Mind Reading Computer

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Mind reading is the way to detect or identify the other's mental states. The easiest way for mind reading can be done by simply looking and understanding the facial expressions. For instance the smile can give us an expression of happiness. But now a days, it may be possible that not only one people can understand the other's mental state but also a computer might understand the mental states of the people. This paper describes the ways how a computer might speculate the mental state of a human and thus becomes the mind reading computer. This paper emphasizes on the ways by which a computer might speculate the mental state, First method is by Facial Expression Analysis (FEA) and the second by using a Futuristic Headband. The machine might be able to react to commands just by say, moving a dot across a TV screen . So far the S.R.I, computer has been taught to recognize the seven different commands—Up, Down, Left, Right, Slow, Fast and Stop.

***Keywords*— Include at least 5 keywords or phrases**

I. INTRODUCTION

Human expresses their mental states, including thoughts, emotions and desires every time through the facial expressions, vocal implication and the gestures. Mind reading machine is the co-ordination of human psychology and computer techniques. Some equipments are used to collect the data& then analyzed. To use all those data for the further prediction it is known as "Theory of mind reading". The team in the Computer Laboratory at the University of Cambridge has developed the mind reading computers that implements a computational model of Mind Reading to speculate the mental states of people from their facial expressions or signals. Using Digital Video Camera, the Mind Reading computer system analyzes a person's underlying mental state, such as whether that person is Thinking or Confused, Agreeing or Disagreeing, Interested or Bored. Our mental states shape the decision that we make, govern how we communicate with each others, and affect our performance. Existing human-computer interfaces are mind-blind — oblivious to the user's mental states and intentions. A computer may wait indefinitely for input from a user who is no longer there, or decide to do irrelevant tasks while a user is frantically working towards an imminent deadline. When computer gets the input from that user there are difficult challenges such as computer gives the result, existing computer technologies often frustrate the user, have little bit persuasive power and cannot initiate the interactions with the users. With the increasing complexity of computer technologies and the pervasiveness of mobile phones and wearable devices, there is a need for the machine that are aware of the user's mental state and that adaptively respond to their mental states.

The ability of mind reading by a computer can provides us many applications in the field of Medical, Crime and one's life also.

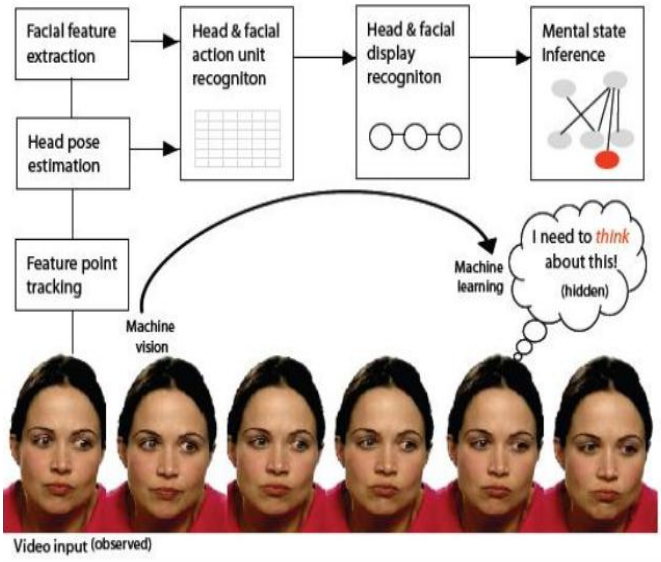
II. WHAT IS MIND READING COMPUTER?

Mind reading computer may be defined as the machine that speculate the human mental states. The understanding of a human's thoughts is one of the most difficult tasks. No one exactly knows what a person would do in the upcoming second by executing his present thoughts or what would a person thought about any other human or what would a person desires and many more. But a mind reading computer could give the answer of allthese questions.

It was developed by a team of Cambridge university, taking an inspiration from the Psychology, vision of computer andMachine Learning. Prior knowledge of how the particular mental states are expressed through the face in real time is required. Software from Nevenvision identifies 24 feature points on human face and tracks them in the real time. Movement, Shape and Color are then analyzed to identify the gestures like smile etc.

A Computational Model of Mind Reading

The goal is to enhance the human-computer interaction through compassionate responses, to improve the productivity of the user and to enable the applications to initiate interactions with and on behalf of the user, without waiting for an input from that user.



