INTERNATIONAL JOURNAL OF HIGHER EDUCATION AND RESEARCH
IJHER, Vol., 8(1), 2018, 45-65.
www.ijher.com

IJHER
(ISSN 2277 260X)

CODEN:IJHER ORIGINAL ARTICLE

BLUE EYES TECHNOLOGY IN MODERN ENGINEERING: AN ARTIFICIAL INTELLIGENCE

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ABSTRACT
This paper attempts to provide knowledge about Blue eyes technology in modern engineering. It is based on hard facts, research and experiences gathered from different authors, books, journals, documents from websites in hope that it will serve as an adequate learning resource for intended readers. The paper discussed Blue eyes technology to aid understanding and significance of Blue eyes technology in modern engineering technology - identifying the advantages of using artificial intelligence technology and the limitations of artificial intelligence technology. The paper concludes by recognizing benefits of using blue eyes technology in modern engineering, type of users that can operate the blue eyes technology system, and its effectiveness in modern engineering.
Keywords: Artificial Intelligence, Blue Eye, Modern, Technology

INTRODUCTION

A Blue eye technology is aimed at creating computational machines that have perceptual and sensory abilities like those of human, using non-obtrusive sensing method, employing most modern video cameras and microphones to identify the user's actions through the use of imparted sensory abilities which allows the machine/computer to understand what a user wants, where he is looking at, and even realize his physical or emotional states.

The basic idea behind this technology is to give the computer the human power. We all have some perceptual abilities that are we can understand each other's feelings for example we can understand ones emotional state by analyzing his facial expression. If we add these perceptual

abilities of human to computers would enable computers to work together with human beings as intimate partners (Swati, 2015).

Research Questions

Why is Blue eyes technology necessary?

What are the benefits of using blue eyes technology in modern engineering?

What type of users can operate the blue eyes technology system?

What are the limitations of using Blue eyes technology?

How effective is blue eyes technology in modern engineering?

Terms and Definition

- *Blue*: in this term stands for Bluetooth, which enables reliable wireless communication
- *Eyes:* because the eye movement enables us to obtain a lot of interesting and important information.
- *Emotion computing:* is the study and development of systems and devices that can recognize, interpret, process, and simulate human affects.
- *Manual and gaze input cascaded (MAGIC):* This work explores a new direction in utilizing eye gaze for computer input.
- *Data acquisition unit (DAU):* Data Acquisition Unit are to maintain Bluetooth connections to get information from sensor and sending it over the wireless connection to deliver the Alarm Messages sent from the Central System Unit to the operator and handle personalized ID cards

- *Central system unit (CSU):* CSU maintains other side of the Blue tooth connection, buffers incoming sensor data, performs online data analysis records conclusion for further exploration and provides visualization interface.
- *Simple user interest tracker (SUITOR):* it tracks computer users through multiple channels - gaze, web browsing, and application focus to determine their interests and to satisfy their information needs.

ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is intelligence exhibited by machines. In computer science, the field of AI research defines itself as the study of "intelligent agents ": any device that perceives its environment and takes actions that maximize its chance of success at some goal. Colloquially, the term "artificial intelligence" is applied when a machine mimics "cognitive" functions that humans associate with other human minds, such as "learning" and "problem solving" (known as Machine Learning). As machines become increasingly capable, mental facilities once thought to require intelligence are removed from the definition (Wikipedia, 2017).

It's Benefits

- Error Reduction: Artificial intelligence helps us in reducing the error and the chance of reaching accuracy with a greater degree of precision is a possibility.
- No Breaks: Machines, unlike humans, do not require frequent breaks and refreshments, it allow machine programming for long hours and can continuously perform without getting bored or distracted or even tired.
- Digital Assistants: Highly advanced organizations use 'avatars' which are replicas or digital assistants who can actually interact with the users, thus saving the need of human

resources. For artificial thinkers, emotions come in the way of rational thinking are not a distraction at all (Reddy, 2016).

