REVIEW ON BLACK BOX

Amol Shenkar[1], Hredeya Mishra[2]

[*1]*PG Scholar, Mechanical Engineering, Jaihind College of Engineering, Kuran, India*
[2]*Assistant Professor, Mechanical Engineering, Jaihind College of Engineering, Kuran, India*

ABSTRACT

The Black Box will give us feedback about health of vehicle and crashes/accidents and allow for accessibility to data involving the vehicle's mechanical and electrical status. The Black Box will give us instant feedback for any physical anomalies, and will also give the command center access to the data on the Black Box. Because the Black Box is designed to withstand a large impact, it will also secure the data in the Black Box. Need of black box The Black Box will give us instant feedback for any physical anomalies, and will also give the command center access to the data on the Black Box. Because the Black Box is designed to withstand a large impact, it will also secure the data in the Black Box. The Black Box will be used by Field Technician Soldiers, and Command Center mechanic to diagnose and repair any issues that may arise while out on the end or at home base. If an accident were to occur, a Data Analyst can use the Black Box to determine the cause of the accident, and provide ways to prevent a future accident.

Keyword *Black Box, Feedback, accessibility to data*.

1. INTRODUCTION

Since 1974, General Motors has shipped devices within the airbag control systems of their vehicles that are capable of recording rudimentary information about the deployment of the airbag during a crash, but in 1999 GM introduced a more advanced system that they call the ”Sensing & Diagnostic Module” (SDM). This system stores a wide variety of information about the 5-second period leading up to a crash, including whether the driver’s seatbelt was buckled, the vehicle’s speed, the engine speed, the position of the brake pedal, and the position of the throttle pedal. While initially deployed only in certain models, this device is now present in essentially all cars GM sells. GM claims that the purpose of the SDM is to enable their engineers to improve the performance of the car’s airbag system, and the safety of their cars in general, but obviously the data itself is not limited to that particular use.

The idea of a black box was first conceived by a research scientist named David Warren in the 1950’s, while working at the Aeronautical Research Laboratories in Melbourne, Australia. This was the age of the first jet-powered airliner, the British-made Comet. In 1953 the Comet was plagued by a series of unexplained crashes that gave rise to serious doubts about it’s safety, and threatened the fledgling commercial aviation industry. The severity of the crashes meant that there was little evidence to be found among the wreckage, and investigators had no idea where to even begin looking for a possible cause. Dr. Warren, a chemist specializing in aviation fuel whose own father was killed in an aviation accident, was tasked with determining whether a fuel explosion could be responsible, but his attention wandered elsewhere. There are millions of cars and trucks already equipped with black boxes, otherwise referred to as event data recorders. Most of these devices capture rudimentary information just prior to an accident. The activation of an air bag initiates the retention of this information and allows for subsequent retrieval of data such as vehicle speed, seat belt use, and brake application. Black boxes and related automated recording equipment are being promoted as “research” devices that can aid automobile companies and government agencies in the design of safer vehicles.

1) Black boxes may be installed on a sufficient number of vehicles to guarantee scientifically valid results that can lead to vehicle safety improvements. The vehicle owners should willingly agree to the installation of the devices and there should be no coercion to accept the installation.

2) Prohibit insurance companies from requiring as a condition of coverage or payment access to black box and related recording device information.

3) Prohibit the coerced use (subpoena, court order, discovery of black box and related recording device information for enforcement and judicial purposes.

4) Permit the vehicle owner to use his or her black box and related recording device information for his or her purposes in civil and criminal matters.

5) Vehicle owners should be able to activate, de-activate, and read without any special or expensive equipment, black boxes and related recording devices, conveniently and with equal effort for either function.
6) Black boxes and related monitoring devices should not be enabled to transmit or broadcast data to any external wireless receiver.

