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Human Computer Interaction: Trends and Challenges

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Abstract - *Overview HCI (Human-Computer Interaction) is the study of how humans interact with computers and how computers respond or are not designed to interact successfully with humans. This research paper provides an overview of the topic of HCI. H. Definitions of various organizations and terms, an overview of existing technologies and recent advances in this field, how the sphere interacts with various other areas of the sphere such as engineering, cognitive and behavioral psychology, and anthropology Human computer interaction, including what to do. , sociology, ergonomics, industrial design and more. Simplicity and value are the main principles by which this paper is structured and the intention of this paper is to provide an overview of HCI and applications or devices, trends and challenges in the HCI space.*

***Key Words*: Human-computer interaction, functionality, usability, technology, anthropology, sociology, ergonomics, healthcare, intelligent business, education, learning, consistency**

1. INTRODUCTION

Due to the interdisciplinary nature of Human Computer Interaction (HCI), there`s currently definite upon definition of the range of topics which form the realm of human-computer interaction. However according to the foremost famous definition of "Human Computer Interaction" ,A "Human-computer interaction may be a discipline concerned with the look, evaluation and implementation of interactive computing systems for people use and with the study of serious phenomena surrounding them." Established early so it absolutely was incline within the direction of "usability" of the interface systems that concentrates at nonfunctional obligations, extending as of this usability towards maintainability, mature it had been equilibrium through "functionality" of the system with the authentic symmetry found the minute an equilibrium regarding these dual features - functionality and usefulness of the system is at hand and is fundamentally investigated on HCI design that embraces user endeavor then must be apparently sensed and verified . Nowadays, computers have a significant role in education and healthcare industries. The digital devices like notebook, tablet, PCs and handheld portable devices like smart phones, watches became almost usual and trending equipment. The usage of electronic devices within the field of healthcare and education environment is remarkable, because it offers attractive, realistic and amazing facility. At the same time, the use of digital devices in the classroom aims to expand the educational environment for all students. We also found that the use of digital devices in the classroom was highly effective in improving student and teacher motivation, course-supported comprehension, and overall academic performance. This essay explores the category or level of interaction design for new computing technologies used by humans. These technologies are characterized by a different physical appearance than traditional desktop computers, and therefore a different context of use. These technologies include, for example, wearable computers such as the Apple Watch, B. health monitors, immersive virtual spaces, and ubiquitous computerized environments. These are typically considered breakthrough technologies. Modern technology often means interacting differently than the normal operation of a computer.

2. LITERATURE SURVEY

Review Human-Computer Interaction (HCI) is a student who studies human-computer interaction with the aim of creating systems and their interfaces that are fun to empathize, characterize, control, participate in winning, and are user-friendly. is. This can be thought of as two powerful information processing devices (a human and a computer) trying to communicate with each other over a narrowband and very limited interface. Video games (AR) are being explored along with new technologies that support learning in engineering, medicine, and education. The appearance and development of the cyber-human framework, supported by human-computer interaction (HCI) principles, applies to two domains. The first explored her use of VR in teaching science and technology concepts to students with autism, and the second, in training first responders involved in the COVID-19 pandemic. Focused. The Human Computer Interaction (HCI) program will play a number one role within the creation of tomorrow`s exciting new computer program software and technology, by supporting the broad range of fundamental research which will ultimately change the human-computer interaction experience therefore the computer isn't any longer a distracting focus of attention but rather an invisible tool that empowers the individual user and smooth the natural and productive human-human collaboration. the expansion in Human-Computer Interaction (HCI) field has not only been in quality of interaction, it's also experienced various branching in its past. Rather of designing regular interfaces, the

various research branches have had contrasting concentrate on the concepts of multimodality instead of unimodality, intelligent adaptive interfaces instead of command/action based ones, and at last active rather than passive interfaces. the most important concepts in HCI are functionality and usefulness. Services provided normally by a system are called functions. Usability is the ease, accuracy, and clarity with which users use the system's features. HCI essentially deals with the planning, evaluation, adoption, and use of data technology, with the typical goal of improving user performance and knowledge. Human-computer interactions develop or enhance specific goals in device design. The five key goals are safety, usability, efficacy, efficiency, and value. Advances in technology, computing, and language communication processing have led to the discovery of agent-based technology. This suggests that it has important implications for the focus of HCI, intelligent private agents being one of the rapidly evolving technologies.