(Fig 1.1)Processing stages in the mind-reading system

The model represents these at different granularities, starting with the Face and Head movements and building them in time & in space to form an effective and clearer model of what mental state is being represented. Color, Movement and Shape are then analysed to identify the gestures like a smile or eyebrows being raised. Combinations of all these gestures occurring over time indicate the different mental states. For example, a combination of a head nod, with a smile and eyebrows raised might mean interest. The relationship between observable head and facial displays the corresponding hidden mental states over time and is modelled using the Dynamic Bayesian Networks.

III. NECESSITY OF MIND READING COMPUTER

The mind-reading computer system presents an information about your mental state as easily as the keyboard and mouse presents the text and commands. Imagine a future where we are surrounded with cars,mobile phones, and online services that can read our minds and react to our moods.

We are working with a major car manufacturer to implement this system in cars to detect driver mental states such as drowsiness, distraction and anger.Current projects in Cambridge are considering further inputs such as body posture and gestures to improve the inference. We can then use the same models to control the animation of cartoon avatars. The mind-reading computer system may also be used to monitor and suggest an improvement in human-human interaction.

The Affective Computing Group at the MIT Media Laboratory is developing an emotional-social intelligence prosthesis that explores new technologies to augment and improve people's social interactions and communication skills.

The need of Mind Reading Computer are due to following reasons:-

• Input to computer with an incredible speed

• To support learning systems and on-line shopping .

• To control the animation of cartoon like avatars.

• To detect driver mental states such as anger, drowsiness, distraction.

• To monitor and Suggests improvement in human-human Interaction.

IV.HOW DOES IT WORK?

Electroencephalograph (EEG) a device used by the medical researchers to pick up electrical currents from the various parts of the brain.

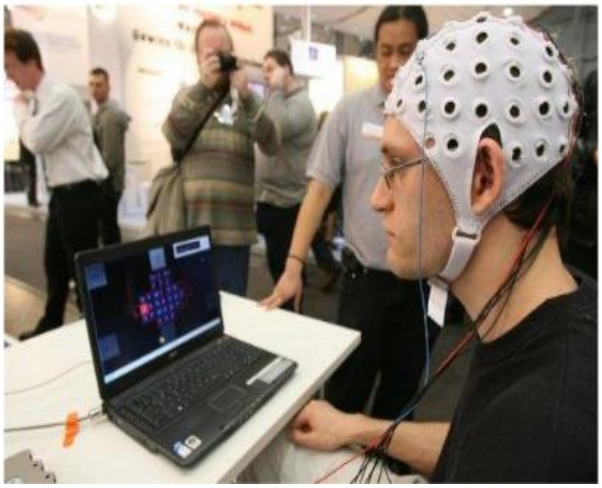
Functional near-infrared spectroscopy (fNIRS) Technology which measures the volume and an oxygen level of the blood around the subject's brain. Futuristic headband that sends light into the tissues of the head where it is absorbed by the active, blood-filled tissues and then it measures how much light was not absorbed. NASA has developed the computer program which can read silently spoken words by analysing the nerve signals in our throats and mouth. Just the slightest movement in the Voice box and tongue is enough to work. Initially scientists trained the software program to recognize the six words-including go, left, right and 10 numbers. Participants hooked up to the sensors silently, said the words to themselves and the software correctly picked up the signals 92% of the time.

Futuristic Headband

The user wears a futuristic headband that sends the light in that spectrum into the tissues of the head where it is absorbed by active, blood-filled tissues. The headband after that measures how much light was not absorbed, letting the computer gauge the metabolic demands that the brain is making.

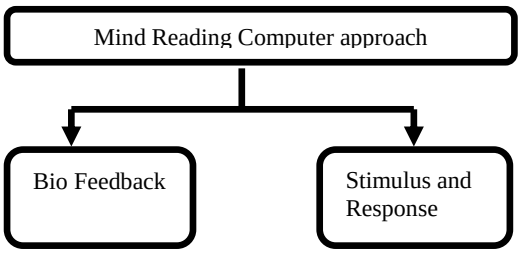
(Fig 2.1) Futuristic Headband

The results are then compared to an MRI, but can be collected with lightweight, noninvasive equipment. When user wears thefNIRS sensor then an experimental subjects were asked to count the number of squares on a rotating onscreen cube and to perform some other tasks that are necessary. The subjects were then asked to rate the complexity of the tasks, andtheir ratings agreed with the work intensity detected by the fNIRS system up to 83 percent of the time.



