IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 1, August 2022
Impact Factor: 6.252

Review on Human Computer Interface

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Abstract: *Human-Computer Interaction (HCI) is the design and implementation of interactive computing systems that users can interact with. It includes desktop systems as well as embedded systems in different devices. Success of a technology simply results from the easiness with which the user can interact with it. If the interface is poor or hard to use then the user will simply ignore the product or the technology. A simple and easy way to use a system doesn't mean that a simple technology is behind such a system, on the contrary, a well advanced technology needed to build it. The most important concepts in HCI are functionality and usability. Services provided usually by a system are called functions. Usability is when a user utilizes the system's functions easily, properly and clearly. Functionality and usability may vary from one system to another. A system is said to be successful if there is a balance between both functionality and usability. In this paper we will look at existing HCI and the recent advances in the field.*

Keywords: Human-Computer Interaction.

I. INTRODUCTION

Humans and computers communicate in a variety of ways, and the interface between the two is critical to making this connection possible. Human–machine interaction (HMI), man–machine interaction (MMI), and computer–human interaction are all terms used to describe HCI (CHI). Today's graphical user interfaces (GUIs) are found in desktop applications, web browsers, mobile computers, and computer kiosks. Speech recognition and synthesizing systems use voice user interfaces (VUI), and evolving multi-modal and Graphical user interfaces (GUI) let humans to interact with embodied character agents in ways that previous interface paradigms cannot. The growth in human–computer interaction field has led to an increase in the quality of interaction, and resulted in many new areas of research beyond. Instead of designing regular interfaces, the different research branches focus on the concepts of multimodality over unimodality, intelligent adaptive interfaces over command/action based ones, and active interfaces over passive interfaces. The Association for Computing Machinery (ACM) defines human–computer interaction as "a discipline that is concerned with the design, evaluation, and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them". An important facet of HCI is user satisfaction (or End-User Computing Satisfaction). It goes on to say: "Because human–computer interaction studies a human and a machine in communication, it draws from supporting knowledge on both the machine and the human side. On the machine side, techniques in computer graphics, operating systems, programming languages, and development environments are relevant. On the human side, communication theory, graphic and industrial design disciplines, linguistics, social sciences, cognitive psychology, social psychology, and human factors such as computer user satisfaction are relevant. And, of course, engineering and design methods are relevant." Due to the multidisciplinary nature of HCI, people with different backgrounds contribute to its success. Poorly designed human-machine interfaces can lead to many unexpected problems. A classic example is the Three Mile Island accident, a nuclear meltdown accident, where investigations concluded that the design of the human-machine interface was at least partly responsible for the disaster. Similarly, accidents in aviation have resulted from manufacturers' decisions to use non- standard flight instruments or throttle quadrant layouts: even though the new designs were proposed to be superior in basic human-machine interaction, pilots had already ingrained the "standard" layout. Thus, the conceptually good idea had unintended results. Human-computer interaction (HCI) has been considered as computer-related cross-disciplinary domain that is strongly associated with design for information, interaction, and communication and technology. Researchers in HCI are frequently involved in designing research prototypes based on theories from the cognitive and social sciences, anthropology, and sociology in addition to computer science. They equally focus on HCI research and the analytic

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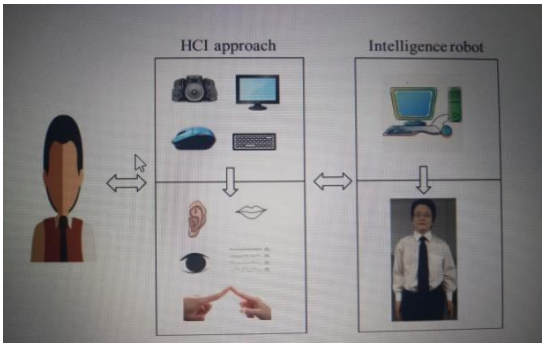
approaches and techniques in design practice. However, there is a lack of clarity regarding the nature of design processes involved in this influential field and the role of design and design thinking in HCI research and practice. HCI education and practice have been facing many challenges triggered by the rapid advancement of technology. Fast changing interface and interaction systems require new processes that allow for rapidly developed designs, evaluations, and interaction strategies facilitating efficient and unique user interactions with computer systems.