- Repetitive Jobs: Repetitive jobs which are monotonous in nature can be carried out with the help of machine intelligence. Machines think faster than humans and can be put to multi-tasking. Machine intelligence can be employed to carry out dangerous tasks.
- Daily Application: Computed methods for automated reasoning, learning and perception have become a common phenomenon in our everyday lives. We have our lady Siri or Cortana to help us out. We are also hitting the road for long drives and trips with the help of GPS. Smartphone in an apt and every day is an example of the how we use artificial intelligence (Reddy, 2016)**.**

Precincts

High Cost: Creation of artificial intelligence requires huge costs as they are very complex machines. Their repair and maintenance require huge costs. They have software programs which need frequent up gradation to cater to the needs of the changing environment and the need for the machines to be smarter by the day. In the case of severe breakdowns, the procedure to recover lost codes and re-instating the system might require huge time and cost. *No Replicating Humans:* Intelligence is believed to be a gift of nature. An ethical argument continues, whether human intelligence is to be replicated or not. Machines do not have any emotions and moral values. They perform what is programmed and cannot make the judgment of right or wrong. They cannot take decisions if they encounter a situation unfamiliar to them. They either perform incorrectly or breakdown in such situations.

No Improvement with Experience: Unlike humans, artificial intelligence cannot be improved with experience. With time, it can lead to wear and tear. It stores a lot of data but the way it can be accessed and used is very different from human intelligence. Machines are unable to alter their responses to changing environments. They fail to distinguish between a hardworking individual and an inefficient individual.

Unemployment: Replacement of humans with machines can lead to large scale unemployment. Unemployment is a socially undesirable phenomenon. People with nothing to do can lead to the destructive use of their creative minds. Humans can unnecessarily be highly dependent on the machines if the use of artificial intelligence becomes rampant. Humans will lose their creative power and will become lazy. Also, if humans start thinking in a destructive way, they can create havoc with these machines. Artificial intelligence in wrong hands is a serious threat to mankind in general. It may lead to mass destruction. Also, there is a constant fear of machines taking over or superseding the humans (Reddy, 2016).

With the limitations mentioned above, Blue eyes technology is a preferred solution to combat such disadvantages such as where there is high cost in creating artificial intelligence, creation of blue eyes on the other hand is less expensive and less time consuming. For data security unlike artificial intelligence where there is no safety of data, the users in blue eyes technology don't have to worry about the security mechanism. It has a different level of data security which is required;

- Only the registered mobile devices could connect.
- Bluetooth connection authentication is required.
- Bluetooth connection encryption

- Access rights restrictions.

These are some of the concrete security procedures that make this technology even more different and unique. Where artificial intelligence cannot improve on experience, blue eyes technology monitors and records operator's daily activities so as prevent unnecessary human errors. Unemployment is not admissible in blues eyes as the technology requires different users to operate it for better performance and so on. Blue eyes technology uses different techniques and technologies to solve these limitations which will be discussed in the next chapter.

THE TECHNIQUES

This paper seeks to view and improve the technology so as to combat the above limitations via Blue eyes technology utilizing the following modern techniques; emotion computing**,** manual and gaze input cascaded (magic) and simple user interest tracker (suitor). These techniques use tools like microphones, cameras, and Bluetooth module and emotion mouse. The techniques are elaborated with their descriptions to explain their importance to the implementation of Blue eyes technology. It also includes the main features on the construction of Blue Eyes Technology. The Hardware: DAU and CSU which consist of the physical components used and the Software: Connection manager, Data analysis module and Visualization module for the interface.

EMOTION COMPUTING: Rosalind Picard (1997) describes why emotions are important to the computing community. There are two aspects of affective computing: giving the computer the ability to detect emotions and giving the computer the ability to express emotions. Not only are emotions crucial for rational decision making as Picard describes, but emotion detection is an important step to an adaptive computer system. An

adaptive, smart computer system has been driving our efforts to detect a person's emotional state. An important element of incorporating emotion into computing is for productivity for a computer user (Wendy Ark D.)**.**

Types of emotion sensors

- For Hand: Emotion Mouse**,** Sentic Mouse
- For Eyes: Expression Glasses
- For Voice: Artificial Intelligence Speech Recognition

Hand

Emotion Mouse: The device can measure heart rate, temperature, galvanic skin response and minute bodily movements and matches them with six emotional states: happiness, surprise, anger, fear, sadness and disgust.

