accessibility to be less than optimal. Despite significant advances in assistive technologies, blind and visually impaired Internet users continue to encounter barriers when accessing web content [9]. On web pages containing a large amount of information, task completion time can increase due to additional complexity in navigation. This can lead to a greater chance of mistakes and also slips.

IV. GRAPHICAL USER INTRFACE (GUI)

According to Allan White [10], the ease with which an older user can navigate a website is generally perceived as of paramount importance. Accordingly, design should be centered on easy-to-use navigational elements. Navigational ease is determined by factors such as keeping the navigation bar in the same spatial location and having a prominent homepage button on each page. Large quantities of information on a page, though cutting down on the need to scroll or move to another page are probably undesirable because it is distracting. In this paper, a Graphical User Interface design (GUI) for different age groups like children, old people and visually impaired people is designed and implemented.

V. WEB DESIGN

 Web based software is useful for multiple users at an instant. The following design factors are considered in the present work. These are links should be clearly named as bulleted list and should not be tightly clustered. There should be differentiation between visited and unvisited links. There should be high contrast between the foreground and the background and at the same time screen layout should be simple, clear and consistent.

VI. IMPLEMENTATION

A Graphical User Interface of language learning for children and older people is created.

A. English language learning

For children, the GUI is created for English language learning. It includes alphabets which consist of : Alphabet letters from A-Z along with pictures indicating each letter so that the children can easily learn them. Numbers - This section helps in learning numbers. Animals - This section has different animals. Games - This section has different games like Alphabet matching game, Number matching game, Animal matching game and Exercises. The exercises consist of 'Fill in the blanks' so that the children answer them from what they have learnt in above sections.

B. Telugu Language Learning

For older people, the GUI is done on the basis of Telugu language. I have considered all the design factors for the GUI of older people which are discussed in section IV. This consists of Telugu vowels (Achchulu) – hre all the vowel letters are represented along with the appropriate pictures. Telugu consonants (Hallulu) – where the consonants are represented along with the appropriate pictures. Numbers in Telugu (Sankhyalu) i.e. each number is represented with the picture so that the older people can learn easily. Words in Telugu (Padalu) - Some of the words are presented in this section. Exercises (Abhyasalu) - These include 'Fill in the blanks' of some of the words and numbers of what they have learnt in the above sections.
Telugu Lipi Editor is a software by which Telugu fonts are embedded into HTML documents. Using this
software, a GUI for Telugu language for older people is created. Both the GUI's of children and older people are integrated into one GUI as U*NIVERSAL DESIGN FOR ALL: LANGUAGE LEARNING*

VI. RESULTS

Screenshots of WebPages developed for children and old people are shown below in Figure 1, Figure 2 and Figure 3.
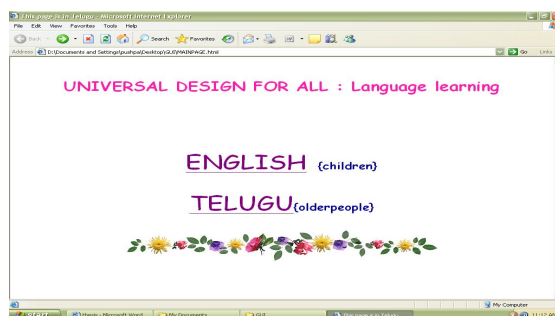

Figure 1. Universal design for all- Language Learning main page.

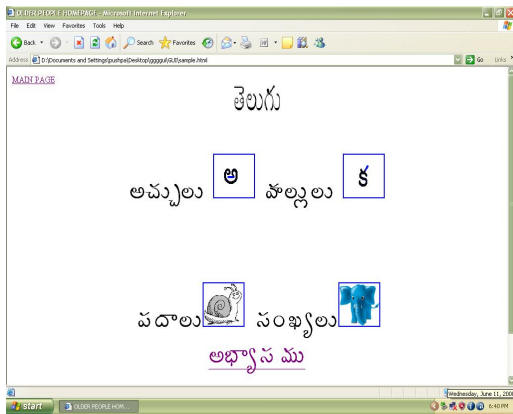Figure 2: Children's Home Page

Figure 3. Older People Home Page

VII. CONCLUSIONS & FUTURE WORK

User Interface is designed and implemented with interactive software accessible to children, old people and visually impaired people. A GUI for different disabled people can also be developed using screen readers. It can be extended to other Indian languages.

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