

Transportation: Contribution to the Growth of National Economy

TRANSTECH-11

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SUB-THEME :

I.T. and Software Technology in Transportation
Technological Development of Machineries in Transportation
Instrumentation and Controls in Transportation sector

BLUE EYES

How can we make computers “see” and “feel”?



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Is it possible to create a computer which can interact with us as we interact with each other? For example imagine you are a captain of a ship and on a day when you are about to make an accidental mistake which can be disastrous and some one senses it out and alarm the crew saving life & property. This someone could be the technology of **BLUE EYES**. This has a large impact on transportation and it will surely affect the economy of the country by reducing the danger of great disaster.

The basic idea behind this technology is to give the computer the human power by giving some perpetual abilities. The “**BLUE EYES**” technology aims at creating computational machines that have perceptual and sensory ability like those of human beings.

KEYWORDS:

Blue eyes	Data Acquisition Unit (DAU)
Transportation	Alarm
Operator	Bluetooth
Central system unit (CSU)	

INTRODUCTION:

Transportation needs to be safer and précised as the contribution of transport to the India’s economy is a large factor. Since the economic liberalization of the 1990s, development of infrastructure within the country has progressed at a rapid pace, and today there is a wide variety of modes of transport by land, water and air. However, the relatively low GDP of India has meant that access to these modes of transport has not been uniform. The automobile industry in India is rapidly growing with an annual production of over 2.6 million vehicles and vehicle volume is expected to rise greatly in the future.

Why safe transportation is required for goods and people? Transportation is the primary governing factor which influences the global economics. Any disorder in the transport facilities will not only derail the common man’s life but also crash down the economy local or global depending on the size of the catastrophe. In urban cities transport is the life line of the people as well as the jobs and functioning of the city. In vast countries like India transport is the major factor which helps connecting the various parts and regions of the country.

So to make the transportation safer, a technology named as **BLUE EYES** was designed and is talked about in this paper which would understand the operator’s basic physiological parameters and will work according to that. The best thing about this technology is that this can be used in all the modes of transport to make it safer i.e. land (road, rails, trams, buses, auto rickshaws, automobiles, etc.), air (airplane, helicopters), water (ships, ferries, high speed crafts, etc.).

Animal survival depends on highly developed sensory abilities. Likewise human cognition depends on highly developed abilities to perceive, integrate, and interpret visual, auditory, and touch information. Without a doubt, computers would be much more powerful if they

had even a small fraction of the perceptual ability of animals or humans. Adding such perceptual abilities to computers would enable computers and humans to work together more as partners.

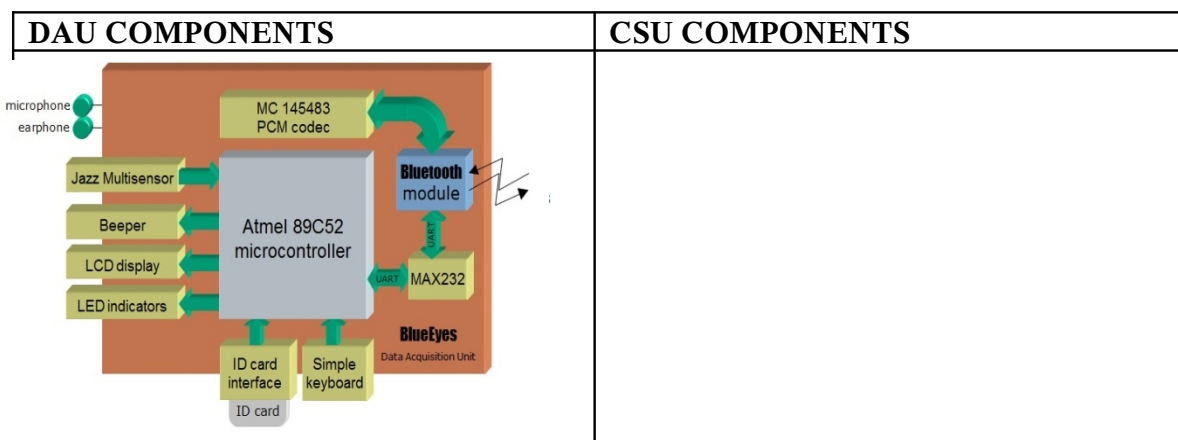
BLUE EYES use sensing technology to identify a user's actions and to extract key information. Information is then analyzed to determine the user's physical, emotional, or informational state. And then it can be used to produce the results according to what situation you want.

