Computers and Intelligence: The Brain, Machine and Intelligence

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Abstract — *This paper discusses on human mind and computer intelligence. It briefly discusses about the structure of the brain and explores how human brain can interact with machines using Brain Computer Interaction. Then the paper discusses about the origins of Artificial Intelligence, current state of AI, its applications and implications to the human society. The idea of "true human like intelligence" and the possibility of machines having such intelligence is explored.*

Index Terms — Computer, Intelligence, human mind, Brain

I. INTRODUCTION

Computers and Human Mind is a vast and interesting area to explore. It touches various aspects including computer science, biology and sociology. Our literature review mainly focuses on human intelligence and computer intelligence, and how and whether we can build machines capable of having intelligence. Several studies have been conducted on brain structure [1], brain computer interaction [2][3][4][5] and its implications [6]. Some articles discuss on artificial intelligence [7][8][9], AI applications [10] and its implications [11].

First we will make a comparison between the human brain and machines. Then we would focus on the interactions of these two entities. Then we would focus on intelligence. We will look at the history of Artificial Intelligence, its developments and applications. Then we will try to answer the question whether a machine would be capable of having a true human like intelligence [12][13].

Throughout our study we noticed that the area of computers and intelligence is a growing field. It's still at its infancy. The technology and our knowledge base need to improve for us to see successful creations in this area.

II. THE BRAIN AND THE MACHINE

Human brain can be considered as a system with coordinating abilities and much other complex functionality. The science has taken the matter of duality of mind and body and has analyze edit to build a clear understanding of interaction of mind and consciousness. The structure of the brain is analogues to the structure of a computer system with intricately linked subsystems. This consideration has directed the science to explore the distinctive features of both systems and build amazing solutions by interconnecting them. One such activity is the working structure of brain has linked with the computer related activities to give disable people the capability of successful communication with the outside world.

A. Brain Structure

The brain can be explored in two aspects;

- Brain as a data processing system
- Brain as a super structure of intricately linked mental organs [1].

The first approach is an analogy of a data processing system. A comparison between two systems can be used to identify the distinct properties of each system. Both systems have different features and the brain is more complex than a computer system which is capable of making decisions and working as an individual. A human being has access to higher operations of mind in terms of thought and experience. From a computer's perspective, all operations have the basis of transmission of electrons across P-N junctions. But at a higher level this hardware complexity does not matter for a user. In the same way, synaptic junctions are the basic points of neuronal activity where most complex processes originate [1].

Most of the basic processes of a human are automatic. Conscious matters when more complex operations take place. These operations become automatic when they are stored and rehearsed properly. Though lots of mental processes are nonverbal and symbolic, language play an important role when making concepts and relate them to the outside world.

The next approach is the idea of Noam Chomsky. According to Noam Chomsky, language is one of the mental organs which are in coordination with other organs. It is like software of the operating system. According to Chomsky, the mental organs are specific systems organized for a specific function and mind is a complex system of interacting faculties. All human beings develop language regardless of conscious training, but its development depends on the environment. The basic system is easily acquired and conscious education is needed for the improvement of it. This basic system is like an operating system. Learning new languages need much effort and conscious.

The author concludes the paper with the message human brain with mental organs which can integrate to form a complex system has the model of a computer system which has interconnections of hardware and software by means of different layers of a computer system. [1].

B. Brain Computer Interactions

Brain computer interfaces (BCI) arean application of intelligent systems that make use of the signals that are generated as a result of human thoughts. Advances in cognitive neuroscience and brain-imaging technologies give the ability to interface directly with brain activity. These technologies let us monitor the physical processes in the brain that correspond with certain forms of thought. With the identification of needs of disabled, the researchers have begun using these technologies to build BCIs.

A brain-computer interface is a novel communication system that translates human thoughts or intentions into a control signal. Therefore BCI applications assist people with severe disabilities. To employ a BCI successfully, users must first go through several training sessions to obtain control over their brain potentials and maximize the classification accuracy of different brain states [2].