(Fig 2.3) a person wearing futuristic headband

Preliminary outputs show that using button size sensors, which are attached under the chin and on the side of the Adam's apple, it is possible to pick up and recognize the nerve signals and patterns from the tongue and vocal cords that correspond to specific words.



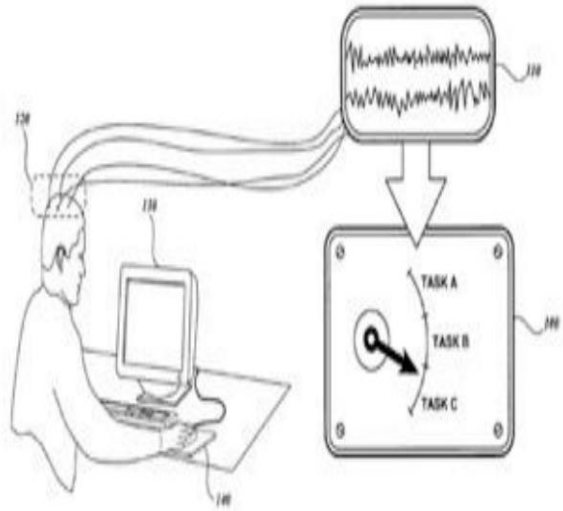
(Fig 2.2) mind reading computer approach

Mind Reading Computer uses the following two approaches:

1)Bio Feedback: In this process an individual can learn how to change the physiological activity for purposes of improving the health and performance. Accurate instruments measures the physiological activity such as skin temperature, heart function brainwaves, breathing and muscle activity. These instruments gives rapidly and accurately 'feedback' information to user. A subject is connected to an electroencephalograph (EEG) and particular groups of brain signals are monitored. The cons of biofeedback is that the training period can stretch to long duration approximately around the months, and the results can be changed between subjects and the tasks which they try to perform.

2) Stimulus and Response: When a subject is given a certain stimulus, the brain will automatically produce a measurable response
so there is no need to train the subject to manipulate the specific brain waves.

WEB SEARCH



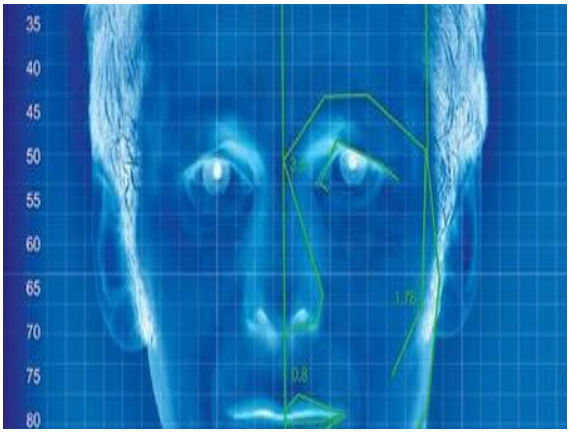
(Fig 3.1)Websearch using Mind- Reading Computer

When the first test of sensors were performed scientists trained the software program to recognize only six words which are "go", "left" and "right" and 10 numbers.

The Researchers put the letters of the alphabet into a matrix with each column and row named with a single-digit number. In that way, each letter was represented by a unique pair of number co-ordinates. These were used to silently spell "NASA" into a web search engine using the program. "This proved we could browse the webwithout touching a keyboard"

V. TECHNIQUES OF MIND READING COMPUTER

1. *Facial Affect Detection*:- It is done using the hidden Markov Model, Active Appearance Modelor Neural Network processing.

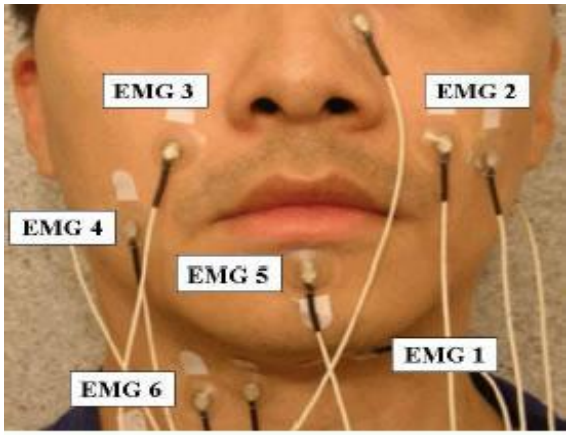


(Fig. 4.1) facial affect detection

2. *Emotional Classification*: This Classification was done by Paul Ekman.The emotions include in this classification are Happiness ,Sadness, Surprise, Anger, Fear, Disgust.

