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Gadget-Inspired Graphical User Interfaces

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ABSTRACT

Computers are of little use for less literate people or people with no knowledge of using computers because of text intensive user interfaces, fear of technology and a steep learning curve for skills to use computers. We propose an approach to develop text-free user interfaces for computer applications. Text-free user interfaces can enable users to use computers without requiring them to learn English (or any other) language. Most of the people have some experience of using gadgets such as televisions, mobile phones, DVD players, washing machines, and microwave ovens etc. We propose to use the basic knowledge gained through the use of these gadgets to design user interfaces. The power button on a TV remote control can be mapped with computer start/shutdown process and channel switching activity on TV with application switching on a computer. This knowledge can be represented by a set of signs to develop user interfaces. Sign languages are being used by special people for communication since ages. The computers of today also make limited use of these languages in the form of Graphical User Interfaces augmented with text. Our proposed language is built on top of the sign languages and the most common symbols used in our daily life. This language is completely text-free and rich enough to represent complex tasks so that it can be used to develop text-free user interfaces for computer applications. Studies have also shown that, in addition to a lack of technical know-how of computers, a big hurdle for computer illiterate people, especially with low literacy, is a fear of technology. Designing user interfaces inspired by commonly used gadgets will also help these people in overcoming this fear.
KEYWORDS: Human computer interaction, User interface, Text-free user interface, Sign language

1. INTRODUCTION

The United Nations Educational, Scientific and Cultural Organization (UNESCO) defines literacy as:

The ability to identify, understand, interpret, create, communicate, compute and use printed and written materials associated with varying contexts.

According to UNESCO, the current world literacy rate is about 83.7%[1]. The distribution of this fraction across the globe, however, is not uniform with a majority of educated people being in developed countries. The literacy rate in Europe is as high as 99.1% and a meagre 68.4% in Africa. Also, the literacy defined above does not enable someone to benefit from computer because the major language used in computers is English and people in every country are educated in local language. In addition to formal education, an individual usually needs to invest time and money in getting a formal training to get acquainted with this very gadget called "Computer". The nations of the world are aware of the need of training their masses in computer literacy and spend huge amount of time and budget for this purpose annually

The computers have a strong impact on the life of individual and we are moving towards an age completely dominated by computers (albeit in the forms not known or thought of today). The recent trends in research also focus on improving the services provided to existing users instead of devising new ways to cater the needs of unskilled and semi-literate class of users. The computers with current user interfaces fail to attract new users. At present, a significant proportion of population is excluded from benefiting from computers because of lack of basic skills to use computers. This neglected proportion of society compels us to invent a different kind of computer that speaks their language and does not force them to learn its language.

We introduce the idea of GIGI(Gadget-Inspired Graphical User Interfaces). GIGIs are graphical user interfaces inspired by daily gadgets used by most of the people and are completely free of any text. We propose to develop a sign language that can be used to develop GIGIs for various computer

[1]http://stats.uis.unesco.org/unesco/TableViewer/tableView.aspx?ReportId=201

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applications. This language would enable unlettered people or people without basic computer usage skills to benefit from computers. Developing a sufficiently expressive sign language will enable the other application developers to extend their user base to those who do not use these applications due to the factors mentioned above or because of a fear of technology. Some such applications include online shopping, tourism, and health care etc.

The rest of paper is organized as follows. Section 2 provides related work. Section 3 gives details of the proposed system. Section 4 provides two case studies to describe utility of proposed approach and the paper is concluded in Section 5.

2. LITERATURE REVIEW

A text-free user interface is a graphical user interface that does not contain any text but is composed of only graphical signs and symbols. Text-free user interfaces can be useful in applications where the users are unable to read text e.g., children or adults with low level of literacy. The idea of developing text-free user interfaces is very appealing as this kind of user interfaces can be equally beneficial for expert computer users too.

"A picture is worth a thousand words" is a very famous saying. Human mind is very smart in processing images and it is very easy for a user to understand a particular phenomenon in the form of pictures. Many studies have proven the effectiveness of using graphics and symbols instead of using text-based user interfaces and have applied them in a variety of applications such as job search, Automatic Teller Machines (ATMs), financial management and healthcare (Medhi et l., 2007b; Medhi et al., 2007c; Thatcher et al., 2006; Parikh et al., 2003; Grisedale et al., 1997; Raza et al., 2012). Some researchers have identified complex structure and a hierarchy of conventional user interface as the biggest obstacle and proposed extremely simplified navigation in user interfaces (Grisedale, 1997). The studies have also shown that, although low-literate people cannot read text, but most of the people can understand numerals (Medhi et al., 2007c; Parikh, 2003). Hence an effective symbol based user interface may contain numbers and still be usable by semi-literate people.