There are situations where healthy people can work with BCIs. Some examples of such applications are gaming environments and navigating maps. Healthy users can communicate using BCIs when the conventional interfaces are inadequate, unavailable or too demanding.

In contrast there are some challenges that need to be considered in both invasive and non-invasive methods. The users need good training before using the system. Since the system operates with signals, the accuracy of the result cannot be guaranteed in noisy environments. The systems that have been developed so far use complex hardware that is difficult to handle outside the labs. As a solution, researches have moved to use wireless technologies to the BCI systems.

A new wave of brain-machine interfaces help disable people connect with the outside world [3]. Computer Brain Interfacing started few years ago with many successful tests. These technologies use computers to analyze and redirect electrical impulses generated by the brain's neural activity. The paper states that the BCI devices have evolved to form moving a cursor using brain to draw letters and moving a robotic hand.

CBI's successes are also made possible thanks to major advances in brains research and computer technology over the past few years [3]. Wolpaw,Turner and Donoghue are pioneers in developing mind controlled devices using various types of brain waves. Non-invasive methodologies also have immerged to make the patients more convenient.

The challenges that mentioned above were addressed by the researches and have proposed many solutions to them. As an example, researches are now exploring ways to bypass the thinking aspect in order to control a neuro-prosthetic device. It may be hard to imagine what CBI devices will enable patients to accomplish in future, but it is ultimately the mind that will enable them to escape bodily limitations.

One remarkable solution that has been achieved as a result of computer intelligence is the current silentspeech methodologies. It reflects the improvements of BCI technologies. There are electrophysiological recording techniques for the speech deprived individuals to help with silent-speech communication. But these techniques are not suitable in some situations. Patients suffer from locked-in syndrome retain slow eye movement or blink control which limit them from using the current techniques. Such individuals can be helped by brain-computer interfaces (BCIs).

Silent speech communication for profoundly paralyzed individuals can be achieved by utilizing scalp-surface based electrodes,cortical-surfaced electrodes orintracortical microelectrodes [4]. Though these methods provide silent communication for paralyzed users, they are not currently capable of operating at rates fast enough for conversional speech.

In addition, these techniques require accurate visual perceptual abilities for the user which is entirely impractical for the users with severe paralysis. As a solution, restoring communication to a paralyzed individual by intracortical BCI was introduced [4]. This technique has been used by several patients who have successfully learned to control the position of a mouse cursor on computer screen and select desired characters.

There are some future challenges for BCI techniques in order to reach the near-conversational speech. Silent communication using intracortical electrode BCI is not yet accurate enough to achieve normal speakingrates.

Furthermore silent communication BCIs are currently restricted to usage within the laboratory. Therefore considerable effort should be made to make the technique suitable for real world use. The experiments has been taken into account with integrate wireless technology with the system and integrate the hardware component with a wheelchair make it more portable.

According to Velichkovsky and Hansen[5] eye tracking and brain imaging are the modern technologies in the field Brain Computer Interfaces. The eye tracking technology mentioned in [5] uses data obtained from eye movement of a person. It uses only the gaze direction to get the input data in a head free condition. It does not consider the other activities of the person who involved in. The main application of eye tracking technology is eye-mouse. It is like a normal mouse which controlled by eye movement. It reduces the selection time. And also this technology is used to control the virtual keyboard and user interfaces. This technology will help the elderly and physically disabled people to control the electronic devices. This eye-mouse is operated by making a small sequence of animation within 500ms.

There is another approach to gaze mediated interaction is using eye tracking as a substitute of a mouse. It uses a new type of non-command multimedia application. It continuously measures the amount of attention being paid to an individual object on the display. It has been proposed, to term this non-command interaction principle as "interest and emotion sensitive media" (IES) [5]. There are many applications that use the combination of the command and non-command approaches.

III. ARTIFICIAL INTELLIGENCE

Artificial Intelligence is a fascinating area; most people are captivated by its fantasies, possibilities and promises.

