

HCI: Its role in Distant Education Websites

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Abstract—Normal websites provide a major source of information, but when it comes to distance education network, the dependencies of both teachers and learners is majorly on mediators such as computer and other facilities. Thus the designing of HCI plays a major role. This paper throws light on how to model distance education websites based on three traits: manners of interaction, principles of interaction design, and process of interaction design. The final purpose of this paper is to accomplish a more symphonic relationship between human, computer and environment by means of our research.

Keywords— Human-Computer Interaction, HCI, Distance Education, Distance Education Websites.

I. INTRODUCTION

Distance education denotes to that the teacher and learner are parted in time or space, but can communicate with each other by the use of electronic resources like computer, multimedia and the internet. It is not only the unescapable results of the expansion of society, economy and education itself, but also the replication of the society's requisite about education [1]. Distance education practices prodigious study environment and communication systems, and withdraws everyone the prospect of learning knowledge through lifetime.

In contemporary years, Ministry of Education of the People's Republic of China had clearly required "achieve education resources sharing across time and space" and emphasized "the development of modern distance education is the strategic measure to run a great education under the shortage of educational resources" in many political documents. And lots of universities and colleges had established and built their own distance education websites. However, there are still some deficiencies and difficulties in the current distance education systems. For example, since most of those websites are developed just by low-level reduplication, it is grim to converse and stake resources amongst different websites or among different components in the same website [2]. Above and beyond the said points, distance education website has its exceptional features associated to conjoint websites. Unlike from the situation that people just gain information from regular websites, the teachers and learners using distance education network want much supplementary communication with each other. That means they are in more demand of collaboration with midway such as computer and other conveniences. So the investigation on human-computer interaction strategy takes much more prominence. In this paper, by considering users' behavior belongings when get into knowledge, a user model to accurately foretell user's true target is time-honored based on the theory and explanations of human-computer interaction design for distance education websites, which is associated to the concepts of graphic design, method of user investigation & research, intellectual psychology and computer science.

The paper is systematized as follows. In Section II, the concept of human-computer interaction and other interrelated hypothetical knowledge is given. Section III familiarizes the exploration and exploration on the user and establishes a user model. Section IV is the foremost contented of research which presents the special design attitudes. Finally, a supposition and standpoints to our work are given in Section V.

II. THE CONCEPTION OF HUMAN-COMPUTER INTERACTION AND OTHER ASSOCIATED THEORIES

2.1 The Conception of Human-Computer Interaction

Human-computer interaction (HCI) is the technical science that explores the communiqué between human and computer over communal considerate and interchange, accomplish to organization, amenity and progression evidence occupations for people at the thoroughgoing prospect. It makes the computer accurately convert into a pleasant-sounding associate in people's life. In this day and age HCI has technologically advanced into fourth generation; multi-modes communication is the foremost feature and

enlargement route of fourth generation HCI [3]. The practice of HCI is in point of fact a progression of key in and outputting data [4].

2.2 Cognitive Psychology

Cognitive psychology investigates public's high-ranking progression of psychological goings-on, chiefly embrace cognitive process, such as attention, perception, depiction, memorial, rational and dialectal, etc. Cognitive subject can in chorus process multi-information, but its dealing out capability is limited [5].

2.3 Color Identification on Visual Interface

Color plays an important role in increasing the exactness of information credentials and ensuring the helpfulness and high speed of HCI. And through the research of HCI principles for color identification, the information to be transferred can be correctly and effectively transmitted to user through better contrast between color information of visual body and background in design [6].

2.4 Method of Service Oriented Architecture

Service oriented architecture (SOA) is a kind of technology based on logically abstract business; it changes the business process models and technical architectures. It represents an open, sprightly, scalable and combinable architecture [7]. Method of service oriented architecture provides us the technical support of HCI design.

III. INVESTIGATION AND RESEARCH ON THE USER

Before getting start to design the form and function of a distance education website, we should have a unblemished approachability of who are the users and what are their superfluous hassles. Therefore, the method of user investigation & research is operated in order to get the features for what they need.

The mainstream methods of user investigation & research and their specific arrangements are concluded in the following figure.



Figure 1. Mainstream methods of user investigation & research.

3.1 Questionnaire on the User of Distance Education Websites

Questionnaire is the widest use method to get information which we want knows. The design of questions must obey the principles of useful, specific, inimitable and not contradict each other. According to the questionnaire testing in Rongli Li's contribution [8], we get 100 users' information and tendentious opinions. Including their:

- Basic information.
- Knowledge of web and motivation of surf web.
- Surfing and operating habits.
- The specific usage of network function modules.

- Esthetic preferences.

Through the result of above exploration, there are some representative conclusions in various aspects could be summarized. Base on the conclusions and former scholars' research [9-11], we form the user model as follows.