3. HCI WITH OTHER AREAS

HCI currently covers psychology, ergonomics, sociology, socio-culture, philosophy, economics, law, mathematics, ecology, biology, design, media, communication sciences, cognitive sciences, information sciences, natural sciences, technical research, etc. , is taught in some information technology subjects. - Web Engineering, Artificial Intelligence and Machine Learning, Pervasive Computing, Ubiquitous Computing, Ambient Intelligence, Geography, Management Information Systems and Industry, Manufacturing, Systems Engineering, and more. HCI's explorations and processes captivate and blend all these prospects. HCI is the social identity of society.

HCI and Computer Science: HCI's Computer Science division explores and develops abstractions, techniques, languages, and tools to address this problem. A key concept in user interface software is the decomposition of interactive system design into different levels. H. Divide into conceptual, semantic, syntactic and lexical levels and develop a design for each level.

HCI with cognitive and behavioral psychology : Cognitive Psychology is one of the majors` contributor to Human-Computer Interaction (HCI) research by providing and applying psychological principles to understand and help advances the models that explain and predict human performance.

HCI with anthropology: It is, highlighted how user research in HCI shares more similarities with ethno methodology — which aims at analyzing social structures from everyday methods and practices — preferable than with that kind of analytic ethnography found in social sciences, which is always interpretative besides observational.

HCI with sociology : HCI precisely in social media search Sociology demystify the technical. From digital data gathering methodologies, usability as a planned force directing our digital interactions and cautionary tales of controversy, HCI has a body of relevant work and expertise to offer on the full range of `the digital`.

HCI with ergonomics : Ergonomics and HCI are related to each other because ergonomics is the working environment the end user is operating within and HCI is the interaction the end user actually has with the computer system. The computer is the only physical interface between the end user and the information, which they are typed into the computer system.

4. APPLICATIONS OF HCI

Everyday Life: Today, technology permeates all areas of our lives. Computers impact our lives even though we don't own them or use them directly. ATMs, ticket machines, and hot drink vending machines are just a few examples of computer interfaces you can use every day, even if you don't have a computer. Human-Computer Interaction (HCI) is key to creating these systems and interfaces. Whether you're designing an ATM or a desktop computer interface, you should review HCI principles to ensure your interface is safe and convenient. , reliable. and efficient.

Healthcare: Human-Computer Interaction (HCI) plays a key role in the design of decision-oriented software in healthcare. CDSSs, electronic health records (EHRs), medical imaging systems, and other computer-based collaboration tools, such as telemedicine and home care applications, are routinely used by physicians. Data integration and analysis from wearable devices, remote monitoring, and digital his counseling are only available during the clinic visits he follows. These clinics are sparse and require intermittent data collection and interpretation. can be processed. In addition, shared decision-making schemes allow patients to be directly involved in clinical decision-making, enabling patient-centered care.

People with Disabilities: An eye-tracking system designed to assist people with disabilities, where eye tracking plays a large role in command-and-action scenarios. Pointer movement, blinking, clicking. Lip reading or lip tracking is known to be a

powerful tool for correcting speech recognition errors. A gaze recognition pointing system that enables disabled people to work on their PC by interacting with the machine via voice and head gestures.

Education: The use of electronic devices in education is important as it provides an engaging, more realistic and interesting environment. At the same time, the use of digital devices in the classroom should improve the learning environment for all students. It was also clear that the use of digital devices in the classroom is beneficial for improving student engagement, ability to apply courses based on understanding, and overall academic performance.

Industry and Business: HCI is known for companies that rely on technology and computers for their day to-day operations. A well-designed, easy-to-use system reduces distractions, makes employees happier and more productive. HCI is essential, especially when designing safety-critical systems such as those found in power plants and air traffic control centers. In these cases, design errors can have fatal consequences, including the death of many people.

5.TRENDS

The recent expansion in technology have made significant positive impacts on the human-computer interaction (HCI). It is now possible to interact with computers using voice commands, touch screen, eye movement, hand gesture, etc.

1.Speech recognition: Applications: Amazon's Alexa , Apple's Siri , Google's Google Assistant ,Microsoft's Crotona Speech recognition technology and the use of digital assistants have moved rapidly from our mobile phones to our homes, and its application in industries such as business, banking, marketing, and healthcare is significantly becoming apparent.

2.Gesture recognition: Applications: Smartphone's and Tablets free users from keypads and Microsoft's Kinect gaming system mice A hand gesture recognition system provide a natural, creative and modern way of non verbal communication. It has a extended area of application in human computer interaction and sign language. Common application areas are Sign Language, Clinical health, robotic control ,gaming, virtual environment, home automation.

3.Gaming platforms and devices: The major HCI devices which are used today are the gaming console controllers for example, the PS4, Xbox One and Wii U, in addition the Mouse and Keyboard used for the computer. New technology is created for example the Kinect, or PlayStation Move, they cannot fully superposition a controller, as they were created after the release of a console, instead of with it.

