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Research Article

Role of Human Computer Interaction

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Abstract: Human Computer Interaction (HCI) as the name suggests is referred to as the interaction between the user and the machine(computer). As all of us are surrounded by the computers so it is important to know and study about how human computer interaction has been possible and how it has developed a major field in Computer Science. Human computer interaction is a multidisciplinary field which involves theories and practices from numerous field which include computer science, psychology and cognitive science, sociology and anthropology, ergonomics being some of them. Every element is accounted in HCI from their perception and the world interaction to the long history of using computers and technology. Poor designing can create unanticipated problems. This paper provides an overview regarding human computer interaction how it has evolved over the years and the role it is played in the field of computer science.

Keywords: Ubiquitous Computing, Neuralink, Cognitive Science

1. Introduction

Human beings have been interacting with computers for a long time now and there are different ways of interacting with them. The three components of HCI are Human, Computer and Interaction but the primary aim of HCI is enhancing the way human and computer interact with each other. Human computer interaction is the field that studies about the interaction between a human and a computer and it is a multidisciplinary field and design of computer technology being one of them. HCI can be considered as a broader field of human factor engineering. Human factor engineering deals with designing interaction between people and product, systems or devices. This means that non computing parts are dealt by human factor engineering as well but it has been mostly considered as a subfield of Computer Science .The application areas for HCI is now increasing due to the ubiquitous nature of the computers . Companies over the years have tried making the computer more user friendly to use thus saving time, money as well as help the non-technical person have a better experience using them efficiently. The basic goal of human computer interaction can be considered as usability. HCI being a multidisciplinary field has a wide range of applications but usability is the common factor in all the fields. HCI studies how our behaviour is affected by technology and how we co evolve along with it. It uses knowledge from the field of cognitive science combined with engineering principles.

2. Components Of Human Computer Interaction

The three main components of human computer interaction are :

- Human
- Computer
- Interaction

Every operation performed in the field of HCI is done by using these components. Understanding a human is one of the essential parts so Card, Moran and Newell in 1983 described the Model Human Processor or Human Processor Model. It is used to calculate how long it takes to perform a certain task. The processing of information by human is called cognition. It is helpful while designing because it helps to get the idea that how the interaction will happen. Cognitive processes and cognitive limitation of users also need to be considered.

Computers have been designed for complex calculation and easy tasks and over the years it has been integral part of every organization and human being. Computer has become a broad term now and refers to any piece of technology. It has its applications in things like self-driving car, smart watches, TVs, Smart Homes etc.

HCI aims to make the interaction easy between a user and a machine. Improving the communication with the machine helps the user to perform the task easily. Interaction takes place at the interface. UI/UX designers help to make it easy to use improving the design and keeping it attractive as well as easy for non-technical users.

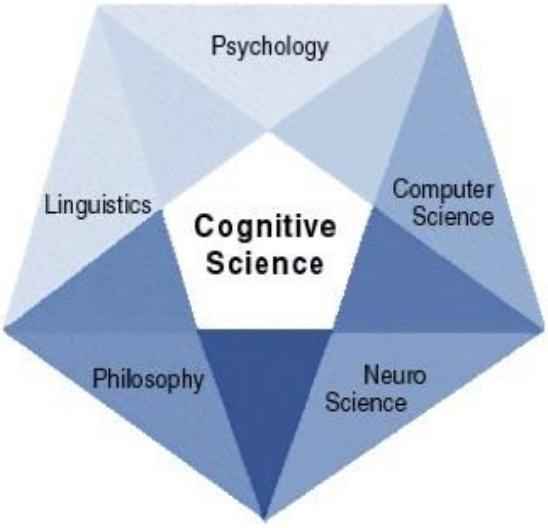
3. Concept

Overview

Human-Computer Interaction is an innovative field of science that explores the different ways of interaction between humans and computers. It evolves around the idea of connecting humans and computers in every possible way. Initially in 1980s, it started with the use of personal computers for simple tasks like notepad and calculations. Now this field has come a long way evolving from a single focus on personal computing to artificially intelligent assistants. Today HCI does have the answers for every wicked problem of the society.

Cognitive Sciences

In order of advancing the human-computer interaction it is important to understand human's cognitive sciences which includes a broad mix of every human science like psychology, philosophy, neuroscience and even anthropology. Basically, an individual needs to be investigated for incorporate psychological interaction, memory thinking and language to develop user interfaces than can function with or for human brain. Along with the cognitive sciences, social science methodologies like ethnography will also be used to explore sciences and create technologies that can enhance social interaction and activities to enrich the human experiences.