A. *History of AI*

The history of AI can be traced back to philosophy, fiction and imagination. The beginnings of AI can be traced back to a time where fiction writers wrote about mechanical, non-human characters in their fictions. These include mechanical tripods waiting on the gods at dinner, mechanical reasoning devices using rules of logic to settle disputes, and robots. One such example is the mechanical man mentioned in the book Tiktok of Oz by L. Frank Baum in 1907. It is an Extra-Responsive, Thought-Creating, Perfect-Talking Mechanical Man, Thinks, Speaks, Acts, and Does Everything but Live. gives a comprehensive look into the history and the roots of Artificial Intelligence. In early twentieth century and after World War II, computers were developed and their computing power increased. In 1940s the bases for information-processing and symbol-manipulation theory of psychology was laid. AI was influenced by many developments in the areas of engineering, biology, neural networks in simple organisms, experimental psychology, communication theory, game theory, mathematics and statistics, logic and philosophy and linguistics.

But only in the latter half of this century were the computers and programming languages powerful enough to build experimental tests of ideas about what intelligence is. The author states that Alan Turing's 1950 seminal paper in the philosophy journal Mind is a major turning point in the history of AI. This is because it explores the idea of making an electronic device behaving intelligently, and it presents the Turing Test.

The author mentions several AI programs that were developed. These include Arthur Samuel's checker-playing program, programs that invent proofs of logic theorems and programs that use symbol manipulation for pattern recognition. The development of language understanding and translation programs was also noted as a turning point in AI. The development of knowledge based systems was also considered a turning point and a paradigm shift in the field of AI. The formation of laboratories dedicated for AI, conferences and forums that appeared in the 1960s helped the field of Artificial Intelligence to grow.

All these developments and understandings have brought forward AI to what it is today. But it is still at its infancy. Author mentions many areas in AI still need to be developed. Knowledge representation and inference remain the two major categories of issues that need to be addressed. He also states that we should think about the social implications of AI, such as job displacement, failures of autonomous machines and loss of privacy.

B. Applications and Developments of AI

AI has touched many areas. According to The Joshua Lederberg Papers bio medical research is one of them. This article discusses the first AI system in the biomedical research. Lederberg, who was a Geneticists, is the first person who linked computer science and biomedical. His goal in introducing computers into the biomedical field was to aid researchers and physicians in problem-solving, decision-making, and diagnostic processes requiring analysis of a large amount of instrument and clinical data. He designed a computer-controlled mass spectrometer capable of analyzing the Martian surface for signs of life. He applied the theoretical principles of computerized spectrometry to experimentation in the chemical laboratory in 1965. They became the foundation of DENDRAL. DENDRAL is a prototype for expert systems and the first use of artificial intelligence in biomedical research. It was a computer program to describe the molecular structure of unknown organic compounds taken from known groups of such compounds, such as the alkaloids and the steroids.

Writer explains more about the DENDRAL and its functionalities. DENDRAL reduced the workload of chemists. It performed its task with greater speed than an expert spectrometric with more accuracy. Likewise artificial intelligent systems reduce humans workload. So we can use the artificial intelligence in every field to reduce the workload and time consumption and to increase the accuracy of the work. From this article we can conclude that DENDRAL played an important role in the development of the modern biomedical system.

Decision Support Systems are an application of AI that establishes a symbiosis of human mind and computer by allowing for a high degree of human-computer interaction.

Decision Support Systems (DSS) have been described as computer-based aids for management decision-makers dealing with semi-structured problems[10]. The differences of DSS and other Management Information System (MIS) components are that in DSS seek to establish a cooperation of human mind and computer by increasing the human computer interaction and by letting the users to maintain direct control over the computer's tasks and their outcomes.

According to Simon's[14] description of the three major stages of the decision process as Intelligence, Design, and Choice there are three stages of support needed to be given to the managers. The first stage of support is to assist the manager in problem exploration and definition. The second stage aids in formulating alternative solutions and the third and final stage in selecting a strategy or plan [10].