2. THEORY AND LITERATURE

An unpowered roller conveyor consists of series of rollers, the frame on which the rollers are placed and the stands on which the framework rests. Because of simplicity of design, competitive cost and trouble free operation, these conveyors are used extensively in handling unit loads in workshops or process plants to convey articles from one working station to another. Unpowered roller conveyors are often used as a storing platform and as such are often termed as roller table. These are also used in stores as storing racks and in loading bays for loading / unloading materials from carriages. A gentle slope may be provided in the conveyor to aid movement of the loads on idle rollers. These gravity roller conveyors are used to convey load in one direction only. The conveyors can have a curved section to change direction. Material movement between two levels may be done by an inclined or a spirally formed gravity roller conveyor. The spiral form increases the length of the conveyor and thereby controls the velocity of the articles moving down the conveyor trend is to provide weight/cost effective products which meet the stringent requirements. The aim of his paper was to study existing conveyor system and optimize the critical parts like roller, shafts, C-channels for chassis and support, to minimize the overall weight of assembly and material saving. Existing design calculation shows the factor of safety is very greater than requirement and there is a scope for weight reduction. Critical parameter which reduces the weight is C channels, roller outer diameter and roller thickness. Though value of deflection, stress is more in case of Optimized design, but it is allowable. 30.931 % of weight reduction due to Optimized design. The literature reviews that have been discussed above were divided into three categories. First category is a discussion about the FEA with shape optimization for weight reduction. Most of the previous study used Scanning tensile testing and hardness testing. Bošnjak S. et. al. (2011) diversifies the investigation with finite element method to prove the most stresses zone have been identified around the chain link.
Reducing weight and increasing strength of the products research are high in demand in the market. And composites materials are getting up to satisfying those demands. This research deals with the analysis for link plate of roller chain with new material that is glass fiber and carbon fiber composite material. In this research reducing weight of conveyor chain and increasing the strength of their connected links are considered. As conveyor chain links contributes considerable amount of weight to the conveyor chain and needs to be strong enough, a single composite chain link is designed

2.1. BLACK BOX SYSTEM OUTLINE

2.1.1 Camera

Vehicle boundary and cockpit video recording. The camera play very important role in capturing the various information in the form of videos and provide the status of vehicle on the path. Thus the given information can be saved and retrieve whenever the operator want it.

2.1.2 On-Board Diagnostics

The On Board Diagnostics is used to store the information from various sensors and collect the given information whichever is needed.

2.1.3 Pressure Sensors

The pressure sensor is very important to clarify the presence of passenger in the vehicle .It is placed inside the seat and work on the weight of passenger and described the position.

2.1.4 Camera /GPS / Monitors

GPS (Global Positioning System) is used to discover the actual positioning of vehicle in any part of world it used for tracking of vehicle in any emergency or if it is stolen. It work on finding location with the help of latitude/ longitude display with collaboration of satellite.

2.2 INSTALLATION AND TESTING

2.2.1 What is GPS?

Originally conceived as a navigation aid for the military, the Global Positioning System, or GPS, has since grown from relatively humble beginnings as different supporting technologies have been developed, some off which are within reach of consumer budgets.[4] The actual application of the GPS technology is what leads to such things as navigation systems, GPS tracking devices, GPS surveying and GPS mapping. GPS in itself does not provide any functionality beyond being able to receive satellite signals and calculate position information.

2.2.2How it Works

They can then measure, using a compass, the azimuth that would be needed to take them from the point on the map to their current position. A line is then drawn from each of the three points, and where the three lines meet is where they are on the map. Translating this into the GPS world, we can replace the known points with satellites, and the azimuth with time taken for a signal to travel from each of the known points to the GPS receiver.

2.2.3 Tracking Devices

One of the easiest applications to consider is the simple GPS tracking device; which combines the possibility to locate itself with associated communications technologies such as radio transmission and telephony. Tracking is useful because it enables a central tracking centre to monitor the position of several vehicles or people, in real time, without them needing to relay that information explicitly.

The tracking centre can then use that information for co-ordination or alert services. One application in the field is to allow anxious parents to locate their children by calling the tracking station - mainly for their peace of mind. GPS vehicle tracking is also used to locate stolen cars, or provide services to the driver such as locating the nearest petrol station. Police can also benefit from using GPS tracing devices to ensure that parolees do not violate curfew, and to locate them if they do.

2.2.4 Navigation Systems

Once we know our location, we can, of course, find out where we are on a map, and GPS mapping and navigation is perhaps the most well-known of all the applications of GPS. Using the GPS coordinates, appropriate software can perform all manner of tasks, from locating the unit, to finding a route from A to B, or dynamically selecting the best route in real time. These systems need to work with map data, which does not form part of the GPS system, but is one of the associated technologies that we spoke of in the introduction to this article. The availability of high powered computers in small, portable packages has lead to a variety of solutions which combines maps with location information to enable the user to navigate.

3. FACTORS TO BE CONSIDERED WHILE DESIGNING OF BLACK BOX

3.1 COSTING OF BLACK BOX

The cost is factors which is most important of all, we have to reduced the production cost as mfg. but without reducing the efficiency and safety of product. The costing of black box is specified by considering the part needed to design a black box and their cost specification as per the industrial cost list and vendors sheet.