Engineering

After understanding the cognitive sciences of human, things are needed that can work in compliance of these sciences. Here cognitive engineering comes in handy which is building thing that work with human's thoughts or brain waves. Until now human act according to their thoughts to interact with computers using I/O devices like mouse, keyboard, touchpad and displays. In today's times cognitive engineering aims at developing brain-machines interfaces to connect humans and computers.

4.The Interaction

Interaction is the way to manipulate the objects and services using conceptual models. It can be achieved by implementing user interfaces for humans. Initially it started with the desktop models then ubiquitous computing and now it has come to neural technologies.

Desktop Models And Ui/Ux

For many years, the concept of human-computer interaction revolved around the desktop models. Desktop and mouse are from the earliest findings of HCI. Other accessories were also created to interact with desktop but the focus was on desktops. The modern-day design came a long way from Command Line Interface (CLI) to the latest Graphical User Interface (GUI). During the early days designers played a small role. It was difficult to the non-developers to understand the gap between user and the system made interacting difficult. The growing field of HCI was inspired by this process. HCI is a forerunner to the UX design. Modern UI/UX design is evolving through the various research conducted on design techniques. Despite the similarities there are some differences between HCI and UX design. HCI is more academically focused and involved in scientific research while the UX designers are mostly industry focused. Modern user design has been evolving though the research conducted by HCI design techniques. HCI has helped in influencing the techniques of the UX design techniques.

Ubiquitous Computing

The traditional computer may be a glass box – all we will be able to do is press buttons and see the effect. The barrier is broken by the ubiquitous computing and the augmented reality systems by establishing a link within the electronic and the real world. Ubiquitous Computing (Ubicomp) is a paradigm in which computational capability is embedded into everyday objects/devices so that communication is effective and perform the task with minimum computer interaction by the end user. It is also known as pervasive computing which was coined by IBM .Ubiquitous Computing has grown since few years and is constantly evolving with the advancement in technology. In ubiquitous computing the computing is omnipresent and it can be accessed from any location and in various format. In the A research program was initiated in the 1980's by a group of researchers which were led by Mark Weiser. The aim of it was involving human computer interaction in the everyday lives of people rather than only on desktop. Weiser note that the most advanced technology is the one that is indistinguishable. They immerse themselves in everyday life until they are no longer separated from it. They weave themselves into the fabric of everyday life until they are indistinguishable from it. The main aim of ubiquitous computing is to create an environment where the devices connectivity is embedded such that it is unobtrusive and readily available.

Examples of Ubiquitous Computing

- Self-Driving Cars that need no driver and can detect traffic and traffic signals accordingly.
- Smart meters to manage and record the electricity consumption.
- Automatic Intelligent Lighting System and Cooling system that can be controlled with phones.
- Apple Watch or Fitbit.
- Smart Speakers such as Google Assistant, Amazon Echo or Apple Home Pod.

The ratio of computer to humans was decreased by the arrival of diverse computing which is referred as third wave of computing. The mainframe computing occupied a lot a space because of its huge size and it represented the first wave of computing. When the ratio became almost equal between the number of devices and the people that used them it refers the second wave of computing.

Neural Technology

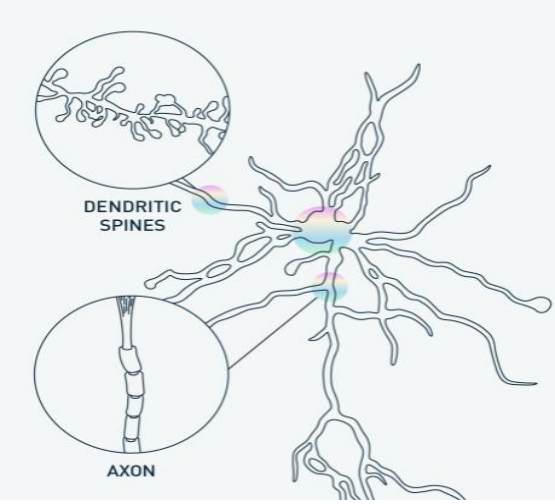
It is in very initial phase where computer interacts directly with the human brain. Neuralink is one major example of neural technologies which interact directly with brain using neural waves.

