



INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact Factor: 6.078

(Volume 8, Issue 3 - V8I3-1363)

Available online at: <https://www.ijariit.com>

Human-Computer Interface

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ABSTRACT

Human Computer Interface is diverse into several field. But the main focus is in the computer science area. Software developers are continuously developing new products that can be very helpful to people. Day by day new technologies are coming into market, where most of the people are unaware of them. People use machines or computer technology in their daily life but they don't even understand how that machine actually working, what is the mathematical logic that is used in a programming language behind this. To understand a machine only programming language is not enough, human psychology and physiology is also much important to understand how a computer system works or responds. The main objective is to develop a user centric system which can be used by commands and the system will do the work as per the user need and understand how the system can be more useful and efficient and effective to make task easy for users.

Keywords: Human Computer Interface, Interactive Device, Interface Analysis, HCI Design, Usability Engineering, Dialog, participants.

1. INTRODUCTION

If we observe the relationship between human and computer, we can see that there is a dramatic shift in the interaction between human and computer for the last couple of decades. Computers are becoming very essential for each and every human being day by day. Even if the person doesn't know anything about computer or machine, we can see he or she is using computer device(any) in his or her daily life somehow. Human Computer Interface is the practice, study and mutual understanding, and developing and creating software for performing certain tasks effectively. The primary step of HCI is having the ability to sense and respond appropriately according to the user command.

Human Computer Interface is a systematic way of interaction by which human can interact with different kind of computer machines. We know that computers need to be feed with vast amount of data to work properly. Here Artificial Intelligence comes into place. Artificial Intelligence influence the interaction between the human and computer machine by which the computer System have the capability of speak, listen, identify, recognize (face, voice, retina, thumb print, etc), control, etc. The interaction can happen in different ways – visual based, audio based, sensor based, etc. Machines works asper the user commands to it in the program.

2. INTERACTIVE DEVICES

There are several devices used for interaction between human and computer. Some of the devices are developed recently like – touch screen, gesture recognition, speech recognition, etc. Most effective and ancient interactive device is keyboard. Keyboard is known as a primitive device of a computer system. It has an organization of buttons or keys of English alphabets, digits, special characters, etc.

The concept of touch screen came decades ago but the platform become handy recently. From touch screen people are now also trying to use hologram which can be used only by hand movements. Everything can be operated by the user around his or her all 360 degrees. In this field hand gesture recognition is also being focused. This is a brand-new interactive device which can terminate the use of mouse and keyboard. For speech recognition only certain commands are required to command the computer system and the system will perform the task as per the user needs. It is a hands-free movement technology in HCI field.

3. INTERFACE ANALYSIS AND SPECIFICATION

The design of Human Computer Interface can be done if the purpose of the product or the system is well known. Before designing the interface, the developer has to know the reason for the interface. This is the task of Requirement Engineering where several diverse techniques are available to gather the requirements. Interface design is one of the components of the results of these techniques. To determine the base functionality of the system, Functional Decomposition is required where the task will be to examine the system or set of requirements and breaking it down in several components. The software designer must look at the target market of the product before deciding the specifications of HCI. To retrieve all the required information, a dialog must be created between the application and the user. There are generally four levels of user:

- Naïve – These are the users who have never used computer system.
- Novice – These are the users who are slightly familiar with the computer system but don't understand how exactly a system works.
- Skilled – These users have experience in computer technology and are quite comfortable with the operating system.
- Expert – These users are very comfortable with every aspect of computer system. They understand each and every functionality of computer system.

4. SYSTEM DESIGN

In HCI, prototyping is a partial design of software engineering model that helps the user to test the design idea without executing a whole or complete system and it can have a complete range of functionality of the projected system. To improve the design feedback is needed from the user to make the system more user centric.

To operate the program, application or device or system, the user needs a graphical user interface where the icons, menus, widgets, labels are existed for user to use. The interface should be arranged in a way which is easy to use and pleasing the eye.