Sentic Mouse: It is a modified computer mouse that includes a directional pressure sensor for aiding in recognition of emotional valence (liking/attraction vs. disliking/avoidance) (Binyamin, 2010).

Eye

Expression Glasses: A wearable device which allows any viewer to visualize the confusion and interest levels of the wearer. Other recent developments in related technology are the attempt to learn the needs of the user just by following the interaction between the user and the computer in order to know what he/she is interested in at any given moment (Baghe).

Voice

Artificial Intelligence Speech Recognition

ARTIFICIAL INTELLIGENCE: Artificial intelligence (AI) involves two basic ideas. First, it involves studying the thought processes of human beings. Second, it deals with representing those processes via machines (like computers, robots, etc.). AI is behavior of a machine, which, if performed by a human being, would be called intelligent. It makes machines smarter and more useful, and is less expensive than natural intelligence

SPEECH RECOGNITION: The user speaks to the computer through a microphone, which, in use; a simple system may contain a minimum of three filters. The more the number of filters used, the higher the probability of accurate recognition. Presently, switched capacitor digital filters are used because these can be custom-built in integrated circuit form. These are smaller and cheaper than active filters using operational amplifiers. The filter output is then fed to the ADC to translate the analogue signal into digital word. The ADC samples the filter outputs many times a second. Each sample represents different amplitude of the signal. Evenly spaced vertical lines represent the amplitude of the audio filter output at the instant of sampling. Each value is then converted to a binary number proportional to the amplitude of the sample. A central processor unit (CPU) controls the input circuits that are fed by the ADCS. A large RAM (random access memory) stores all the digital values in a buffer area. This digital information, representing the spoken word, is now accessed by the CPU to process it further. The normal speech has a frequency range of 200 Hz to 7 kHz. Recognizing a telephone call is more difficult as it has bandwidth limitation of 300 Hz to3.3 kHz. As explained earlier, the spoken words are processed by the filters and ADCs. The binary representation of each of

these words becomes a template or standard, against which the future words are compared. These templates are stored in the memory. Once the storing process is completed, the system can go into its active mode and is capable of identifying spoken words. As each word is spoken, it is converted into binary equivalent and stored in RAM. The computer then starts searching and compares the binary input pattern with the templates. It is to be noted that even if the same speaker talks the same text, there are always slight variations in amplitude or loudness of the signal, pitch, frequency difference, time gap, etc. Due to this reason, there is never a perfect match between the template and binary input word. The pattern matching process therefore uses statistical techniques and is designed to look for the best fit (Academia.org).

MANUAL AND GAZE INPUT CASCADED (MAGIC)

This work explores a new direction in utilizing eye gaze for computer input. Gaze tracking has long been considered as an alternative or potentially superior pointing method for computer input. The goal of MAGIC pointing is listed as follows;

- Reduction of manual stress and fatigue, since the cross screen long-distance cursor movement is eliminated from manual control.
- Practical accuracy level: In comparison to traditional pure gaze pointing whose accuracy is fundamentally limited by the nature of eye movement, the MAGIC pointing techniques let the hand complete the pointing task, so they can be as accurate as any other manual input techniques.

- A more natural mental model for the user: The user does not have to be aware of the role of the eye gaze. To the user, pointing continues to be a manual task, with a cursor conveniently appearing where it needs to be.
- Speed. Since the need for large magnitude pointing operations is less than with pure manual cursor control, it is possible that MAGIC pointing will be faster than pure manual pointing.
- Improved subjective speed and ease-of-use. Since the manual pointing amplitude is smaller, the user may perceive the MAGIC pointing system to operate faster and more pleasantly than pure manual control, even if it operates at the same speed or more slowly.

Simple user interest tracker (suitor)

Computers would have been much more powerful, had they gained perceptual and sensory abilities of the living beings on the earth. What needs to be developed is an intimate relationship between the computer and the humans, and the Simple User Interest Tracker (SUITOR) is a revolutionary approach in this direction. By observing the Webpage an internet user is browsing, the SUITOR can help by fetching more information at his desktop. By simply noticing where the user's eyes focus on the computer screen, the SUITOR can be more precise in determining his topic of interest. It can even deliver relevant information to a handheld device. The success lies in how much the suitor can be intimate to the user (KUMAR, 2010).

