Effectiveness of Smart Blackbox Technology in Monitoring Accidents of Motor Vehicles in Oman: A Reflection

Sheuly Nath[1], Abdul Malik Sulaiman Said Al Jabri[1] and Vikas Rao Naidu[1#]

[1]Middle East College, Muscat, Oman
[#]Advisor

ABSTRACT

Smart black boxes, also known as event data recorders, are increasingly being used in automobiles as collision monitoring and reconstruction tools in recent years. This study's objective is to evaluate the effectiveness of intelligent black box technologies for tracking automobile accidents in Oman. This study used a combination technique, which included a survey of more than 200 drivers and an analysis of 50 accident incidents recorded by the Smartbox network. The study was conducted to determine how drivers felt about technology and how it affected how they drove while examining accident data to see if it was accurate and helpful for accident reconstruction. According to the poll findings, 82% of drivers felt that the technology may increase road safety, and 68% of drivers were aware of it. However, only 26% of them were deploying this technology because of worries about data protection and expense. According to the investigation, a Smart Black Box delivered exact and consistent data on vehicle speed, acceleration, and braking both before and after the collision. Reconstructing collision scenes and determining the causes of accidents, such as driver error, mechanical failure, or poor road conditions, have both benefited from data. In Oman, motor vehicle accidents can generally be efficiently monitored and repaired thanks to this technology. However, worries about cost and data protection may prevent this technique from being widely adopted. The study suggests that such concerns can be addressed through publicity campaigns, as well as by incentives to install Smart Black Boxes in vehicles.

Introduction

Traffic accidents and hit-and-run cases are of major concern in Oman as repeatedly stated by the Royal Oman Police. The cause of accidents on the road is often unknown due to a lack of eyewitnesses and the inability to determine the main suspect and provide adequate justice to the victims. Through our study, we found that there is a diverse reason for an accident to occur and not all can be accurately determined by the existing system which is In-Vehicle Monitoring System (IVMS). As this system provides information related to the speed of the vehicles, it is not a reliable source for determining the suspect in an accident. Thus, we proposed the system of a Black Box which can record a 360-degree view of the vehicle, the motor functioning of the engine and other related parts, acceleration, the indication lights used and many more. This system will allow the ROP to accurately determine the fault in driving and the cause of the accident while helping the Insurance Agencies to better handle the customers. The automotive industry can also benefit from this system as it can deploy and ensure more safety and security for its customers. Though Event Data Recorders (EDR) are available in some modern cars, they are not available as a ready-to-buy system, are expensive and usually not suitable for passenger vehicles. Thus, our proposed system will be universal and affordable for companies to provide safety to their customers at a noticeable price.

The fatalities on the roads are being blamed on reckless driving and speeding, according to the police. According to figures from the Royal Oman Police, traffic accidents account for about 10% of the country's annual deaths, with 50 people dying on Omani roads every month on average. (Sunil K. Vaidya, 2022). Due to a lack of eyewitnesses in some situations, the cause of the accidents is unknown. Critical machine failure has also been identified as one of the leading causes of these accidents in several situations. Police officers are unable to determine the cause of the accident in these situations. For vehicles supplied to employees by various organizations in Oman, only the InVehicle Monitoring System (IVMS) is now used. It's also used by a lot of school buses and other large vehicles. IVMS, on the other hand, only records data related to speed. 360-degree cameras can evaluate and analyze visual data in real-time for all possible reasons. All of this could be captured with Black Box. The black-box device can also record data about the car's engine and other parts while it is in motion. The reason for the accidents is uncertain in several cases due to a lack of eyewitnesses. In some circumstances, critical machine failure has been recognized as one of the major causes of these tragedies. In some cases, police authorities are unable to pinpoint the cause of the collision.

As a result, this system will produce a clear picture for public dissemination in order to increase awareness about the importance of reducing traffic accidents in Oman.

Objectives

- Study and analyze the major causes of accidents in Oman from various
- documents published and released by the officials.
- Design of a Black-box system for vehicle monitoring.
- Test and implement the prototype in real-time and analyze its effectiveness.

Methodology

The literature study will be completed by utilizing scientific websites and previous investigations. There will be a survey of car owners. In addition, the researchers will seek authorization from ROP officials and conduct interviews in order to determine the primary cause of accidents. Researchers will also attempt to interview a few accident survivors without disclosing their identities to learn about their experiences and suggestions. There are seven primary phases to this research's technique. In the first phase, a literature evaluation will be conducted, which will include an examination of current material such as journals, books, and papers from the Ministry. The first stage will take two months to review existing systems from journals, books, and ministry reports; the second stage will take one month to collect data; the third stage will take five months to design the proposed system; the fourth stage will take two months to prepare the research paper; and the final stage will take two months to finalize the design, test it, and prepare the final document.

Literature Review

Yousuf stated in his article that the main reason for accidents is driving over the permissible speed. Things like multitasking, using a phone while driving and reckless driving are some of the common reasons for road accidents. About 198-371 deaths were reported in 2020 for the same reasons. Other reasons like vehicle defects, not wearing a seat belt, and wrong overtaking have also contributed to the same course. By joining forces with the Government and some NGOs, the rate of accidents was reduced during the period 2016-2020 from 4,721 to 1,341. Nonetheless, the rate of road accidents seems to have increased due to traffic jams on Muscat-Salalah road due to khareef season. Yousuf,K.(2021). The second quarter of 2021 witnessed a sudden increase in road traffic accidents that reached up to 15,200 from which 3,000 were considered major accidents and 12,200 were considered minor accidents. According to the Capital Market Authority, there is a 121% increase in an accident when compared with the first quarter. The compensation amount has also skyrocketed, ranging from OMR 2.3 million for minor accidents and OMR 10.776 million for major accidents. Summing up to a total of 121% increase in compensation claims as stated by insurance indices. The insurance companies also claimed to provide services for financial damage but not for moral damage. Oman Daily Observer. (2021).