II. HISTORY

The concept of Human Computer Interaction originated with the invention of first general purpose electronic computer called Electronic Numerical Integrator and Calculator (ENIAC) in 1946. It was 10 feet tall, covered an area of 1000 sq. Feet and consumed as much energy as a small town. Further with introduction of Graphical User Interface (GUI) and internet, the importance of HCI was realised. Further researches in HCI have been spectacularly successful and have fundamentally changed computing. Just one example is the ubiquitous graphical interface used by Microsoft Windows 95, which is based on Macintosh, which is based on Xerox PARC, which in turn is based on early research at the Stanford Research Laboratory (now SRI) and at the Massachusetts Institute of Technology. Another example is that almost all modern software uses user interface toolkits and interface builders, which were first developed at universities. Even the phenomenal expansion of the World Wide Web is due to HCI research; using hypertext technology in browsers allows one to navigate a link across the globe with a single mouse click. This exponential expansion has been sparked more than anything else by advancements in the user interface. Furthermore, universities and a few company research labs are conducting research that will lead to future computer user interfaces.

III. DEFINITION AND CATEGORIZATION OF HCL

HCI or human–machine interaction (HMI) is the syncretic science of computer science, design, behavioral science, AI, and several other subjects, which involves a thorough research of the scientific implications and practices of the interfaces between people and computers or intelligent agents. There are two levels of meaning associated with the related research works FIGURE 2. On the primary level, it includes the research of ways and design of new technologies to better promote the computers as useful tools, whereas on the higher level, it includes the research of intelligent technologies that will adopt the natural ways of interaction between humans and computers, thereby boosting the cause for the computers to become more harmonious as partners to get along with. HCI was first used in 1976,10 and it was popularized by the book, The Psychology of Human– Computer Interaction published in 1983.11 In 1992, a HCI curriculum was developed by Hewett and other leading HCI educators to serve the needs of the HCI community. Bill Gates emphasized the role of natural user interface and predicted that the way in which HCI will bring a radical change in the next few years. Thereafter, HCI researchers expounded the definition of a natural HCI by employing different approaches. As far as we know, the development process of HCI has gone through five major stages: manual stage, interactive command language stage, graphical user interface (GUI) stage, network user interface stage, and natural HCI. As their names imply, we can understand the characteristics of each stages. A situation of tripartite confrontation exists in this field. GUI is still the basis of the HCI platform, due to which, the network user interface is going through a vigorous development with the emergence of large number of network technologies and applications, such as search engines, social media, etc.



Simultaneously, due to its characteristics of interaction such as directness, naturalness, and parallelism, natural HMI has shown prominent chances of survival to become the next emerging frontier to be researched and developed in this

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field. It seems that natural HCI technologies will lead the next generation of interactive technologies. In fact, natural HCI is not a new concept, and it has been in existence for a considerable amount of time and is constantly developing itself since the emergence of the computer. People want to use the simplest and most effective way to control computer to achieve task completion. However, in the present era, people want to use the most direct and natural way for the computer to provide more services, that is, the computer is hoped to be more intelligent.

IV. GOALS OF HUMAN COMPUTER INTERACTION

A basic goal of HCI is to improve the interactions of between users and computers by making computers more usable and receptive to the user's needs. Specifically, HCI is concerned with:

- Methodologies and processes for designing interfaces (i.e. given a task and class of users, design the best possible interface within given constraints, optimizing for a desired property such as learning ability or efficiency of use).
- Methods for implementing interfaces (ex. Software toolkits and libraries efficient algorithms.)
- Techniques for evaluating and comparing interfaces.
- Developing new interfaces and interaction techniques.
- Developing descriptive and predictive models and theories of interaction.

A long term goal of HCI is to design systems that minimize the barrier between the human's cognitive model of what they want to accomplish and computer understands of the user's task.