System Overview

Blue eyes system monitors the status of the operator's visual attention through measurement of saccadic activity. The system checks parameters like heart beat rate and blood oxygenation against abnormal and triggers user defined alarms. Blue Eyes system consists of a mobile

measuring device and a central analytical system. The mobile device is integrated with Bluetooth module providing wireless interface between sensors worn by the operator and the central unit. ID cards assigned to each of the operators and adequate user profiles on the central unit side provide necessary data personalization so the system consists of Mobile measuring device (DAU) and Central System Unit (CSU) (Jothi, 2016). The Fig. 1 describes the system overview.

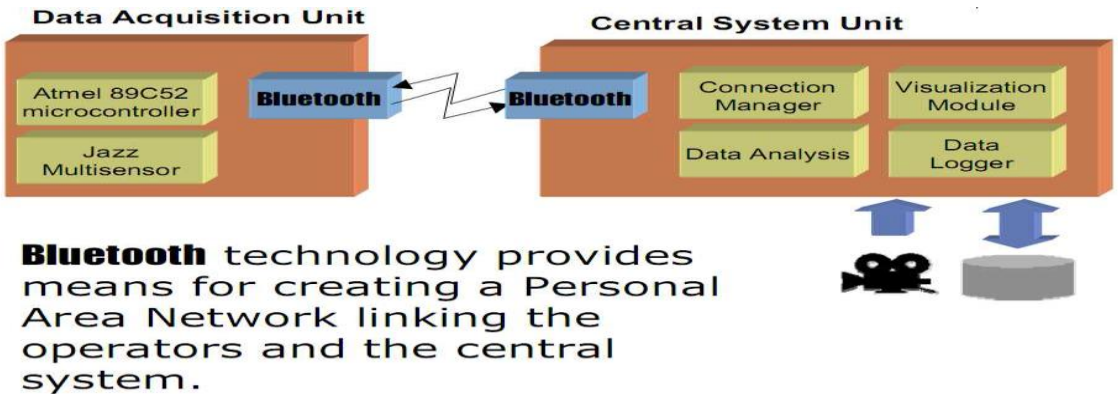

Figure 1. System Overview (Jothi, 2016)

DESIGN

The overall System (Fig. 2) design diagram is as follows:-

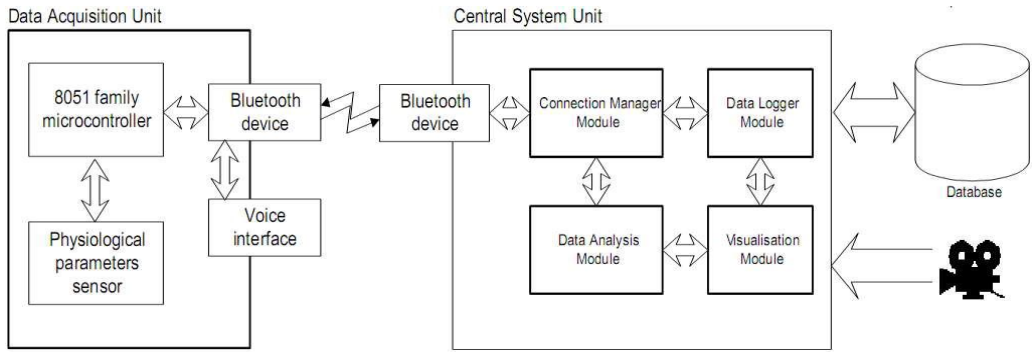

Figure.2 Block Diagram of System Design (Binyamin, 2010)

The Hardware

Data Acquisition Unit

Data Acquisition Unit is a mobile part of the Blue eyes system. Its main task is to fetch the physiological data from the sensor and to send it to the central system to be processed. To accomplish the task the device must manage wireless Bluetooth connections (connection establishment, authentication and termination). Personal ID cards and PIN codes provide operator's authorization. Communication with the operator is carried on using a simple 5-key keyboard, a small LCD display and a beeper. When an exceptional situation is detected the device uses them to notify the operator. Voice data is transferred using a small headset, interfaced to the DAU with standard mini-jack plugs. The Data Acquisition Unit comprises several hardware modules:

- Atmel 89C52 microcontroller - system core
- Bluetooth module (based on ROK101008)
- HD44780 - small LCD display
- 24C16 - I2C EEPROM (on a removable ID card)
- MC145483 – 13bit PCM codec
- Jazz Multi sensor interface
- Beeper and LED indicators, 6 AA batteries and voltage level monitor.