The studies have also shown that in addition to low literacy, another major hindrance for low-literate people is anxiety and fear of technology. This is also related to a strong correlation between illiteracy and poverty. Medhi et al. (2007a) note that in a survey of illiterate people in a poor suburb that the poor house workers were not allowed to touch computes even for cleaning purpose and they were extremely reluctant to use computers in usability testing because of this mind set. They proposed and used full context videos to dramatize the situation of job search to motivate these house workers to use computers. Auditory feedback also proved to be helpful in guiding the user in navigation and use of various options.

In addition to personal computers, because of the penetration of communication technologies, more recently some work has been done on user interfaces for mobile phone (Medhi et al., 2011; Grover et al., 2009; Medhi et al., 2009; Patel et al. 2009; Sherwani et al., 2009; Patnaik et al., 2009). Research on the subject suggests the use of interactive voice response and spoken dialog system instead of typed input. Mehdi et al. (2011) have done an excellent quantitative evaluation of mobile interfaces based upon all text, audio and graphics. Not surprisingly, their results suggest that text-free interfaces are far better than text-based interfaces for the same applications. They also conducted experiments in healthcare with text- based interface and live operator and got as much as ten times higher error rates in text-based interfaces. The authors conclude with the recommendation of developing text-free user interfaces supported by spoken input. Thatcher et al. (2005) have also arrived at similar conclusion.

3. PROPOSED SYSTEM

Our proposed solution is based on the model of transforming the computers into a form the users are most comfortable with. Hence a user is not required to go through any learning process to be able to use the computer. The knowledge gained by the people through their daily life activities and gadgets like TV & its remote control, DVD player & its remote control, refrigerator, washing machines, and microwave oven etc. is used for this transformation. At the heart of this process is a sign language that every human being can understand easily.

A sign language is a language which, instead of acoustically conveying sound patterns, uses visually transmitted sign patterns to convey meaning. A pictogram is an ideogram that conveys its meaning through its pictorial resemblance to a physical object. International Organization for

Standardization (ISO) has also defined a standard for "Public Information Symbols" (ISO 7001:2007)2. Other similar approaches used to convey meaning include DOT pictograms, emoticons, icons, ideograms and Chinese characters etc.

The power of these languages can be exploited to convey meaning to those people who are unable to read natural languages. The proposed approach can be explained by scenarios given below.

We take motivation from one of most common gadgets found in every home i.e. a TV and its remote control. The first component of the proposed approach consists of an OSP (On Screen Panel) that looks similar to a TV remote control. This panel can serve as "Home screen" for a computer and provides an entry point to all applications. OSP can especially be useful on Tablet PCs which are penetrating in the market quickly. A hardware equivalent of OSP may also be designed.

The basic functions of all TV sets are similar. Most of the people have experience of using one TV set but they do not face much problem in using a TV set made by a different company having different sequence of commands for performing certain operations. The basic functions of a TV set are given below:

- Switch ON/OFF
- Tune channel
- Switch channel
- Volume control
- Mute
- Color management

There are also certain advanced functions but these basic functions suffice to explain working of the proposed model. These functions can be mapped to certain applications on computer as given in the Table 1. Table 1 also gives how these functions can be extended to more advanced tasks such as sending an email and tourist guide.

4. CASE STUDIES

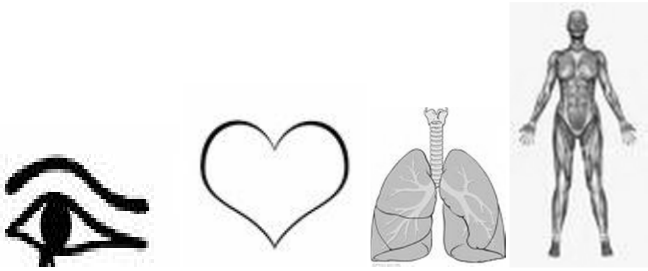
The working of proposed systems can be explained with the help of two mini case studies mentioned below.