The cost Factors is selected by above addition of parts given below:-

Cost = Wi_ Link (A) + Input Ports(B) + Container(C) + PSU(D) + HD/Redundant(E) + Processor(F) + Memory(G) + GPS Receiver(H)

We can reduce the cost of vehicle by reducing the component cost but it can be surely effect on efficiency

3.2 MATERIAL USED

The material used should be very hard so the black box made of it should be sustaining all the possible damage during accident. The possible key point are given below The material used should be made of fire resistant material so that if fire occurs after accident, the black box should remain well to obtain require information. Hardness:-The hardness of material is should be high so it prevent from breakage or damage during accident. The material used need to be strong alloy. Availability:-The material should be easily available in nearby area.

3.3 MANUFACTURING PROCESS

The mfg. process used for black box is plastic molding and performs in very high temp. So that hardness of plastic is increases. It is simple mfg. process and can be atomized in industry.
Aesthetics- It deles with appreciation of beauty.
Ergonomics – It deles with relation of man and machine to improve the production rate.

3.4 OTHER FUNCTION'S OF BLACK BOX

1) Alcohol Sensor ARM-7 microcontroller first reads the value of alcohol sensor if any alcohol is detected in the driver's cabin the ignition is turned off.
2) LPG gas sensor*:* - ARM-7 microcontroller also continuously scans for LPG gas leakage sensor. If any LPG gas leakage is detected then display the gas concentration on LCD and buzzer on for indicate or alert the driver to avoid an accident.
3) Accident switches We are connecting impact switches on to the exterior of the car. As soon as the detected. The ARM-7 microcontroller stores all this data on the ram memory.
4) Fuel Level Indicator For fuel level indication float type fuel level indicator is used. As the level of fuel varies the resistance of fuel level indicator changes and corresponding value displayed on screen.
5) Speed of vehicle (RPM) Speed of vehicle is measured on the basis of tachometer for this we use IR sensor TLP 1031A.
6) Temperature It continuously monitors the temperature of engine as well as cabin & sends its value to microcontroller.
7) Door and Bonnet The door and bonnet status is checked with the help of limit switches. If any of the door or bonnet is not closed properly, an audio indication is given by the buzzer.
8) Obstacle To detect any obstacle, an optical sensor is used. If any obstacle is observed, an audio indication is given by the buzzer.

4. CASE STUDY

CASE STUDY OF CHEVROLET MALIBU :-

The photo at left shows a field crash from the NHTSA crash files involving a 2010 Chevrolet Malibu and a parked truck. As can be seen in the photo, this collision involved a severe underside condition. This crash had a long crash pulse. The software the investigator used estimated the delta V to be 23 mph. The investigator noted that this estimate appeared to be significantly low. A subsequent reading of the Event Data Recovery System indicated a delta V of approximately 50 mph, which appeared much more reasonable to the investigator.
The black box is given the following information about vehicle:-