3.2 Establish User Model

Please see the last page of this paper for the figure of user model. (Fig. 2)

IV. SPECIAL HUMAN-COMPUTER INTERACTION DESIGN STRATEGIES BASED ON USER MODEL OF DISTANCE EDUCATION WEBSITES

From Fig 2, we know that the collaboration can summarized into the relationship between user (include learner, teacher and system administrator) and appearance layer (pages of courses, bulletin, test, homework...) through software and hardware. In this section we focus on the research of design stratagem from the following three aspects:

4.1 Manners of Human-Computer Interaction

From the point of human understanding, sense of feeling include vision, hearing, touch, taste, smell and intuition. A human receive information through sense organs such as eyes, ears, skin, tongue and nose. The environmental information are translated to sensory signals by sensor colliculus and send to brain cortex. Brian makes reaction and feedback to these information, decides on one's own what to see, what to hear, what to speak and most importantly, what to do.

From the point of computer view, HCI involves lots of key technologies like single or multi-modes information input, information merge and re-erect, single or multi-modes information output, large-scale databases, knowledge processing, user intelligent agent and various apps services [3]. Among them the evidence input and output is what we mainly concerned. Input manners include image identification (figure, picture, silent video & animation, color, icon, symbol, text & number, human face, fingerprint, handwriting...), voice identification, expression & gesture & behavior identification, multi-media input and multi-modes input. Output manners include image, sound, action, multi-media output and multi- modes output.

The input and output manners between human and computer are various and of very different, so the manners of HCI are granted diverse. Which we try to summarize to:

4.1.1 Image Interaction

Image interaction means human and computer communicates with each other by sends and receives images, then processes the images to understand information and make response. The image is the carrier of information, can divide into static image and dynamic image. The 70 percent's of information human perceived from environment are received from visual system [12]. So image interaction is a very important manner in HCI field. According to the user model in Fig. 2, users are basically interacting with web pages of distance education websites. Nowadays, the truth that image designs of web pages become more and more elegant also proves the importance of image interaction.

4.1.2 Sound Interaction

Sound interaction, includes but not limit to voice interaction, is also an important mode of HCI. Audio course was a popular teaching manner in the last century because it needs less network bandwidth. Nowadays we can also communicate with computer through voice and sound interaction.

4.1.3 Expression, Gesture and Behavior Interaction

The identification and interaction of expression, gesture and behavior is the new achievement of modern computer science, and it is also the important component of multi-modes interaction in fourth generation HCI. Courses and experiments that rely on action and behavior may need the technology of expression, gesture and behavior interaction.

4.1.4 Other Single Mode Interaction

Human senses of taste and smell are rarely applied in tradition HCI, but we could not exclude the usage of them in future HCI for distance education websites with the development of computer science and biology science.

4.1.5 Multi-media Interaction

Multi-media interaction is the main feature of third generation of HCI. Multi-media technology allows user exchange information with computer through sound, image, text and other media. So it greatly expands the application of computer. Today multi-media interaction between learner and distance education websites has been wide range applied to society. And it still has great room for improvement.

4.1.6 Multi-modes Interaction

As has been mentioned in section II paragraph a, multi- modes interaction is the main feature and development direction of fourth generation HCI. Multi-media technology is just a blend of several independent media, but not a comprehensive process of media. Multiple modes are the natural interaction between human and environment. Nowadays there are lots of research institutes in the world engage in multi-mode interaction research and development. And there is no doubt multi-modes interaction will become mainstream manner of HCI for future distance education.

4.2 Principles of Human-Computer Interaction Design Based on Cognitive Psychology

According to the theory of human-computer interaction described by Don Norman, the abstract principle of "simple, natural, friendly and consistent" [13] should be reflected in every aspect of the progress of interaction design. As has been mentioned in section II paragraph B, cognitive subject can simultaneously process multi-information, but its processing capacity is limited. The following basic rules in cognitive psychology should be followed in the process of HCI design for distance education websites:

- Rules of information organization.
- Rules of visual search.
- User memory characteristics.
- The central energy theory of cognizance.
- Efficiency analysis of perception [8].

Base on above mentioned rules and related analysis, we conclude the principles in HCI design as follow, which central idea is "human-oriented".

4.2.1 Functional, Direct and Easy to Use

Functionality is primary concerned. As we have mentioned, cognitive subject can simultaneously process multi-information, But its processing capacity is limited. So when we design the appearance layer of distance education websites we should make it direct and easy to use.

4.2.2 The Interaction Should Bring Us Emotional Happiness

Emotional happiness means the design of appearance layer should esthetic, enjoyable and friendly. An esthetic interaction design should follow basic graphic art principles such as color identification which has been mentioned in section II paragraph

An enjoyable and friendly design of web pages in distance education websites may change the indifferent and lack of humanity features in traditional interface, and become a happy source to learners and teachers who surf them [14].