Fig. 3 shows the DAU components

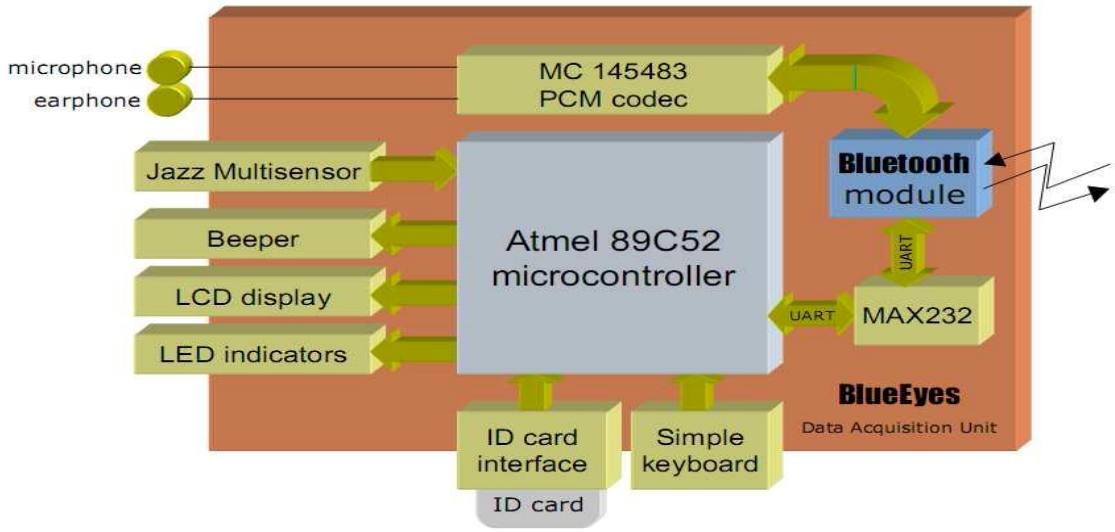

Figure.3. DAU Components (Binyamin, 2010)

Central System Unit

Central System Unit hardware is the second peer of the wireless connection. The box contains a Bluetooth module (based on ROK101008) and a PCM codec for voice data transmission. The module is interfaced to a PC using a parallel, serial and USB cable. The audio data is accessible through standard mini-jack sockets To program operator's personal ID cards we developed a simple programming device. The programmer is interfaced to a PC using serial and PS/2 (power source) ports. Inside, there is Atmel 89C2051 microcontroller, which handles UART transmission and I2C EEPROM (ID card) programming **.**Fig. 4 shows the CSU components (Binyamin, 2010).

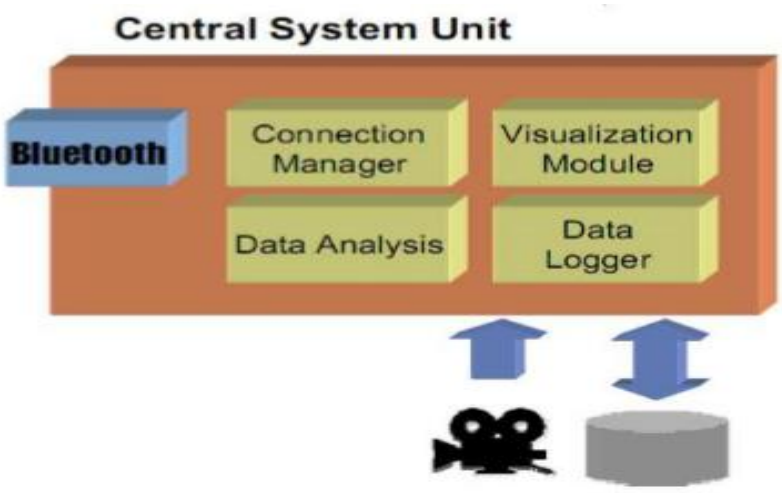

Figure .4 CSU Components (Binyamin, 2010)