The reason for the DSS approach to succeed while previous efforts failed is because it does not try to completely automate the decision making or computerization task without the human processing that is needed. Instead it breaks the decision making process into parts and lets the user to understand and select which of the parts are needed in the process. This way human processing is involved in the process which is understood, adjusted, controlled, and interwoven into the decision-maker's own step-by-step human processing sequence, by the user.

Intention of DSS is to support the more creative and intuitive aspects of decision-making as well as related structured analytical tasks. Though user does not define what is structured and what is unstructured, he states that structured analytical tasks requiring computation are associated with functions performed by the left side of the human brain, while those tasks of a more creative, unstructured and qualitative nature, involving perceiving patterns, have been attributed to the right side of the brain[15].

Some efforts have been made in order to structure the problems and computerize them in order to analyze those using computers. An example is the Yale University simulation called POLITICS, which attempts to model national reactions to international events [15]. But efforts are experimental and can be compared to earlier management science efforts to model and computerize an entire solution process.The DSS approach. however, does not require the human judgment to be replaced by the computers and therefore its application need not to wait till all the researchers are finished and computers will be able to provide human judgment. But more new approaches are needed in order to enhance the right brained capabilities of DSS before we can extend these system's scope of application, to open and qualitative problems.

The development in the field of artificial intelligence goes hand in hand with development in computer hardware. Both fields are developing at a rapid pace.

The paper When will computer hardware match the human brain? by Hans Moravec[8]discusses how imaging and image processing done in computer work compared to a human eye. At the time of writing this paper, digital imaging like in today's world. Therefore according to the paper human eye is much more efficient in capturing (sensing) real world scenes than computers. But today the computers have surpassed that boundary. Computers have much more resolution than human eye. It can capture more data from a scene than a human eye. And yet it lacks the processing power of a human eye. AI still has catching up to do in processing images. But in this paper it says analyzing moving object is for a computer is difficult because of the limitations in hardware. It says that analyzing algorithms need more machine instructions per seconds to achieve acceptable level of image tracking. But with the hardware we have today and the improvements in algorithms we have achieved quite a lot in this area. There are programs which can process videos in real time and track moving objects in it. The same paper discusses about hardware evolution and the ability it has given the software to improve its brain like features. An important statement in the paper is as follows Machines with human-like performance will make economic sense only when they cost less than humans [8]

As the hardware improves it shrinks in size. And the technology used in preparing chips has improved, since the size of chips has reduced drastically, so as the speed it operates.

Hans Moravec, in his paper, predicts that in fifty years' time the computer AI will beat the human brain. Initiation of the AI movement and achieving even the brain of an insect has taken around fifty years, so the big names in AI doubt that in fifty years' time it's highly unlikely that computers will supersede humans. The counterargument for this is also a valid argument. Even though the start of the movement is slow the field is growing exponentially. Therefore achieving such heights like superseding human brain within fifty years is not impossible. Initially Artificial intelligence research was centered on making machines have the capability of a human mind. As the task was not that simple, it diverted to a more commercial endeavor where intelligent units created to aid humans in a given intelligent area. This aspect of artificial intelligence, where trying not to represent the whole intelligent system of humans but an area of it and to combine those areas as they evolve was discussed by many AI field experts. When intelligence is approached in an incremental manner, with strict reliance on interfacing to the real world through perception and action. reliance on representation disappears. The approach discussed by Rodney A. Brooks[9] in his paper is practical and more of an implementable way than the traditional way of thought in AI.

According to his paper, intelligent systems should not have a central system which controls all, rather a set of competing behaviors that ultimately produces the final behavior. This chaotic sort of behavior of creatures is what the makes the system be more flexibility in acting intelligently.

Ultimately experiments with real creatures in real worlds can answer the natural doubts about this approach.