4.1. Case Study 1: Taking appointment from a heart specialist

The following steps can be performed to take appointment from a heart specialist:

a. User selects the well-known doctor symbol (a stethoscope)

b. System displays various body parts for eye specialist, heart specialist, lung specialist and general physician etc.



c. User selects Heart Symbol and request for an appointment.
d. System confirms appointment and shows time using an analogue clock.

[2]http://www.iso.org/iso/iso_catalogue/catalogue_ics/catalogue_detail_ics.htm?csnumber=41081

e. System gives a printer option to user to take a printout of the map and time for the later usage such as seeking help from a literate person.

We understand that the task to reserve an appointment from a doctor is not as simple as it is depicted above with tasks (a-e). A patient might wish to select a doctor from a list of many doctors or select the appointment time according to her/his preference. However for the sake of brevity, a minimal set of tasks is given. Moreover, these issues can be resolved by defining more tasks. A more detailed study, careful consideration and discussion with experts is required for defining symbols and automating tasks for every domain.

Table 1 A comparison of performing various tasks using TV remote control, conventional PC and the proposed OSP (On Screen Panel)

Sr.	Task	As performed on TV	As performed on Computer using conventional input/output	As performed on OSP	Justification
1	Power on/off	Power button	Power button for on, To shutdown in Microsoft Windows(versions 95~XP): i. Click Start ii. Click Shutdown iii. Select Shutdown iv. Click Ok In the latest upcoming version MS Windows 8, this process is even more complicated.	One button can be used to Switch On and Shutdown the computer just like a TV remote control.	The shutdown process of computer is too complicated as compared to TV. The computer should handle these tasks automatically only requiring the user to press one button like TV.
2	Switch channel	i. Up/Down Arrow ii. Select a Number from number pad	i. Switch application through task bar ii. Use Alt+Tab (in MS Windows)	OSP has Application switch button similar to channel switch buttons on TV remote control.	Every channel can be treated as an application on computer and the user can switch between them by using same procedure.
3	Sending email	Cannot be performed	i. Open email client or web browser ii. Login using ID and password iii. Click "Compose New Message" iv. Type recipient ID v. Type subject vi. Compose message vii. Click send	i. The user switches to email application as mentioned above ii. The arrow keys used for channel/volume control can also be used to locate a contact in a picture contact list. iii. The record button can be used to record a voice message iv. Ok button is used to send the message	The user can send an email very easily as compared to the existing mailing systems.
4	Finding a route and cheapest service between two cities	Cannot be performed	Web services, portals, and shopping agents can be used for the task.	i. The user switches to the Travel Guide application ii. The cities are shown to the user in the form of images. Most of the cities have a building or other monument for identification e.g., Al Madinah Al Munawwara can be identified by an image of Masjid al Nabawi and Mekkah by an image of Ka'ba. iii. The user selects source and destination. iv. The system finds the optimal solution and displays the results in an effective way using proper colors for top three choices such as Green, Yellow and Blue for the top three choices respectively. v. The time is displayed by using an analog clock. vi. The speech augmented solution can be more effective.	The required task can be performed by using OSP easily as compared to conventional computer methods.

4.2. Case Study2: Purchasing a mobile phone

a. A symbol of trolley is used form a shopping mall to represent "purchasing" activity. User selects the trolley symbol with the help of OSP.

b. System displays the following options for buying various items like a TV, CD and mobile phone etc.

c. User selects a mobile phone.

d. System displays a number of mobile phones with different specification.

e. User selects the required mobile. System displays price and other required information using appropriate symbols.

f. System confirms from the user proceeds to the next step, otherwise provides an option to select another mobile by repeating step e.

g. If user selects OK, system shows price of the selected mobile by showing the currency notes.

It is emphasized that further study is required to select appropriate symbols and sequence of steps to carry out complex tasks effectively.

5. CONCLUSION AND FUTURE WORK

Existing graphical user interfaces in computer applications fail to help users with limited literacy and skills to use computers. These people, however, possess the experience of using various gadgets in

their daily lives. This knowledge can be used to develop a completely text-free sign language that can be used to design new kind of user interfaces. Taking a simple example of TV remote control, we have shown how many existing functions and tasks of computers and their applications can be simplified. We have also presented two simple scenarios to give proof of concept for the proposed technique. Our future work consists of developing a complete sign language that can be used to design graphical user interfaces for moderate to complex tasks and, then evaluate the efficacy and practicality of the defined interfaces by asking the illiterate people to perform these tasks and, to improve the sign language based on their feedback.

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