According to figures from the Royal Oman Police, traffic accidents account for about 10% of the country's annual deaths, with 50 people dying on Omani roads every month on average. The Royal Oman Police (ROP) has developed tough tactics to curbspeed, which they claim is responsible for 70% of all accidents in Oman. Hundreds of radars and cameras have been installed as part of the plan. "The surveillance radars and cameras are already proving to be a significant deterrent, as evidenced by the decrease in the number of accidents in the last two weeks," a ROP spokeswoman stated.

According to statistics, disobedience of traffic regulations has directly resulted in fatalities, and as we work to "build back better" after the COVID-19 pandemic, the moment has come to reopen city streets to the public and underline the significance of taking necessary safety precautions while driving. (WHO, 2022). Despite a 70% increase in the total number of registered vehicles and a 71 percent increase in licensed drivers between 2012 and 2019, data on traffic-related events in Oman show an improving trend, with a 55 percent decrease in crash deaths between 2012 and 2019. Excessive speeding, on the other hand, was shown to be the primary cause of more than half of all fatal crashes in Oman. (WHO, 2022)

According to a news article published by the Times of Oman on 2nd March 2016, reported an accident caused in Ibri which claimed the lives of 18 people travelling from Salalah to Dubai. The ROP stated that "the actual cause of the accident is unknown and requires further investigation". As the accident occurred at a remote location the investigation process was inconclusive.
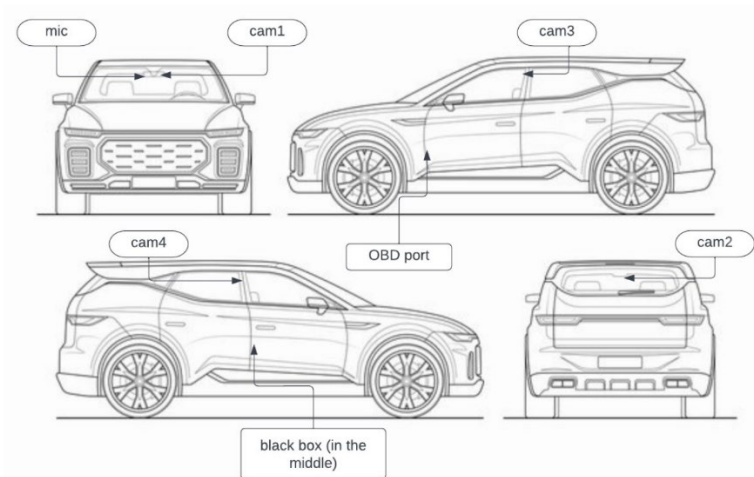
Methods & Results

Figure 1. 3D car diagram

In the above diagram, we can see the various hardware that the project needs. First, the cameras are distributed on all sides in order to get a 360-degree view, don't forget the mic that will be placed beside cam-1. As we will place the blackbox in the middle to ensure its safety and it will connect via the onboard diagnostics (OBD) port to get all the readings that the black box needs.

After completing the research and building up a working prototype of our proposed Black Box model, we can conclude that some if not all of our objectives were reached. This includes that with the 360-degree view, we were able to identify the point of impact or collision. The motor function of the car's engine and related parts gave us an insight into their working pre-collision, whether they possessed faulty, lack of maintenance or improper functioning that resulted in the accident. The acceleration record allowed us to analyze the driving behaviour of the driver and how he reacted at the site of approaching impact. All of these values collectively will allow any ROP or insurance company to draw their final verdict on the accident case.

Discussion

In Oman, only the In-Vehicle Monitoring System (IVMS) is now employed for automobiles issued to employees by several organizations. Many school buses and other big vehicles use it as well. IVMS, on the other hand, solely keeps track of data linked to speed. Other data, such as 360-degree views, were not able to be gathered, which would have been extremely beneficial in the event of an emergency. In real-time, the visual data can be examined and analyzed for all conceivable causes. All these could be recorded in Black Box. During vehicle travel, the black-box system can also record data about the car's engine and other parts. As a result, this system will provide a clear picture for public dissemination in order to raise awareness about the need to reduce traffic accidents in Oman.

Conclusion

After completing the research process and prototype creation, there were some key findings associated with it. We found that many cases of accidents which occur outside cities where cameras and surveillance are not available have the inconclusive cause of accident cases. With our proposed system, the ROP can better assist the accident, the system will be universal for any car type, affordable and easy to maintain. As we concluded from this project, by monitoring and documenting accidents or unlawful acts we can analyze those cases or ROP to prevent them from occurring again.

Limitations

Though blackbox technology will be beneficial for people, cars and insurance companies, the additional cost associated with installation and maintenance will be one of its limitations. If the importance and the benefit of such technology are not properly advertised and promoted to the people and the concerned authorized, they will be reluctant to pay for any additional cost for just safety reasons. As it's an emerging technology in the automotive sector, the knowledge about its cross-vehicle installation remains unexplored. Thus, requiring onhand experiments and further research.

Acknowledgments

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