Neuralink : An Example

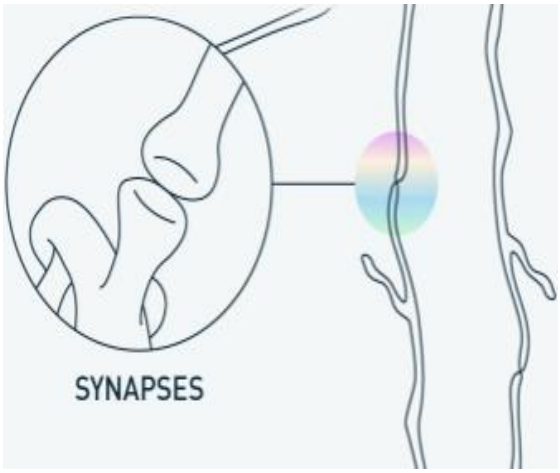
Neuralink is a neurotechnology corporation, it has been working on an implantable brain-machine interface since 2016. It is a system containing ultra-thin probes that will be inserted into the brain and it will process information from neurons and send data to machines.

Science Behind It

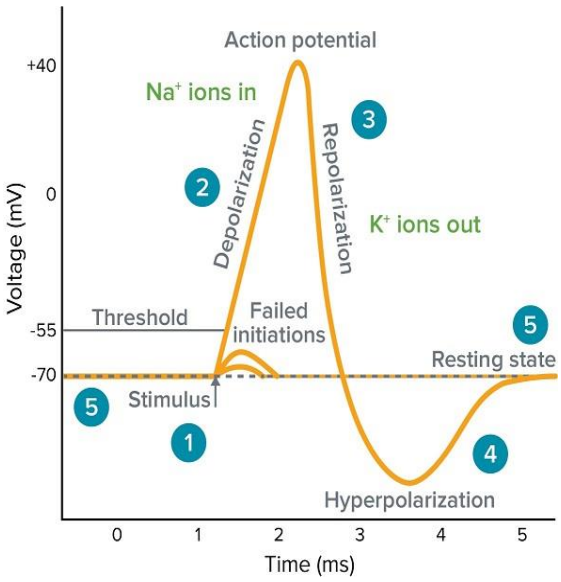
As name suggests, neurons play a major role in neuralink development. Neurons are responsible for information transfer, generally neurons consist of three different parts: a dendrite to receive a signal, and the signal is computed by a cell, and an axon which send the signal out.



Our brain consists of 86 billion neurons and they are connected to each other through synapses. Neurons use electrical signals to communicate. Action potentials make synapses to release neurotransmitters, opening channels because of which current flows across the neuron's membrane. After getting the right input, action potential initiated by neuron.



To detect action potential, electrodes are placed near neurons which enable brain's electrical signals to be recorded. Information represented through those cells decoded by the recording from many neurons. Information of everything we think, touch or see, is carried by neurons.

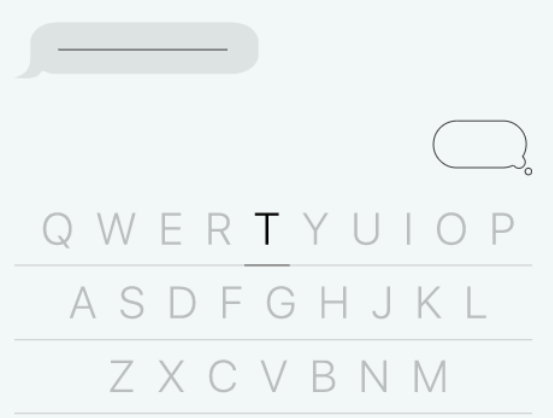


Engineering Of It

The first neural implant will enable human of controlling a digital device like computer or mobile anywhere. The areas of brain which control movement will be equipped by ultra-thin threads.

Applications

This technology can be used in a vast manner but for initially this is being developed for human with paralysis to regain the control of computer and other digital devices. It will give those people ability to communicate more easily via speech synthesis and enable them to follow their creativity through art or writing apps.



5. Conclusion

Over the years Human-computer interaction played a major role in human life but now HCI has become an essential part of life around the world. Every science branch is making use of HCI. It is important that we start focusing more on including common people in the loop of designing and development as they all will provide us a way to make HCI more efficient.

The important thing is the need of people for new systems, like neuralink is the need of hour for disabled people. Research needs to be done to assure the designing of new systems and frameworks for better solutions, solve hidden problems and for the creation of more interactive systems according to the demand.

A lot of theories from different disciplines evolves around the HCI, every theory has its own importance in certain disciplines but designers have less tools and training to apply these theories. We need to find our less expensive and practical approaches to overcome this problem and to ensure that theories which relates to present demands will be given priority.

Overall HCI is making immense progress in terms of research and designs to achieve set of goals. HCI has come a long way from designing for people to designing with people and one day we will achieve our goal of designing in people.

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