IoT based Traffic Tracking and Monitoring with Life Safety Ensuring System

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***Abstract*—This paper describes autonomous way of tracking and monitoring vehicles for the reduction of accidents. This paper also has a solution for post approach even if an accident takes place. As mentioned before the word autonomous means that the system is developed with IoT. The system tells if Tri-Accelerometer and Proximity sensor are pre-installed in a vehicle, it will be easy and efficient to track and monitor vehicles as well as drivers. The location will be traced with GPS system and notifications can be sent by GSM technology. If any abnormal situation is detected by the sensors, alert notifications will be sent with proper location according to the situation level. This system is developed for making the previous system more efficient. At the end, advantages and limitations have been described. Future possible work has also been described as well.**

***Index Terms*—IoT, Tri-Accelerometer, Proximity Sensor, GPS, GSM**

I. Introduction

We are currently living in the Internet era and moving rapidly towards a smart world where every computer will be connected to each other. The Internet of Things (IoT) [10] is the technology that helps us achieve the goal of a smart world. IoT and the cyber physical system [11] are capable of changing the perception of our way of life. Through several initiatives, all developing countries plan to turn their cities into Smart City [3]. For example, an initiative called Digital Bangladesh has been taken by Bangladesh's government to link the country to the Internet.

A. Need of Smart City Vehicle Emergency Communication System

Communication from machine to machine (M2M) [6] is growing rapidly to make machines smarter and more common in nature. Each device or better to say each ' thing ' in a smart city is linked 24/7 to the Ubiquitous network. [5] They can communicate with each other irrespective of their communication protocols and hardware / software infrastructure. In this paper, we used the idea of a smart city to provide a life-saving system for a smart vehicle in any emergency situation on the road. Many modern cars are well-equipped with multiple sensors, mechanical devices, software, embedded hardware etc. to pre-detect and avoid accidents or crashes. Safety and security is one of a most important assets for vehicles. Such types of modern safety devices are very useful and effective for both car drivers and on-road passengers also. But there are some major limitations in those safety systems. Only to avoid crashes can these systems be used. But sadly, if the device does not prevent an accident or there is any other emergency situation other than an accident, there is no mechanism for these systems to deal with it. A study says that in Bangladesh 4,317 people were killed by various types of road accidents in 2018. Almost all of them were killed at the spot of the crash due to the late arrival of rescue teams. So it is clear that some of the lives could be saved if the incident details could be sent to the relevant authorities soon after a situation has occurred.

II. Literature Review

Salman Almishari, Nor Ababtein, Prajna Dash, and Kshirasagar Naik have proposed a tracking system that promises an efficient energy with low latency tracking. It consists of three main parts: the tracking chip, Cloud and Smartphone application. The tracking chip is installed inside the vehicle and that thing continuously sends data to the cloud like temperature, the current location of the vehicle. Last recorded location from the cloud is being shown on the smartphone map application. This system consumes about 17 percent lesser than the normal systems [7].

S. R. Nalawade and S. Devrukhkar have proposed bus tacking system using Raspberry Pi for tracking the bus on Google map both on web and android app. This system will

predict the bus arrival time for students. It also uses many different sensors for providing information about bus. GSM or GPRS module can attach to it for connectivity. Geo-location tracking is also mention for identifying current location of bus. This location is sent to the server where this data is stored database. [8]

[2] In this paper, they suggested to focus on an urban area IoT system. Urban IoTs, has the capability to support the mission and vision for building a Smart City. It mainly focuses on the advanced communication technologies that can become services for the administration of the city and for the citizens enabling technologies, protocols, and architecture for an urban IoT. This paper presents and discusses the technical solutions and best-practice guidelines adopted in the Padova Smart City project, a proof-of-concept deployment of an IoT island in the city of Padova, Italy.

[3] In this paper, vehicle monitoring and tracking systems are implemented by using Blynk platform. The system is developed to monitor driver help parameters like normal average number of time eye blinking, any kind of alcohol consumption. Engine temperature, distance between the vehicles and tracking of the live location of the Vehicle. The Ultrasonic sensor is installed on vehicle, if any two vehicles comes to one another, It will send an alert message to the mail through Blynk application. Temperature sensor is installed near where engine is being kept in the vehicle. When the temperature raises, caution alert message is sent to the mail. Eye-blink sensor and alcohol sensor are utilized to check the condition of the driver, if the state of the driver is abnormal then a notification is sent to mail. The developed system takes care of vehicles and s driver's safety.

Le-Tien, T. and Vu Phung have suggested a system based on GSM GPS. This is for tracking and controlling vehicles in outdoor areas. This system consists of accelerator sensor to detect moving direction of the vehicle. A compass sensor will receive the vehicle's location with the help of GPS. This data will be sent to the main center through SMS or GPRS. The main center has necessary equipment and tools that support GSM. Located position of the vehicle will be represented on Google maps [9].

[5] In this paper researchers present a method for accident detection at intersections using an accident recording and reporting system (ARRS). At first this system uses an algorithm to detect the presence of vehicles by video camera, This camera tracks those vehicles that are moving and figures velocity, position, direction. The algorithm presented was intended to capture vehicles before and after an accident with a moving picture and then automatically relay these data to a traffic monitoring center. The authors have found their system to have a high correct detection rate with a low false-alarm rate.

