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Control and Management of Road Accidents by a New Smart Device

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Abstract: Lack of timely information about road accidents and its consequences to the relatives and health centers is of great concern now-a-days. To tackle this issue a device having a built-in detection sensor, camera, emergency alarm and a navigation system is proposed here which works in three major steps based on a mechanical vibration sensor and AI technology. This approach is to connect all the systems through one smart device by using both hardware and software. In the 1st step the device will detect the faces of the on-board peoples by the detection sensor as soon as it is switched on. Parallely, the vibration sensor is detecting the mechanical vibrations of the car and in the second step if accidently the car faces a mishap the sensor will record abnormal spikes in the data and an in-built emergency alarm connected to the device will start ringing. If the bell stops ringing within few minutes it will be considered that the people on board are safe as they would have switched off the bell, if not in the 3rd and final step the device being GPS enabled, will locate the nearest health check up centre and will send the information about the accident to provide help. Side by side the device also sends emergency notifications to that person's family members, provided that device is paired with any device of the passenger's family members and is registered in the software. This device is expected to reduce death percentage to a huge level as proper treatment can be provided timely to the injured in road accidents.

Keywords: Road accidents, Vibration Sensor, Alarm, Health Centre, AI technology

I. INTRODUCTION

Recently numbers of road accidents have increased by 40% and consequent death percentage is around 38% over worldwide. Some of the main reasons of huge deaths are due to the late arrival of health support, lack of health information and in remote areas lack of people for reporting. To tackle these problems, a new smart device is proposed which works through vibration, motion sensing and AI. This approach is to connect all the system in one by making both the interconnected device and hardware available to the user or the victims.

II. APPROACH

This approach starts with device that tracks the vibration level of the system and matches it with the input data. The device has a built-in detection sensor, camera, emergency alarm and a navigation system. The device works in three steps: When the switch is put on, it first scans or detects the person in the car using the face detection sensor [1]. Face recognition is a person identification system which uses various digital image processing and pattern recognition techniques. Facial recognition has a wide range of applications and is commonly used for security purposes, categorizing photo galleries in various social networking sites and even personal collections. For example, faces of suspects from CCTV camera footage can be cleaned and analyzed against a dataset to get a positive identification like the system used in the different international airports.

The device is also designed to measure the vibration of the vehicle [2]. Motion can be detected by: sound (acoustic sensors), opacity (optical and infrared sensors and video image processors), geomagnetism (magnetic sensors, magnetometers), and reflection of transmitted energy (infrared laser radar, ultrasonic sensors, and microwave radar sensors), electromagnetic induction (inductive-loop detectors) and vibration (triboelectric, seismic, and inertia-switch sensors) [3].

There are many approaches for motion detection in a continuous video stream. Here the present device uses vibration sensors using optical fiber due to its capability of simultaneously long-distance monitoring even without power supply, and immunity to electromagnetic fields. During the past years, many fiber configurations based on interferometers (Mach-Zehnder interferometer, Sagnac interferometer, and Michelson interferometer) have been reported for vibration measurement [4,5]. About 100 m averaged positional resolution is achieved in 40 km fiber length [6]. The detected frequency range can be wider for interferometers because it is mainly limited by the sampling frequency of data acquisition card, meanwhile, often two merged interferometers are adopted to calculate the vibration position by time delay estimation, resulting in complicated signal processing and relatively low spatial resolution. On the other hand, vibration measurement based on phase-sensitive OTDR [7,8], polarization-OTDR [9], and Brillouin-

OTDR [10],[11] are demonstrated. A satisfied spatial resolution could be achieved in these systems based on OTDR technology because the spatial resolution is mainly determined by the pulse width of injected light pulses, however, the intensity of backscattering signal is low, and a huge averaging time is demanded to achieve a reasonable signal to noise ratio (SNR), restricting the frequency response range of the system. The device is programmed with a measuring graph which keeps records of the vehicle's vibration frequencies and analyses it with the input data by repeatedly tracking it [12]. In any case of mishap the device will detect anomaly in the vibration level. It is designed in such a way that when the vehicles experiences jerk, anomaly is detected over a certain range in the graph and spontaneously the device triggers the alarm for a certain period of time and if that alarm is answered and stopped by the passenger the device takes it that no harm has being caused [13].

Fig.1 Schematic diagram of possible road accidents

Fig. 2 Schematic diagram of possible fatal road accidents

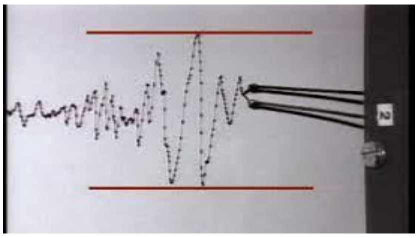

Fig. 3 Recording of the vehicle's vibration frequency with a graph

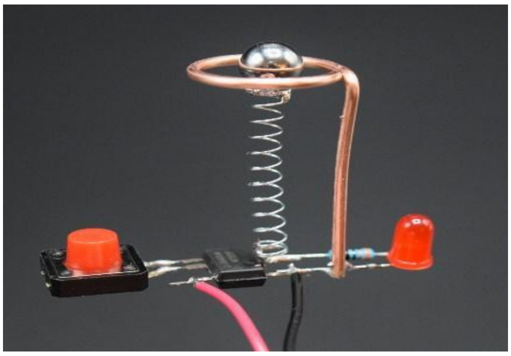

Fig. 4 A detector measuring vibration for a moving car

Fig. 5 The child is saved from the accident spot

The answering system is enabled and can be used by the passengers having minor injury who doesn't need any medical support and can turn off the alarm. But if that alarm isn't answered then the device being GPS enabled sends emergency notifications to the nearby health centers. At the same time the person's family members (provided that device needs to be paired with any device of the passenger's family members and is registered in the software) also get the notification. Upon receiving the notification, the family members and the health support can view the vehicle's location. In case of emergency they can access the location and if wants can access the camera installed on the device to check upon the passenger's condition and if felt needed, can call for nearest medical professionals (an automatic system is also installed if the user family is unable to track the user). Here it is worth to mention that this device automatically detects passenger's presence in the vehicle using its detection sensor [14, 15] (AI used face detection) and so if something happens to the vehicle while it's empty the device won't buzz. Overall, motion and vibration sensing technology can provide valuable data and accurate reports in improving patient condition.

Till now no such technology is there to track and communicate the details of the safety of the car or any wheeler users. This should be made mandatory for all, by the Govt. as an increase in population has caused an enormous rate of road accidents and only few of them are lucky to get medical support due to the lack of technology and people.

III. CONCLUSION

A new technology is designed with a smart device to reduce the number of deaths in road accidents which is of utmost requirement now-a-days. Last but not least; it is worthy to mention that this newly designed smart device can be used as a safety device for both the customers and the police.

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