4.2.3 Safe and Stable

Safe and stable is the primary concern of human-machine design process, but when applied to human-computer design, its content has changed a lot. It means try best to minimize the possible error of interacting; all options are reversible; there are remedial measures for all serious consequences on the possible error, etc.

4.2.4 Reasonable, Efficient and Consistent

A reasonable and efficient interface allows users easily communicate with computer software and hardware through their own knowledge. It greatly releases the pressure of processing in their brain. Consistency means in the same websites we should keep the design of color consistent, operation area consistent, text consistent, etc.

4.3 Process of Human-Computer Interaction Design

The process of HCI design for distance education websites could divide to four stages: (1) structure and main frame design;

4.3.1 Interaction manner design; (3) interface design; (4) later support and additional design [15].

At the beginning of a HCI for distance education websites design process, teachers, learners and system administrator should come together to discuss the main frames of the websites. Then the course resources, information resources, test resources and other resources should be supplied to constitute the structural contents of the network. Designer processes the contents and decide in which manner make these contents interact with potential users by the method of SOA (section II paragraph D). After this stage visual designers make their effort to beautify the interface of distance education websites. Finally, the later support and additional design is necessary after the websites have been operated. As a matter of course, the principles summarized in section IV paragraph B should be followed from the very beginning to the end.

V. CONCLUSION

From the research mentioned before, it can be seen that teachers and learners who surf distance education network need much more communication with each other. So the research on human-computer interaction design takes much more importance. In this paper, we describe the features of users (learner, teacher and system administrator) of distance education websites; conclude the figure of user model; summarize the special HCI design strategies for distance education websites from the following three aspects: manners of interaction, principles of interaction design, and process of Interaction design. It could be a reference for similar research. Naturally, due to time and capacity limits, there are many imperfections in the research of HCI, such as lack of experimental support and comprehensive evaluation system. The imperfections are the main content of the follow up study and research. The ultimate goal is to reach the harmonious interacting relationship between human, computer and environment by means of our hard work.

VI. INTRODUCTION

6.1 Sample 1

parabolic troughs to focus the sun's energy to a fluid-carrying receiver tube located at the focal point of a parabolically curved trough reflector (see Fig.1 above). The energy from the sun is delivered to the tube heats oil flowing through the tube, and the heat energy is then used to produce electricity in a conventional steam generator. Many troughs placed in parallel rows are called a "collector field." The troughs in the field are all aligned along a north- south axis so they can track the sun from east to west, ensuring that the sun rays are continuously focused on the receiver pipes. Individual trough systems currently can generate about 80 MW of electricity. Trough designs can include thermal storage-setting aside the heat transfer fluid in its hot phase-allowing for electricity generation for a couple of hours in the evening. Currently, all parabolic trough plants are "hybrids", which means that they use fossil fuels in addition to the solar output during periods of low solar radiation. Typically, a natural gas-fired heat or a gas steam boiler/re-heater is used. Troughs also can be fused with existing coal-fired plants.

6.1.1 Sample 2

parabolic troughs to focus the sun's energy to a fluid-carrying receiver tube located at the focal point of a parabolically curved trough reflector (see Fig.1 above). The energy from the sun is delivered to the tube heats oil flowing through the tube, and the heat energy is then used to produce electricity in a conventional steam generator. Many troughs placed in parallel rows are called a "collector field." The troughs in the field are all aligned along a north- south axis so they can track the sun from east to west, ensuring that the sun rays are continuously focused on the receiver pipes. Individual trough systems currently can generate about 80 MW of electricity. Trough designs can include thermal storage-setting aside the heat transfer fluid in its hot phase-allowing for electricity generation for a couple of hours in the evening. Currently, all parabolic trough plants are "hybrids", which means that they use fossil fuels in addition to the solar output during periods of low solar radiation. Typically, a natural gas-fired heat or a gas steam boiler/re-heater is used. Troughs also can be fused with existing coal-fired plants.

VII. SAMPLE

7.1 Dish Systems

7.1.1 Sample

Dish systems use dish-shaped parabolic mirrors as reflectors to focus the sun's rays on the receiver, which is mounted above the dish at the dish center. A dish/engine system is a standalone unit composed primarily of a collector, a receiver, and an engine (see Fig.2 below). It works by collecting and concentrating the sun's energy with a dish- shaped surface on a receiver that absorbs the energy and transfers it to the engine. The engine then converts that energy to heat. The heat is then converted to mechanical power, in a manner similar to conventional engines, by compressing the working fluid when it is cold, heating the compressed working fluid, and then expanding it through a turbine or with a piston due to which mechanical power is produced. An electric generator or alternator converts mechanical power into electrical power.