V. DO MACHINES HAVE TRUE INTELLIGENCE?

John R. Searle, author of the paper Is the Brain a Digital Computer? start his answer to this question by stating that

The basic idea of the computer model of the mind is that the mind is the program and the brain the hardware of a computational system.[13]

Writer initially asks 3 questions and then answers them. They are,

1. Is the brain a digital computer?
2. Is the mind a computer program?
3. Can the operations of the brain be simulated on a digital computer?[13]

Answer to the first question he asks is the plot of the paper. So he answers question two and three before he answers the first question.

Answer to the second question, Is the mind a computer program?, is no. He explains this by a very good real world scenario. If a person did not know Chinese he cannot process Chinese language and understand it. But if it was a computer program which process the language it does not need to know the language in order to process the input. The argument is based on the simple logical truth. So a computer program only needs to know the syntaxes.

Yes, is the answer to the third question, Can the operations of the brain be simulated on a digital computer? Operations can be stated as a set of steps and it is a known fact that a set of steps can be simulated on a digital computer.

According to Allan Turing's paper on Computing Machinery and Intelligence,[19] for any algorithm there is a Turing Machine that can implement that algorithm. Also it states that there is a Universal Turing Machine which can simulate any other Turing Machine. Considering these two facts any algorithm can be simulated using a machine. So the question arises whether this Universal Turing Machine is similar to the brain. But there is a difference. These machines mainly understand the syntax not the semantics.

The point author is stating is not that the claim "The brain is a digital computer" is false. Rather it does not get up to the level of falsehood.13] According to John it is simply not false that the brain is a digital computer.

We looked at the similarities and differences between the human brain and digital computers. But there is still an ultimate question that needs to be answered. Will computers ever be able to be as intelligent as humans, or will they be able to be more intelligent than a human? Different researchers have different opinions on this. This question has been the base for many debates, fictions and movies.

Brian Christian in his paper Mind vs. Machine [14] and Andrea Meibos in her paper Intelligence in Computers 15] tackle this question. Brian discusses on artificial intelligence and the human mind. He discusses about the blurring line of artificial intelligence and human mind and how AI programs have become smarter every year. His paper starts by discussing the Turing Test, which is used to measure how _human like' a particular AI program is. A human judge engages in a natural language conversation with a human and a machine designed to generate performance indistinguishable from that of a human being. All participants are separated from one another. If the judge cannot reliably tell the machine from the human, the machine is said to have passed the test.

It is the emotional intimacy, and empathy that humans have when conversing that makes a human conversation human.Brian discusses on some of the techniques used by AI programs to simulate human conversations. Then he discusses on our human values, which makes us truly human.

Brain concludes by discussing an interesting issue. He discusses the importance of our human values, which makes us superior to machines. He states:

I think that, while the first year that computers pass the Turing Test will certainly be a historic one, it will not mark the end of the story. Indeed, the next year's Turing Test will truly be the one to watch—the one where we humans, knocked to the canvas, must pull ourselves up; the one where we learn how to be better friends, artists, teachers, parents, lovers; the one where we come back. More human than ever

Brain states that the line between AI and human intelligence is blurring. But is the intelligence shown by machine really true intelligence? Andrea [15] discusses this issue, and question Is it even possible for computers to have intelligence?

Today there are many computer devices or programs that seem intelligent. But it is questionable whether those programs have the properties of true intelligence. This requires us to define what true intelligence is. The author quotes some definitions of intelligence which includes, "the ability to learn or understand from experience... use of the faculty of reason in solving problems". But it is clear that non programmable human capacities are involved in all forms of intelligence, such as cultural values, common sense, and intuition.

The paper considers how AI programs attempt to achieve some of the aspects of human intelligence. These include (quoting the author 15]):

Creativity: Can computers be creative like humans? Is such creativity necessary for intelligence?

Understanding: What constitutes understanding, and can computers understand?

Simulation vs. Emulation: Must a computer get results via the same method as humans to be intelligent?