IDEA OF BLUE EYES:

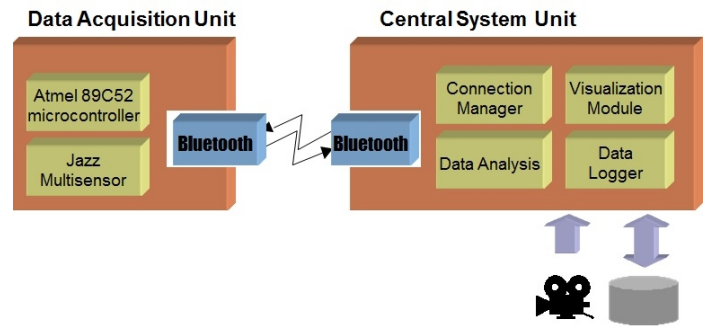
BLUE EYES system provides technical means for monitoring and recording the operator's basic physiological parameters. The most important parameter is saccadic activity, which enables the system to monitor the status of the operator's visual attention along with head acceleration, which accompanies large displacement of the visual axis (saccades larger than 15 degrees). Complex industrial environment can create a danger of exposing the operator to toxic substances, which can affect his cardiac, circulatory and pulmonary systems. Thus, on the grounds of plethysmographic signal taken from the forehead skin surface, the system computes heart beat rate and blood oxygenation.

The **BLUE EYES** system checks above parameters against abnormal (e.g. a low level of blood oxygenation or a high pulse rate) or undesirable (e.g. a longer period of lowered visual attention) values and triggers user-defined alarms when necessary.

The major parts in the **BLUE EYES** system are Data Acquisition Unit (DAU) and Central System Unit (CSU). The tasks of the mobile DAU are to maintain Bluetooth connections, to get the psychological information from the sensor and sending it over the wireless connection, to deliver the alarm messages sent from the CSU to the operator and handle personalized ID cards. CSU maintains the other side of the Bluetooth connection, buffers incoming sensor data, performs on-line data analysis, records the conclusions for further exploration and provides visualization interface.



DAU & CSU is connected each other as shown in the figure. Bluetooth technology provides means for creating a Personal Area Network linking the operators and the central system.



DAU – features:

- Lightweight
- Runs on batteries - low power consumption
- Easy to use - does not disturb the operator working
- ID cards for operator authorization
- Voice transmission using hardware PCM codec

CSU – features:

- Connection management
- Data processing
- Visualization
- Data recording
- Access verification
- System maintenance

WORKING OF BLUE EYES:

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

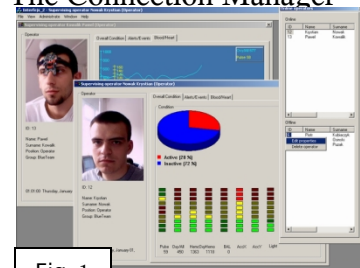


Fig. 1

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. Each of the analyzers registers at the appropriate Operator Manager or another analyzer as a data consumer and, acting as a producer, provides the results of the analysis. The most important analyzers are:

- Saccade detector - monitors eye movements in order to determine the level of operator's visual attention using jazz multisensor (fig.2).
- 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

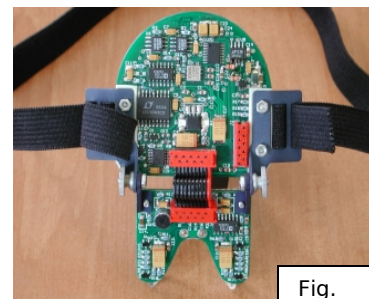


Fig.

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 off-line 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:

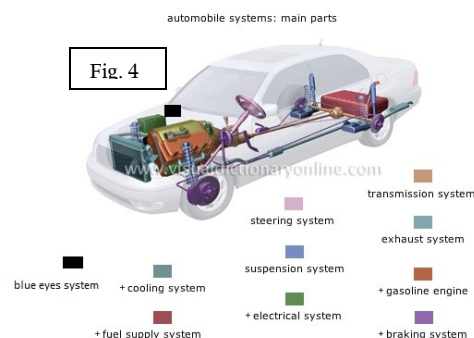
- a pie-chart used to present a percentage of time the operator was actively acquiring the visual information
- A VU-meter showing the present value of a parameter time series displaying a history of selected parameters' value.