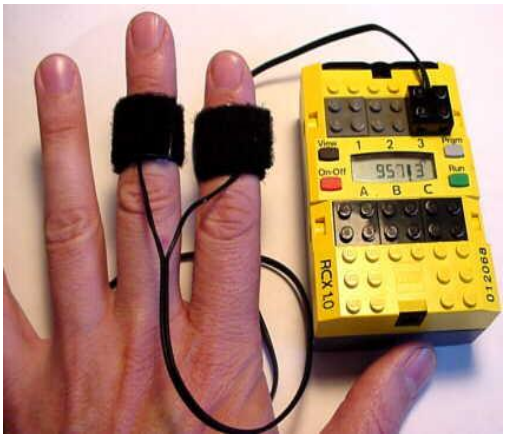

(Fig. 4.2) emotional classification

3. *Facial Electromyography*: This technique is used to measure electrical activity of the facial muscles. Muscles used are “corrugator supercilii muscle” and others.



(Fig. 4.3) facial electromyography

4. *Galvanic Skin Response:* It is a measure of skin conductivity, which is dependent on how moist the skin is.



(Fig. 4.4) Galvanic Skin Response

5. *Blood Volume Pulse:*-It is measured by a process called photoplethysmography.
It produces a graph indicating blood flow through the extremities.

(Fig. 4.5) Blood Volume Pulse

VI. PROS AND USES OF MIND READING COMPUTER MIND CONTROLLED WHEELCHAIR:

The mind controlled wheelchair was developed by the University of Electro-Communications in Japan. With the power of mind you can move the wheelchair. It can be done by mapping the brain waves when you think about moving forward or backward, left, right and then assigns required actions to a wheelchair command of actually moving forward or backward, left, right. Mind Controlled Wheelchair could be useful for people who are paralyzed, and are not able to control their body parts.

The parts of this system includes an electric wheelchair, a laptop computer, an Arduino, an interface circuit, an EEG headset, and a collection of ready-made and custom software. The EEG headset, which connects wirelessly to laptop and then allows the operator to simply think "forward" or "left" or "right" to cause the wheelchair to move. The Performance is directly related to practice by the user, better configuration of the software, and good contact made by the EEG electrodes on thescalp of the operator. The interface circuit connects between the Arduino's digital pins and the joystick of the wheelchair. When the Arduino receives a command from thecomputer, it causes the circuit to "fool" the wheelchair into thinking that the operator has moved the joystick.

(Fig5.1) A Man sitting on Mind Controlled Wheelchair

- Computer Can read minds
- Help paralysed patients
- Help handicapped persons
- Help comma patients
- Help people who cannot speak
- Can be used for military field and sting operation
- Used for mind gaming, robotics, etc.
- Eliminate the capability of persons to lie
- Prevent from the terror
- For controlling a mechatronic device.
    - Interactions within a virtual reality environment
    - Communication by thoughts.
    - In spell checking.
    - In Interactive gaming area.

The pilot of a high-speed plane or spacecraft can order some vital flight information by his/her thought only. Pilot do not need to search the right dials or switches on the crowed instrument panel.

(Fig 5.2)Pilot of a high-speed plane ordering vital information by thought

(Fig 5.2) Mechatronic Device

Then researchers put the letters of the alphabet into a matrix with each column and row labelled with a single-digit number. In that way, each letter was represented by a unique pair of number co-ordinates. These were used to silently spell "NASA" into a web search engine using the program. "This proved we could browse the web without touching a keyboard". The finding raises issues about the application of such tools for screening suspected terrorists -- as well as for predicting future dangerousness more generally. We are closer than ever to the crime-prediction technology of Minority Report.

IX. FUTURE SCOPE

If 3 year project of Tufts university becomes successful, then we can allow computers to respond to the brain activity of the user. If it will be known that which air traffic controllers were overloaded, the next incoming plane would be assigned to another controller.

X. CONCLUSION

This paper describes the Mind Reading Computer that speculate the mental states from the facial expressions along with the head gestures in the Real Time Video. The mental state is recognized by comparing the present real time video with the preinstalled videos which contains the different expressions for different mental state (represented by various actions).

The other way of detecting the mental state is to be done with the help of futuristic headband which sends an Infrared light into the head's tissues which absorbed the light, the amount of light which are no absorbed help in detecting the various mental states.

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