V. IMPORTANCE OF HUMAN COMPUTER INTERACTION

Human-Computer Interaction, or HCI, has become a need. Since humans are now completely surrounded by technology, the manner in which they interact has changed. The interaction between humans and computers is extremely significant role. The computer should be able to comprehend the instructions humans have provided and should be able to generate output in the appropriate manner Human beings are what a typical user considers. Only a human operating a computer interacts with a computer. The necessity and significance of HCI, on the other hand, can be overstated. a basic understanding of the following two fields:

- Human Robot Interaction(HRI)
- Brain Computer Interaction(BCI)

5.1 Human Robot Interaction

Human Robot Interaction is the study of interactions between humans and robots. It is often referred as HRI by researchers. Human robot interaction is the multidisciplinary field with contributions from Human Computer Interaction (HCI), Artificial Intelligence, Robotics, Natural language understanding and social sciences. Even before there were any robots, human-robot interaction was a focus of science fiction and intellectual conjecture. Because HRI relies on a thorough understanding of human communication. Many parts of HRI are extensions of human communication issues that predate robotics.

5.2 Brain Computer Interaction

A brain computer interaction (BCI), also known as a direct neural interface or a brain machine interface, is a direct link between the brain and external equipment. BCIs are frequently used to assign, augment, or restore cognitive or sensory motor function in humans. The field of BCI has grown tremendously, with the majority of its applications focused on neuroprosthetic applications that aim to restore impaired hearing, sight, and movement.

Signals from implanted prostheses can be processed by the brain like normal sensor or effector channels after adaptation, thanks to the brain's extraordinary cortical plasticity. Invasive BCIs, partially and non-invasive BCIs, EEG, MRI, and MEG are all used in human BCI research. Invasive BCI research has focused on restoring damaged vision and delivering new capabilities to paralysed people. During neurosurgery, invasive BCIs are inserted directly into the grey matter of the brain. BCI devices that are partially invasive are placed into the skull but do not rest inside the grey matter of the brain. They generate higher-resolution signals, whereas non-invasive implants generate low- resolution signals. Electroencephalography (EEG) is the most studied potential interface among non-invasive interface

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technologies, owing to its fine temporal resolution, ease of use, portability, and low set-up cost. Apart from that, non-invasive BCIs such as magneto encephalography (MEG) and functional magnetic resonance imaging (MRI) have also been effectively used.

According to a Microsoft-sponsored assessment based on the analyses and opinions of more than 40 experts in domains ranging from computing to sociology, by 2020, the world will be a different place. "As a result, the concepts of interface and user will be obsolete," says the author. "Computers are becoming increasingly human-like," according to the New York Times. BBC. The document explains how the company's future is expected to pan out. According to Human Computer Interaction (HCI), in In a little over a decade, computers will be capable of anticipate the demands of its users, and humans will benefit as a result. able to communicate with computers on a meaningful level. The means by which humans interact with computers continues to evolve rapidly. Human Computer Interaction is affected by the forces shaping the nature of future computing. The future of HCI is expected to include the following characteristics:

- **Ubiquitous Communications:** Computers will communicate through high speed local networks, nationally over wide area network and portably via infrared, ultrasonic, cellular and other technologies.
- **High Functionality Systems:** Systems will have large number of functions associated with them.
- **Mass availability of computer graphics:** Computer graphics capabilities such as image processing, graphics transformations, rendering and interactive animation will become widespread as inexpensive chips become available for inclusion in general workstations.
- **Mixed media:** Systems will handle images, voice, sounds, video, texts, formatted data.
- **High bandwidth interaction:** The rate at which humans and machines interact will increase substantially.
- **Embedded computations:** Computation will pass beyond desktop computers into every object for which uses can be found.
- **Augmented reality:** A common staple of science fiction, augmented reality refers to the motion of layering relevant information into our vision of the world.

VI. CONCLUSION

Ever since computers were born, there have been various interactions between people and computers in order to make computers more responsive to the humans‘ needs. The techniques are force sensitive and provide unprecedented resolution and scalability, allowing creating sophisticated multi point widgets for applications large enough to accommodate both hands and multiple users. The possibilities with this technology are endless and if pursued by the right individuals or companies we could see a complete shift in Human Computer Interaction (HCI).

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