There are programs that display creativity to some degree. There are programs that can improvise jazz music, and programs that can create unique artistic images without an input. There are also programs that deduce mathematical concepts when basic ground rules of mathematics are given.

But this apparent creativity is based on random elements of the program constricted by some boundaries, and not a portrayal of emotion. The author concludes by mentioning that real creativity by computers is impossible and also undesirable since we do not want machines to be creative and not follow the instructions. And it would affect the qualities such as dependability, honesty, and reliability that we expect from a computer.

For computers to "understand" and to be intelligent, they should both be able to interpret data and relate in some way about their experiences. Computers are very good at interpreting and organizing data, and can be programmed to some extent to change their algorithms based on new information, empathy would require both emotion and consciousness, or self-awareness. While current computers do not have emotion, cognitive scientists believe that they have discovered how emotions are created, and some AI experts believe that emotion could be implemented on computers. However required technology or knowledge is still not developed.

In conclusion the author states that the traditional computers are incapable of being truly intelligent. Quoting the author:

Computers may seem to use reason and have understanding, but this alleged intelligence is only a façade hiding the clever code that the machine follows exactly. The machines' artificial intelligence is just that-- artificial.

As discussed above, Turing test has become the ultimate test of an AI product. The paper, The Turing test and artistic creativity by Margaret A. Boden[16] discusses the topic of artistic creativity in computer (in AI terms) with testing for its compatibility using Turing Test (TT). Making a computer to work as a human artist is a difficult job, even if it is achieved, measuring computers performance and testing whether it has truly achieved the target is even more difficult.

But surprisingly testing computers ability to generate world class caliber art is relatively easy than checking whether it is creative like a normal human being. Since there are different types of segments in art the computer can concentrate on one artistic segment and do some variations to an existing art. For instance the computer can be programmed to analyze Mozart and generate compositions similar to him. The result of this happened to be astounding. Even the best musicians in the world sometimes fail to identify whether it's done by a human or a computer. Even though this was quite an achievement it has yet to prove itself.

The paper written by Margaret A. Boden16] talks about a program called Emmy which composes music, and using that the paper tries to analyze the current state of this research area. But the concern here is that whether these computers are actually thinking like creative human beings. In their process of creating computer composed music is it trying to be creative? Or is it merely doing some slight changes to an already composed music by human beings? That concern makes us wonder about creativity. What is creativity? The paper tries to describe creativity as a relative thing and hard to define. In a way that is true, but it does not solve the problem of computers trying to be artistic.

So to overcome that obstacle Margaret A. Boden considers music genres (classical music. western, eastern etc.), work done by world renowned musicians and compare the performance of computers relative to those. And Margaret A. Boden goes beyond testing the computer's ability just by Turing test. That is a good move that he make, since in the end what we need to learn is what the public opinion is about this movement of computers trying to be like humans. In Margaret A. Bodens' paper he emphasize this matter. extract from the paper is as follows.

However, passing the TT does not necessarily bring acceptance. Sometimes, on discovering that the image/music they had previously admired was generated by a computer, people simply withdraw their previous valuation. (I have seen this happen more than once.) Margaret A. Boden. The Turing test and artistic creativity,pg. 411 Kybernetes Vol. 39 How to measure creativity? Do we want computers to be creative? What are the issues that need to be considered when we discuss this paper? There is no clear cut answer to those questions and even the answers are subjective. We would like to end this section with an extract from the paper which emphasizes the view of some individuals.

Art, they say, necessarily involves the communication of human experience from one person to another: therefore, computer art is not really art. Any beauty it may have seemed to have, they insist, is purely superficial – indeed, illusory. (We all make mistakes, someone once said to me.)

VI. SOCIAL IMPLICATIONS

In previous sections we looked at the interactions of human brain and machine, and the idea of intelligence. Methods of Interactions of humans and machines are developing, and these new developments will have a great impact on the society and our moral understandings. This section looks at these impacts.

