

Brain Box Machine Reading Brainwaves: Mind Reading Computer

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ABSTRACT:

In last few decades many innovative inventions has been done with the growth in the modern technology and Mind Reading Computer is one of them. Mind Reading Computer, part of a neuroscience, is a machine that can interpret and respond to the human brainwaves. It does a difficult task of reading and stimulating human mind. The mind-reading computer system presents information about our mental state as easily as a keyboard and mouse present text and commands. Imagine a future where we are surrounded with the computer systems reads our minds and react to our moods by reading our facial expressions, vocal nuances and gestures.

INTRODUCTION:

Understanding a brain remains a mystery, but then with the progress in the technology we have tried to understand and read electrical brain activity where the computers can be used to see how brainwaves can be read by a mind reading computer [2]. When the users are interacting with the machines or the computer they express theirs emotions and thoughts through the facial expressions and the gestures. Mind reading computer is one such machine that reads and understands all those human thoughts. Reading the human thoughts and understanding the human brainwaves is a difficult task. Computers are one of the most important foundation stone of today's modernized world. Mind reading computer is a complex machine that enables computer technologies to understand and react to people's emotions and mental states [1]. It is a co-ordination of human psychology and the

computer technology [3].Unlike the mind reading computer, today's generation computer are mind blind i.e. they do not respond to the user's mental thoughts until the input is being given by either the keyboard or the mouse. So the computer needs to wait till the input is being provided. The existing computer therefore cannot be utilized to the maximum.

[1]. CONCEPT OF MIND READING:

The ability to determine an individual's mental state based on behavior and then use that information to guide one's actions or predict those of others, is known as the "theory of the mind."It belongs to the neuroscience technology or simply neuro technology that studies how people understand the brain and thoughts. It also includes technologies that are designed to improve and repair brain function and allow researchers and clinicians to visualize the brain [5]. Mind reading understands the combination of the facial expressions with the head gestures in real time and thus makes the respective decisions. It reads the hidden mental states of a person based upon the observable facial and head displays of a person. The prior knowledge is being provided about all the possible combinations of the head gestures including the eyebrows, lips, eyes, cheeks etc. Different combinations results into different decisions. The head gestures play an important role in mind reading. The expressions, movement, shape and color are then analyzed through the system and the gestures are identified then [1]. This is how the mind reading concept works. Also, the team in the Computer Laboratory at the University of Cambridge has already

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developed mind-reading machines. Mind reading concept enhances the human-mind interaction.

A computer that can reads and moulds the emotions into the required one, especially in case of a criminal; here no need for a stringent punishment rather a computer is required that can change the mind and hence make the better world than it is now. However, this technology by computer, to change the mind according to a desire is not established now. But in future it might be developed some day. So for all this mind reading computer is just the basic step.



Figure 1: Block diagram of the automated mind reading system

Also consider a situation where we are surrounded with mobile phones, online services and cars and the all these systems can read our minds and react accordingly. It makes life so easy as by just thinking we can order our system to work accordingly. Moreover it becomes a boom for a physically handicapped person because he will able to drive a car, access online services and mobile phones just by thinking. All we can do is to give a mind reading machine that will be able to read mind by scanning the facial expression.

HEAD POSE ESTIMATION:

It use expression – invariant feature points to estimate pitch (500), yaw (500) and roll(300) for example estimation of head yaw using ratio of left point to right point of eye widths and estimation of head roll using the angle between the two inner eye corners.

Facial actions are identified from feature points comprised of motion, shape and color descriptors. Motion and shape-based analysis are particularly suitable for a real time video system color based analysis is computationally efficient and is invariant to the scale or viewpoint of the face, especially when combined with feature localization (i.e. limited to regions already defines by feature point tracking). For lip shape tracking that identifies for example lip corner pull(smile)and lip pucker the polar distance between each of the two mouth corners and the anchor point is computed. The average percentage change in polar distance calculated with respect to an initial frame is used to discern mouth displays.



Figure 2 : Estimation of head roll using the angle between the two inner eye corners.

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MENTAL STATE RECOGNITION:

We then evaluate the overall system by testing the inference of cognitive mental states, using leave-5-out cross validation. Figure 3 shows the results of the various stages of the mind reading system for a video portraying the mental state *choosing*, which belongs to the mental state group *thinking*. The mental state with the maximum likelihood over the entire video (in this case *thinking*) is taken as the

classification of the system. 87.4% of the videos were correctly classified. The recognition rate of a mental class m is given by the total number of videos of that class whose most likely class (summed over the entire video) matched the label of the class m. The false positive rate for class m (given by the percentage of files misclassified as m) was highest for *agreement* (5.4%) and lowest for *thinking* (0%). Table 2

summarizes the results of recognition and false positive rates for 6 mental states. A closer look at the results reveals a number of interesting points. First, onset frames of a video occasionally portray a different mental state than that of the peak. For example, the onset of disapproving videos were (mis)classified as unsure. Although this incorrectly biased the overall classification to *unsure*, one could argue that this result is not entirely incorrect and that the videos do indeed start off with the person being unsure. Second, subclasses that do not clearly exhibit the class signature are easily misclassified. For example, the assertive and decided videos in the agreement group were misclassified as *concentrating*, as they exhibit no smiles, and only very weak head nods. Finally, we found that some mental states were "closer" to each other and could co-occur. For example, a majority of the unsure files scored high for*thinking* too.



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Figure 3 : The status of the dynamic Bayesian networks for 7 mental states shown at 8 inference instances in a video of *choosing*, which belongs to the *thinking* group.

ADVANTAGES AND APPLICATION: Mind reading computer could help paralyze patients, handicapped people, and people have been in comma, people who cannot speak.

For example a prototype mind controlled wheelchair developed from the University of Electro Communications is Japan. This works by mapping brain waves when you think about moving left, right, forward or back and work accordingly.

Mind reading computer can be used in military purposes, sting operations and severe investigations (as in the form of lie detector).Mind reading computer can prevent from terrorism.

Also it can be combined with consoles and used for mind gaming.

DISADVANTAGES:

It can be breaches in privacy and can extract important and confidential information through the person which may be about the country. In this way information may be gained by any terrorist or criminal then it can be highly dangerous. Also these mind reading computers cannot be 100% accurate as human mind is much more complex than a computer, after all human had created the computer. But the accuracy could be reached up to 86.4%.

CONCLUSION:

This paper describe mind reading computer that infers mental states from facial expressions along with head gestures in real time video. The mental state is recognized by comparing the present real time video with the preinstalled videos which contain 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 Infrared light into head's tissues which absorbed the light, the amount of light which are not absorbed help in detecting the various mental states.

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