The software

Blue Eyes software's main task is to look after working operators' physiological condition. To assure instant reaction on the operators' condition change the software performs real time buffering of the incoming data, real-time physiological data analysis and alarm triggering. The Blue Eyes software comprises several functional modules System core facilitates the transfers flow between other system modules (e.g. transfers raw data from the Connection Manager to data analyzers, processed data from the data analyzers to GUI controls, other data analyzers, data logger etc.). The System Core fundamental are single-producer-multi-consumer thread safe queues. Any number of consumers can register to receive the data supplied by a producer. Every single consumer can register at any number of producers, receiving therefore different types of data. Naturally, every consumer may be a producer for other consumers. This approach enables high system scalability – new data processing modules (i.e. filters, data analyzers and loggers) can be easily added by simply registering as a costumer.

Connection Manager is responsible for managing the wireless communication between the mobile Data Acquisition Units and the central system. The Connection Manager handles:

- Communication with the CSU hardware
- Searching for new devices in the covered range
- Establishing Bluetooth connections
- Connection authentication
- Incoming data buffering
- Sending alerts

Data Analysis module performs the analysis of the raw sensor data in order to obtain information about the operator's physiological condition. The separately running Data Analysis module supervises each of the working operators. The module consists of a number of smaller analyzers extracting different types of information. The most important analyzers are:

- Saccade detector - monitors eye movements in order to determine the level of operator's visual attention
- Pulse rate analyzer - uses blood oxygenation signal to compute operator's pulse rate
- Custom analyzers - recognize other behaviors than those which are built-in the system. The new modules are created using C4.5 decision tree induction algorithm.

Visualization module provides a user interface for the supervisors. It enables them to watch each of the working operator's physiological condition along with a preview of selected video source and related sound stream. All the incoming alarm messages are instantly signaled to the supervisor. The Visualization module can be set in an offline mode, where

all the data is fetched from the database. Watching all the recorded physiological parameters, alarms, video and audio data the supervisor is able to reconstruct the course of the selected operator's duty. The physiological data is presented using a set of custom-built GUI controls:

- A pie-chart used to present a percentage of time the operator was actively acquiring the visual information
- A VU-meter showing the present value of a parameter time series displaying a history of selected parameters' value. Fig. 5 describes the Software analysis (Binyamin, 2010).

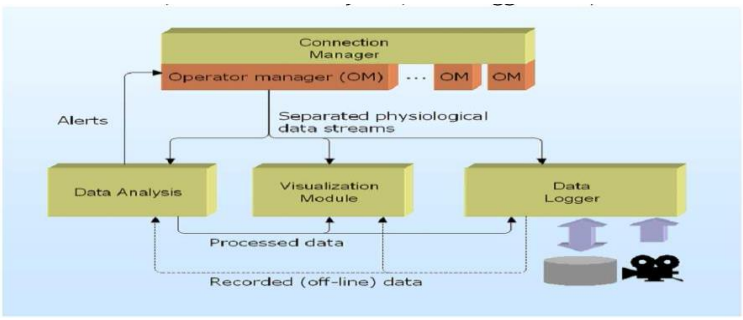

Figure.5. Software Analysis Diagram (Binyamin, 2010)

DISCUSSION

Why is Blue eyes technology necessary? Human errors are still one of the most frequent causes of catastrophes and ecological disasters. The main reason is that the monitoring systems concern only the state of the processes whereas human contribution to the overall performance of the system is left unsupervised, he/she may not notice important changes of indications causing financial or ecological consequences thereby creating a threat to human life. Blue eyes system is developed to be the complex solution for monitoring and recording the operator's conscious brain involvement as well as his physiological condition such as weariness thereby

preventing unnecessary recurrence of human errors which in turn saves life and properties (Mr. Gaurav, 2012). In modern engineering, blue eyes technology:

- Reduces cost in production and manufacturing materials
- Reduces fatigue/weariness on operators/users
- Prevents dangerous incidents
- Ability to suggest a better course of action during daily activities.

The limitations of Using Blue eyes technology involve the following;

- Target not selected if not looked at for a set threshold.
- Target selected if stared at without user intention.