5. USABILITY ENGINEERING

The progress of software and system including user contribution, which assures the effectiveness, satisfaction and productivity of the system, is called Usability Engineering. It includes the entire process of Usability Function features like requirement gathering, implementing, testing hardware and software, etc

6. DESIGN METHODOLOGY

Designing the HCI is the problem-solving process that has various components like cost, resources, etc. It is decided on the product or system. Following are some design methodologies:

- User-centred design – It provides the user-centred design where the user can get the opportunity to work in different work area.
- Activity Theory – Activity theory provides reasoning, analytical tools, and interaction design. This method describes framework where HCI takes place.
- Value Sensitive Design – This method is used to develop new technologies time to time and it includes three types of studies – Conceptual, Empirical, and Technical.
- Participatory Design – This method focuses on processes and procedures. This design method is used in various fields – graphic design, planning, software design, landscape design, etc.

7. DIALOG DESIGN

Dialog is basically communication between human and computer. A well-designed dialog is very useful for people to use a computer system. There are some very good key points for designing good dialog:

- 7.1 Meaningful Communication** – the computer will understand what people are entering or giving input to the system and people would understand what computer is presenting as an output.
- 7.2 Minimal User Action** – Good dialog minimizes the number of required keystrokes. On a GUI screen the codes can be entered by selecting the option from the dropdown list available. As user become more familiar with the system, this helps users become more efficient on their tasks.
- 7.3 Standard Operation and Consistency** – Once users get familiar with the system, consistency makes it easier for user to learn the updated version of the system.

8. OBJECT ORIENTED PROGRAMMING PARADIGM

Python is a scripting language which supports functional and structured programming method and it can be compiled to byte code which can be very useful to build large application like HCI. For developing an interface which can help people, there are many programming languages are present. But from all of them, Python is the most user friendly, easy to use, easy to learn, easy to read, and has a broad standard library which is very portable and compatible with cross platforms like Unix, Windows, Macintosh. Python supports GUI application which is very helpful for an interface like HCI. Python libraries are basically a bundle of codes which can be used in different programs repeatedly. Because of these modules python program is actually become very simpler and convenient to programmers. We just need to import these modules whenever we want to use those functionalities of a particular module. It is just a one-line code to import a module.

pytsx3 is a module which is used for speech to text conversion. It even works offline. It supports two voices – male and female voice. We can change the voices by the id of the voice. It depends on how many voices are present in the user system. It supports three TTS engines – sapi5 for windows, nsss for mac operating system, eSpeak for other platforms.

SpeechRecognition module is used to convert audio into text. It generally takes the sound energy of a person through the systems microphone and converts it to the electrical energy from analog to digital and finally to text.

There are several other modules which we can use like pywhatkit module to interact with the browser, wikipedia module to fetch the information from Wikipedia, smtplib module to send mail to others, requests module which is basically a HTTP library which allows users to send HTTP requests, os module is used to interact with the user computer system, datetime module to know the current date and time, etc. There are so many libraries that are present in python which are very useful in HCI field to develop a software.

9. PARTICIPANTS

The HCI experiments are basically done to help people in several area. The experimenting part commonly prefer the people who have some knowledge of computer system, educated. But the main focus of HCI is to make human work easy and efficient. Like for old people, they don't know how to use computers or what is programming because HCI was not known to people two three decades ago. And also, for the handicaps, who aren't able to speak, who aren't able to move, HCI helps them to communicate with other people in different ways. So those people who are designing the system, who have the knowledge of developing the programming skills, actually helping others to live, communicate, and make daily works easy and efficient by developing the HCI technology.

10. CONCLUSION

Human Computer Interface is one of the most popular topics in the field of computer science and artificial intelligence as it is developing its technology every day. The interaction is based on the human and computer, so it would be very helpful to the user because the system is totally dependent on the user and the system works on the user command or instruction. The work in the field of HCI could bring the revolutionizing change in future.

11. ACKNOWLEDGEMENT

First and foremost, I would like to thank the Almighty who always showers his blessing and gives me opportunity to do all good work, without his will it would not have been possible. I sincerely thank the Department of Computer Science for providing me good platform and necessary facilities. I express my gratitude to Professor M. Saratchandra Babu, our respected principal for the facilities provided by him throughout the course. I would like to thank our respected Associate Professor, Head of The Department, Dr. T Uma Devi for giving me such a wonderful opportunity to expand my knowledge for my own branch. I would like to express my gratitude to my supervisor, Assistant Professor, P J Santosh Kumar M, Department of Computer Science, GITAM (Deemed to be University), Visakhapatnam, under whose supervision I was able to complete my project. I am really thankful to him for guiding and correcting various documents of mine with attention and care. I thank one and all who have contributed directly or indirectly to my project

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