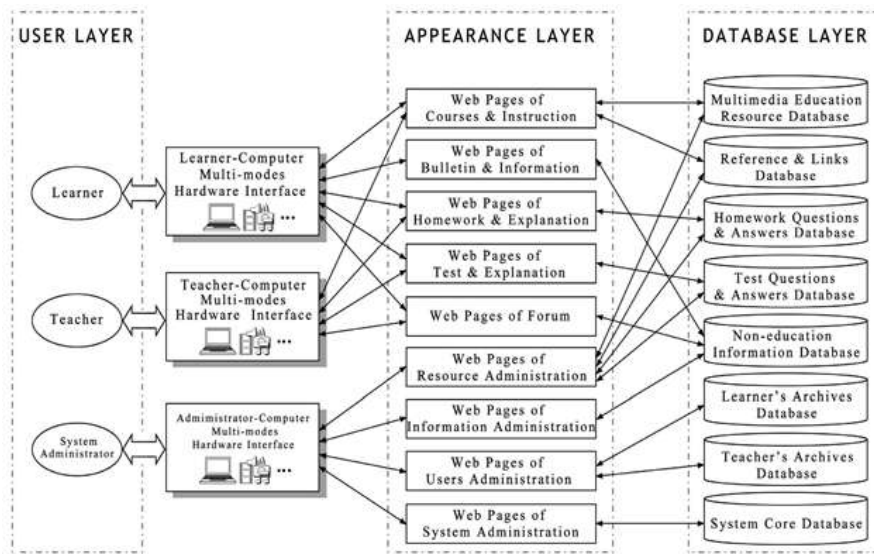


Figure 2. User model and inner logical structure.

REFERENCES

- [1] Zhe Li, "Design and Implementation of E-Learning System Based on SOSOC," A Thesis of Master Degree, Northwest University, 2006.
- [2] Jingjing Yan and Xuerong Gou, "SOA-based Network Curriculum Sharing Platform Research," Computer Science, vol. 36, Apr. 2009, pp. 161-162.



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- [3] Baozong Yuan, Qiuqi Ruan, Yanjiang Wang, Rujie Liu, and Xiaofang Tang, "A Conceptual Model and Features of New Generation (Fourth Generation) Human-Computer Interactive Systems," ACTA ELECTRONICA SINICA, vol. 31, Dec. 2003, pp. 1945-1954.
 - [4] Chao Gong, "Human-Computer Interaction: Process and Principles of Human-Computer Interface Design," Proc. IEEE Symp. International Conference on Computer and Automation Engineering (ICCAE 09), IEEE Press, pp. 230-233, doi:10.1109/ICCAE.2009.23.
 - [5] Chun Jin and Nairen Zhang, "The Standard Design Principles of Human- Computer Interface Based on Cognizance Theory," Chinese Journal of Ergonomics, vol.11, Sep. 2005, pp. 32-34.
 - [6] Ye Zhang and Jia Wang, "Human-Computer Interaction Design Strategy for Color Identification on Multi-media Visual Interface," Proc. IEEE Symp. International Conference on Computer-Aided Industrial Design and Conceptual Design (CAID&CD 09), IEEE Press, pp. 1874-1877.
 - [7] Weili Hu and Xiaolong Deng, "Exploration and Research of the Remote Network Education System Based on SOA," Journal of WUT, vol. 31, Oct. 2009, pp. 736-739.
 - [8] Rongli Li, "The Research of Using Human-Computer Interface Design Method on College Learning Web," A Thesis of Master Degree, Tianjin University, 2007.
 - [9] Bei Shu, "Research on Web-Based Personalized Teaching and Learning Management Environment and its Implementation," A Thesis of Master Degree, Shanghai Jiao Tong University, 2001.
 - [10] Wenfeng Zhang and Shumin Huang, "The Research on Personalized Modern Distance Education System," Journal of Guangdong Radio & TV University, vol.15, Jan. 2006, pp. 10-13.
 - [11] Zengan Zhang, "The Application of SOA Base on the Sharing of Online Course Resources," A Thesis of Master Degree, Liaoning Normal University, 2009.
 - [12] Yongxiang Liu, "Study of the Interaction Design of Man-machine Interface Based on Product Usability," Packaging Engineering, vol.29, Apr. 2008, pp. 81-83.
 - [13] Xinyuan Cai, "Principles of Human-Computer Interaction in Game Design," Proc. IEEE Symp. Second International Symposium on Computational Intelligence and Design (ISCID 09), IEEE Press, pp. 92- 95, doi: 10.1109/ISCID.2009.171.
 - [14] Jidong Song, "Analysis of Human-Computer Interaction Graphical Interface Design of the Emotional," Art and Design, vol. 11, 2008, pp. 168-170.
 - [15] Songhe Yuan, "The Concept and Design Research of Distance Education Course Online," unpublished.