Maartje Schermer in his paper The Mind and the Machine, On the Conceptual and Moral Implications of Brain-Machine Interaction [6] tries to take a look at how society will react to new methods of brain and machine interactions.

Brain-machine interfaces allow humans to interact with machines directly using the brain. It is a growing field of research and application. The increasing possibilities to connect the human brain to electronic devices and computer software can be put to use in medicine, the military, and entertainment. In the near future the mysteries of brain would be unraveled and it would be possible to connect human brain to machines. This technology would produce limitless possibilities. The paper discusses on the current situation of Brain Machine interaction, what the future would be like and mostly it stresses on the implications that such technologies would have on our understanding of conceptual and moral standards.

Current brain machine interaction technologies are mostly medical based, developed to help disabled humans. A bionic ear that converts sound into electrical impulses that are transmitted to an electrode implanted in the inner ear helps deaf people to hear again. Similar technologies are being developed to help blind people see. A second form of brain-machine interaction is Deep Brain Stimulation (DBS). With this technique small electrodes are surgically inserted directly into the brain. which sends out tiny electrical pulses to stimulate a specific brain area. This technology is used for treatment of neurological diseases such as Parkinson's disease. The third form of brain-machine interaction is where the brain controls a computer directly. This technology, called neuro prosthetics, enables people to use thought to control objects in the outside world such as the cursor of a computer or a robotic arm.

Then the paper discusses on the implications of this technology. First, the idea of privacy is discussed. When human brains are able to communicate with machines and are connected to the internet, there is a threat that the subjects could be located and maybe even controlled remotely. Then the blurring distinction between man and machine and the idea of the cyborg are discussed. The more artificial parts are added to the human body, the more uncertainty there is about where the human stops and the machine begins. The final conclusion is that this distinction would depend on our views on what it is to be a person, to have a free will and to have responsibility. We would draw this distinction depending on the context too. For example a person with a bionic limb on a race would have more advantage over a normal person, where as it would be acceptable for a disabled person to carry out day-to-day activities.

New technologies have changed the way our society think and interact; they have changed our moral values. Brain Machine interaction would be also such a technology and we should be mindful of its possibilities and its dangers.

The development of AI, understanding of brain structure and related IT implications raises many social issues. In the earlier days the human computer interaction was focused on single user interacts with the desktop computer. But now with the development of network technologies it is focused on network and social design. Users use the computers as a medium to communicate with other people. Because of their busy life people do not have time to meet other people and talk with them. So these network technologies are very useful for people to communicate with others. R. De Paula says socio computing is the recent research area that helps to design the interactive technologies.

We need new research designs, new methods, and new epistemologies to study the shift from an isolated mind in the use of computer technologies toward collective actions situated in the sociocultural context.

V. CONCLUSION

Since the inception of AI field scientists tried to imitate human brain. In this paper we discussed about how human brains work and how scientists implemented intelligent machines using the knowledge gained about human brains. But some deviated from the initial idea of imitation to concentrate more on making machines that communicate with human brain (BCI). BCI was used to assist people with severe disabilities. Technologies such as Silent speech communication , eye tracking, brain imaging were discussed under this.

Do machines have true intelligence? That is one of the questions we tried to answer in this paper. Through the topics like Turing test the idea of intelligence and measuring a machines AI capabilities were discussed. And bit of history regarding the field of AI was discussed to make things more complete and make the readers aware of initial achievements in the field of AI. Since the late Fifties with the aid of figures like John McCarthy, the field of Artificial Intelligence has improved. And the development of this field has been spanned to different areas as we have discussed in this paper; Brain Computer Interfacing; speech recognition; embedding Artistic creativity in to machines; Turing test etc. But still there is no hard and fast rule or a methodology to answer this question. And in most cases the answer depends on the perception of the person.

Ultimate goal of these endeavors is to make computer's do the chores of humans and to make lives of humans better. Weather this is going to be successful or not is a question that nobody has the correct answer to.

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