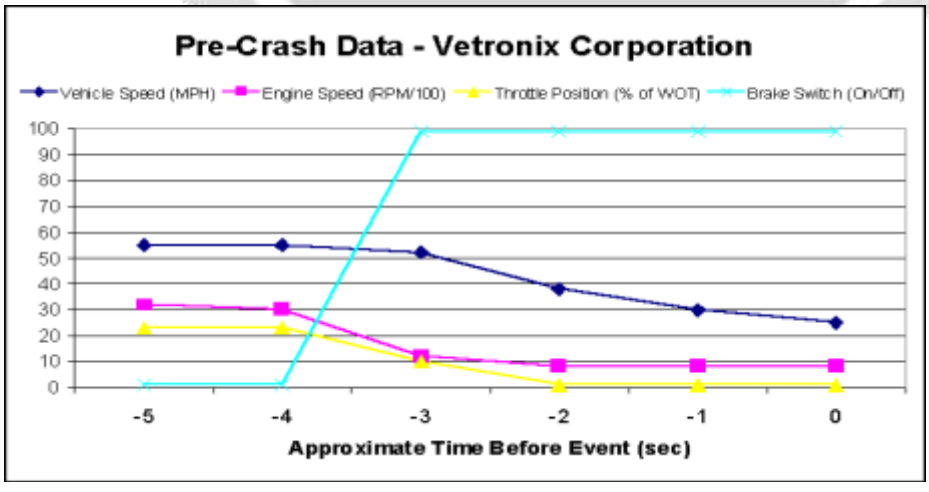

Figure.1 Pre-crash Data

Result:-
1.The investigator found that the air bags doesn't blown out when the accident take place.
2. Video and audio information tells that brakes are not engaged properly, when driver sees the vehicle in front.
3. The Seat belt is unlocked during accident.
This study established a statistically significant reduction in the number of accidents for several fleets in which the behavior of the drivers was monitored in such a way that the drivers could also be confronted with their behavior. As yet, these positive results can be given only within rather wide confidence intervals, this being due chiefly to the small sample size. When viewing the total group of fleets involved in the study, it is possible to estimate an accident reduction of some 20%. In the case of the only fleet for which the costs of its own accident damage were known, there was also a favorable development in terms of accident reduction. In this respect, accident damage can also be considered a measure for the severity of the accidents outcomes.

5. ADVANTAGES, DISADVANTAGES AND APPLICATION

5.1 ADVANTAGES

1) Security of vehicle.
2) Record driving data, collision data and position data.
3) Analyze the accidents detail.
4) Send location of car and its maintenance to base station through GPS & GSM technique.
5) Sense gas & fuel leakage and display its status on car monitoring system.
6) Detect if the driver is drunk or not.
7) Detect if the driver is feeling sleepy.
8) Shows engine temperature.
9) Remote place data can be acquiesced.
10) Various difficult data like vibration can be measured.
11) Data acquiesced is placed on internet.
12) Due data present on internet can be acquiesced at any time.
13) This data acquiesced from one country to another country by use of internet.

5.2DISADVANTAGES

1) Cost of some sensor is very high such as vibration sensor
2) Damage of sensor cannot be detected.

5.3 APPLICATION

1) .Personal vehicle
The main application of black box is for personal vehicle use if any unfortunate accident had occurred to a vehicle fitted with black box then immediate help can be provided to the victimized car on receiving SMS.
2) Insurance companies
Most of the time of accident is false .so insurance companies can implement this car black box in the insured vehicle and as a data before and at the time of accident is locked into black box. the insurance company can easily analyze the data recorded. And they can find out whether the accident had made or occurred. And so the false claim is avoided.
3) .Research and development of vehicle
In testing the vehicle in R and D sent a engineers required data at various speed and time. But this data is not available exactly as it is not possible to measure the data for every second and to measure the number of parameters at the same time. But if black box is used the data can be made available for each and every second with very high accuracy. Black box not only makes the data available but with the help of LABVIEW software the data can be plotted in graphical form that is speed Vs time ,engine temp. Vs time.
4) Military applications

Military vehicles carry ammunition from one place to other for e.g. in Kashmir military vehicles can be fitted with car black box so if militants had attacked or damaged the vehicle immediate SMS is send to military based station and this ammunitions can be made save from wrong hands.

5) Traveling agencies and state transport(ST)

The black box can also be useful for traveling agencies and state transport as in today's scene number of accidents are happened to buses and many people die in this accidents. Due to immediate help is not made available.

6. CONCLUSION

In the 21th century the demand of automobile is increasing day by day, which leads to increasing of rate of accident. A implementation of "black box in the cars" is first step to reduce the accident by knowing its actual culprits, also addition of GPS in vehicle help to track the exact location of vehicle in abnormal condition. We have discussed the installation, design and retrieving the data from black box .It works in all vehicles and can be easily transferred between vehicles. Finally, it should be noted that our design is suitable for portable navigation devices since the cost, size and power consumption of inertial sensors meet the requirements for mass market consumer electronics.

7. ACKNOWLEDGEMENT

The authors take this opportunity with great pleasure to express my deep sense of gratitude towards my esteemed guide Prof. Hredeya Mishra, Prof. Mankar his valuable guidance , incessant encouragement and co-operation to me this work.

8. REFERENCES

[1] Mohamad Afshar. An Open Parallel Architecture for Data-intensive Applications. PhD thesis. Technical Report UCAM-CL-TR-459, University of Cambridge, Computer Laboratory, July 1999.

[2] Kemal Akkaya and Mohamed Younis. A survey on routing protocols for wireless sensor networks. *Ad Hoc Networks*, 3(3):325–349, May 2010.

[3] I. F. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci. Wireless sensor networks: A survey. *Computer Networks*, 38:393–422, 2002.

[4] Gustavo Alonso, Fabio Casati, Harumi Kuno, and Vijay Machiraju. *Web Services: Concepts, Architectures and Applications*. Springer-Verlag, Berlin / Heidelberg, 2009.

[5] E. D. Kalpan, Understanding GPS: Principles and Applications, Artech house Publishers, ISBN 0890067937, February 1996.