4.New Interface Technologies: Such as multi-touch, gesture/movement built on top of the base gesture/movement recognition, speech recognition, and eye / face tracking platform Challenges .

5.Emotion Detection: Facial expression is an big part of non-verbal communication and one common means of human communication. Expression recognition, as one of the crucial development directions of human computer interaction, can improve the fluency, accuracy and lightheartedness of interaction.

6.Virtual Assistants: From the HCI point of view, virtual assistants are the most engaging group of Internet agents. Virtual assistants usually serve as virtual representatives and online assistants, learning of users' habits, needs and proclivity, and responding individually to behavior of those users. Assistant's customization bestow to higher rates of return visits and sizeable customer loyalty as well as good perception of a company reputation. Examples: Site Pals invented and produced by Odd cast, German site's SAP's manager Jochen Keller recruits potential workers by help of his virtual assistant, German Ministry of Education employed Wolfgang Schumacher which teaches graduates how to make a business plan and found their own enterprises. He explains the rules of market analysis and the firm management etc

7.Agumented reality: Area of application: Architecture, sports, camera, military, medical, mobile applications. Augmented Reality is a technique that allows users to overrun digital information with their physical world. The Augmented Reality (AR) displays have an extraordinary characteristic from the Human– Computer Interaction (HCI) perspective. Due to its rising popularity and application in diverse domains, increasing user-friendliness and AR usage are condemning. Context-aware is one approach since an AR application can adapt to the user, environment, needs and boost ergonomic principles and functionality.

6.CHALLENGES

With all the latest trends, HCI faces several challenges, especially from a personal, organizational, administrative, psychological, social, or cultural perspective.

1. Learnability: One of the usability criteria is learn ability. Learning ability occurs in relation to software or electronic devices that bridge human-machine interaction. The most common applications are those that follow the conventions of other similar programs. Streamline learning by creating a simple user interface design with predictable layout and navigation. A good way to improve learning ability is to examine the user's guesses before using the application.

2.Generalizability and Consistency: Extending knowledge of a particular interaction to new situations helps It helps bring some consistency to the proposed system model. The Consistency Principle supports users by allowing them to transfer knowledge from one application to another. The application should be consistent with the current version of the product, its use of metaphors, and user expectations. The latter has individual differences and is the type that requires the most consistency.

3.Perceived Consistency: The concept of perceived stability is closely related to the principle of consistency. For example, it gives users a visual sense of stability even when certain actions are not available. They are not removed from the appearance, just grayed out.

4.Designing Learning Healthcare Systems: A Key Moment for HCI Researchers and Designers is Connecting Patients Seeking Health, Clinicians Delivering Care, and Providers Looking to Reduce Costs While Improving Quality of Care That's it. Help form a large healthcare system. Macro-HCI mindsets and big data analytics tools can provide insights at all levels that can be shared with relevant stakeholders, but driving meaningful change in such large-scale systems remains a challenge. . Bottom-up strategies foster patient and physician engagement, but top-down governance is required to set policy, deal with bad actors, and drive continuous improvement.

5. Accelerating Analytical Clarity: The big data movement is generating massive amounts of heterogeneous data. Its analysis leads to a better understanding of the invisible processes in business, community growth/decline, learning and public health. This better understanding, enhanced by well integrated visual interfaces and statistical techniques, can lead to safer and bolder decisions that improve the well-being of individuals, communities and the planet.

6. A safe cyberspace: Criminal activity and data breaches threaten to reduce engagement, participation, political involvement and tool use in all types of transactions. Designed with usable privacy and security in mind, it maintains benefits, minimizes intrusions, and meets security expectations.

7.Error reporting and Recoverability: The user should be able to understood which user actions have led to the present state, and what the system did to reach there. We need to find out if they there are somehow invisible states that result to the current state. Unless the user can learn to remember any possible path leading up to an identifiable state, the publishing of possible paths appears unnecessary. Support for undoing errors should be given for the of user to take disciplinary action once an error has been recognized.

7. CONCLUSION

This white paper provides an overview of the topic HCI. H. Human-Computer Interaction. Contains various definitions and terms. Also, how various other disciplines such as computer science, cognitive behavioral psychology, anthropology, sociology, and ergonomics are related to his HCI and how they interact with his HCI It also explains how to create more effective applications for future generations. In addition, Paper has demonstrated various applications of his HCI in various fields such as daily life, healthcare, disability, education, industry and business, as well as his HCI such as voice, gesture recognition, game platform, emotion, etc. We also offer new trends. Perception, Augmented Reality, etc., and the challenges faced by his HCI especially when viewed from a personal, organizational, administrative, psychological, social or cultural perspective.

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