What type of users can operate the blue eyes technology system? Users belong to three categories; Operators, Supervisors and System administrators.

- *Operator:* Operator is a person whose physiological parameters are supervised. The operator wears the DAU. The only functions offers to the operator are Authorization to the system and receiving alarm alerts:
- *Authorization:* Operator has to enter his personal PIN into DAU, if PIN is accepted, authorization is said to be complete.
- *Receiving Alerts:* This function supplies the operator with the most important alerts about his and his co-workers' condition and mobile device state.
- *Supervisor:* He is the person responsible for analyzing operators' condition and performance. The supervisor receives tools for inspecting present values of the parameters (on-line browsing) as well as browsing the results of the long-term analysis (off-line browsing).

- *System Administrator:* He is the user that maintains the system. The administrator is delivered tools for adding new operators to the database, defining alarm conditions, configuring logging tools and creating new analyzer modules (UK Essays, 2015).

Efficiencies of blue eyes technology

In the automobile industry, by simply touching a computer input device such as a mouse, the computer system is designed to be able to determine a person's emotional state. For cars, it could be useful to help with critical decisions like: "I know you want to get into the fast lane, but I'm afraid I can't do that. Your too upset right now" and therefore assist in driving safely. Current interfaces between computers and humans can present information vividly, but have no sense of whether that information is ever viewed or understood. In contrast, new real-time computer vision techniques for perceiving people allows us to create "Face-responsive Displays" and "Perceptive Environments", which can sense and respond to users that are viewing them. Using stereo-vision techniques, we are able to detect, track, and identify users robustly and in real time.

It could be deployed in video games where, it could give individual challenges to customers playing video games, typically targeting commercial business. The integration of children's toys, technologies and computers is enabling new play experiences that were not commercially feasible until recently. The Intel Play QX3 Computer Microscope, the Me2Cam with Fun Fair, and the Computer Sound Morphers are commercially available smart toy products developed by the Intel Smart Toy Lab in (RAM, 2013).

CONCLUSION

Prevention from dangerous incidents, physiological condition monitoring, operator's position detection and the reconstruction of the course of operator's work are merits of Blue eyes technology. The following are some of the limitations;

- Target not selected if not looked at for a set Threshold
- Target selected if stared at without user Intention
- Doesn't predict nor interfere with operator's thoughts
- Cannot force directly the operator to work

The technology area of applications

Outlined beneath are some unique applications of Blue eye technology.

- Generic control rooms: (Blue eyes system can be applied in every working environment requiring permanent operator's attention)Power station
- Captain bridge
- Flight control centers
- Video games
- Automobile industries.

Small CMOS camera to monitor the operator's point of gaze, single PCB (SMD technology), low voltage ICs - LiIO battery power are recommended for **DAU** while data mining algorithms , advanced database encryption are recommended for CSU.

Future scope

At IBM's lab researchers are tackling the lofty goal of designing smarter devices. Following the movement of your eyes, the "gaze—tracking" technology uses MAGIC (Manual Acquisition with Gaze-Initiated Cursor) to control your mouse. With MAGIC, the cursor follows your eyes as you look around the screen. When your eyes spot on an object, you click the mouse to select it (Studymafia). Why not free up your hand and let your eyes do all the work? Researchers tried that and found that the hand is quicker than the eye, or at least more accurate, says Morris, the research center director. Also, current versions of the gaze tracking technology only come within an inch or so of its target. One limitation of today's input devices is that we have to tell them what we want. When you lay your hand on the Emotion Mouse, it will measure how you are feeling and react accordingly. Aside from pointing devices, researchers at Almaden are studying emotion technology for use in automobiles, video games, remote controls and telephones. But it may be a decade before this type of technology is readily available (Studymafia). More on these researches should be strengthened. In future, it is possible to create a computer which can interact with us as we interact with each other with the use of blue eye technology. It seems to be a fiction, but it will be the life lead by "BLUE EYES" in the very near future. Ordinary household devices -- such as televisions, refrigerators, and ovens - may be able to do their jobs when we look at them and speak to them, thereby making us "lazy" and even possible more efficient in performance and giving more time to think, be creative and innovate new ways to help each other (Technical pages, 2008).

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