IMPLEMENTATION IN TRANSPORTATION:

The idea of **BLUE EYES** can be used in transportation to make it safer. Firstly I would implement the idea in the water transportation i.e. by ships and ferries, etc. As the ships are controlled by the captains and the captain deck is the place where we can install the **BLUE EYES** technology. Captain deck and engine room both are the places which should be particularly taken care of. Let us assume the captain accidentally misjudges the steering and navigation of the ship then we are talking about devastating economic and resource damage to the nation. All this can be avoided as before the accidental judgment the DAU unit will have checked the captains vital signs using its sensors and it would have been transmitted to the CSU unit. The CSU unit would trigger the alarm or it may override the system for some time or may stop the ship at the place when the problem is diagnosed. Given fig.3 is an engine control room where the cameras and the microphone can be installed and the touch sensors can be placed in the handle which can be an input for the DAU unit to check the psychological conditions of the operator.



Secondly I would implement the idea in the automobiles. Now-a-days accidents in automobiles are increasing exponentially due to rising stress levels among the people as well as the drug and alcohol driven accidents of which the youth are a primary component. This is not only the question of the money and property but the future of the national workforce. The other reason can be as mentioned earlier the stress in the operator due to various reasons one of them being lack of sleep, causing mentally giddy state. All in all this is a great loss to the national economy and human resources. To eradicate this, **BLUE EYES** technology can be applied. It can be installed in the car in the front of the car as shown in the fig. 4 which can check the operator immediately when he enters the car and if the operator's



vitals are not stable then the car will not start or it will trigger the alarm so that the operator's friends or the people thereby can know and would come to stop the operator. It can save the operator's life and property. The same issue can be considered in truck transport which is the backbone of the nation's internal transport and trade. If it is damaged then it could be a great setback to the economy and the people would suffer a lot.

Thirdly I would like to discuss the installation in the trains, metros and trams. The accident in the trains is also a common issue in these days. The primary reason for such accidents can be the mental confusion or disorientation of the driver. For e.g. on 1 January 2011 – Amritsar-Sealdah

Akaltakth Express rammed into two trucks in Uttar Pradesh's Jaunpur district when its driver "failed to notice" the red signal at a level crossing at Babura railway crossing, killing a man (a truck driver) and leaving two people (another truck driver and a helper) injured. No passengers were injured in the collision.



Fig. 5

If the **BLUE EYES** would be applied there then the accident may have not occurred. The DAU unit will sensor the condition of operator and will relay the data to the control centers at the stations or might stop the train. In the fig. 5 train engine control room the **BLUE EYES's** DAU unit can easily installed and the CSU might be automatic and placed in the engine room itself or it can be operated at the station centers.

COST ESTIMATION:

Item	Cost(approx.)	
Jazz multisensor	Rs 5200	
AT89c52 microcontroller	Rs 180	
MC145483 PCM	Cost estimation for blue eyes application in a small body, for e.g. car.	
PCM clock gener		2
HD44780A00 LC		
MAX232		
Earphone	Rs 52	
ST14c16 EEPROM	Rs 92	
ID card interface	Rs 196	
Passive elements	Rs 400	
Plugs, sockets, case, bards	Rs 600	
Cameras (optional)	Rs 800x4	
Total	Rs 11492	

IS IT POSSIBLE FOR COMMON PEOPLE

The benefit of this technology over the ABS airbags is that the vehicle would not be in the garage for months. ABS bags which come for nearly Rs 60,000 are almost 6 times

the price of **BLUE EYES**, as the price of this equipment is only Rs.11, 492/- only. This technology does not only ensure the safety of life and property but also is very economical for the manufacturers. Let us say any person who buys a Rs. 6, 00,000 will even be willing to spend out of his own pocket to save his car from months of garage work.

LIMITATIONS OF BLUE EYES

Following are the limitations of the **BLUE EYES TECHNOLOGY**:

- This is a form of artificial intelligence; a field which is highly debated over and with an uncertain future.
- The technology works on the principle of judging a person's mental and physical condition, which can't be predicted with 100% accuracy.
- Assuming a condition wherein the person's vitals are not stable he may still be taking a right decision, but here the technology will interfere in the smooth day to day functioning of all our activities.
- Besides we can't all ways predicts how the system will react to a particular situation which it has not been programmed for; in such a case giving the technology the override control will be a risky situation.
- Basically the main concern remains that this is an over secure system against a situation which may not be a potential threat.

CONCLUSION

Finally after looking at all the pros and cons I can say that the **BLUE EYES** technology's pros greatly outweigh the cons. This is a very promising technology which holds a lot of scope today and an even greater scope in the future. The world trade is growing in leaps and bounds, and the main component which link India to this developing world is the transport. Hence securing transportation is going to be of vital importance in the upcoming days.....

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