Prashant A. Shinde and Mane have proposed a system which is to believed that their system will increase the security of school buses. This system brings the current school buses to traffic while using the Raspberry Pi, GPS, GSM GPRS. The site constantly collect data and compare these data with the valid known name and path what is stored in the server database. Until the bus arrives at school same process goes on. If the school bus goes to wrong path, The system detects that something is suspicious and it will send a message to the owners about warning and behavior of current bus's selected wrong path [1].

[4]In This paper proposed an overview of the current state-of-the-art, discusses current projects, their goals and highlights how emergency services and road safety will evolve with the blending of vehicular communication networks with road transportation. The power of computing to improve the speed of operations and increase productivity has vastly develop through time to time. The next possible evolution is the convergence of telecommunication, computing, wireless, and transportation technologies. Once this becomes true, roads and highways will become communications and transportation platforms, which will change our surrounding and access to services and entertainment.

III. Methodology

Methodology Vehicle tracking life safety ensuring is the main priority for this project. For ensuring a faster paced tracking system both GPS GSM will be working together to measure a more accurate reliable tracking source. Sensors like tri axis accelerometer sensor, Proximity sensor will be used in a low cost budget friendly computer device such as Raspberry Pi b+ model for ensuring a reliable life safety emergency system for users. GPS, GSM, Sensors all will be installed on Raspberry pi. This device will track down every data from all of these installed microchip and send all of these data to the server. A range of limited x-axis, y-axis, z-axis will be set for tri-axis accelerometer sensor in the raspberry pi device to track every sudden change of direction of the vehicle. Using accelerometer sensor the system can also detect which angle the vehicle is pointing and how fast the vehicle is moving from one place to another place. Hence the velocity of vehicle can be traced down and all of these data will be stored in the server.These data will be checked with user's current location road permitted speed limit. Proximity sensor is going to be used for detecting near object of the vehicle. A range of 4 meter from upward side and downward side will be set in the vehicle for object detection and according to the distance of that detected object the speed of that vehicle will be decreased and monitored by the current area speed limit using GPS. There is an acceptance level for sudden change of direction and detecting object that will neglect these data and won't trigger any alert message. When a data is received that crosses the limit of acceptance level, a notification is going to trigger to alert the user. This alert comes with an auto-send program for 30seconds. If the user cancels this notification then the alert will be dismissed. If the user confirms the alert, Raspberry pi will send a S.O.S request to the server with the current location of the user. The server will send alert message to the nearest Police Station and Hospital with the user's last recorded position for emergency purposes to ensure the life safety of the user. Even if the user cannot response the alert

notification, after 30 Seconds all of these emergency service will auto occur via Server.

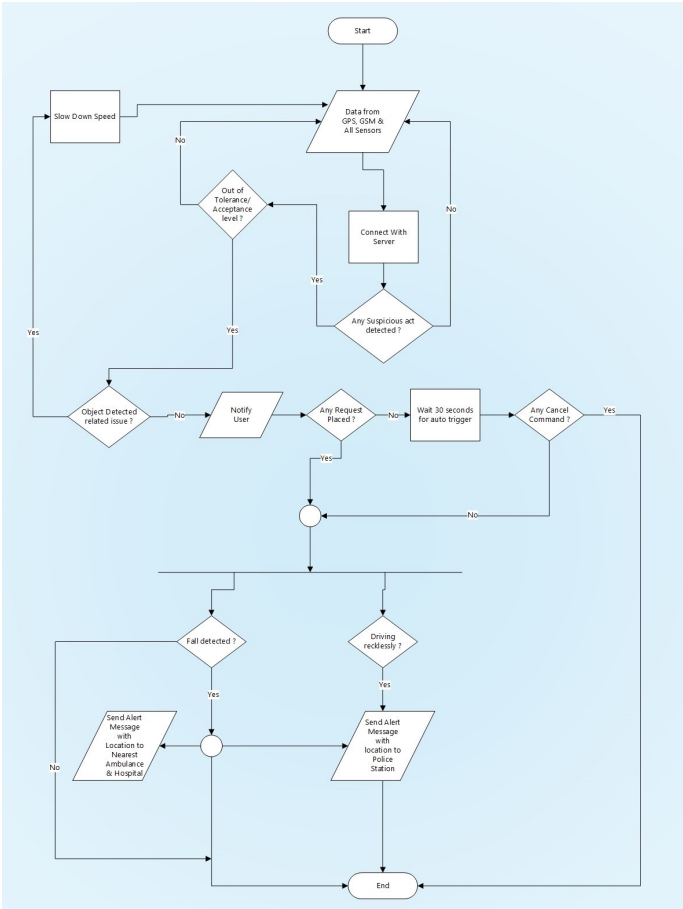

Fig. 1. flowchart of the overview of the proposed system

IV. Discussion and result

The system we have built is very effective for the purpose. The main goal is to reduce accidental cases and if accidents occurs this system can detect danger and take smart steps for ensuring peoples Health/life safety. The system is made based on IoT concept. If everything can be autonomous, so why not in this case. And IoT helps to make everything autonomous. Minimal number of sensors has been used to make the system. Our proposed System should be implemented because of its major advantages.

- Cases of accidents can be reduced
- Traffic system can be monitored
- Vehicles can be traced
- User will get alert messages if Driver is doing something suspicious act while driving
- Driver will get time to manage everything
- Even if any accident occurs, user's condition can be traced and further steps can be taken
- Alert messages will be sent with the current user's location to the nearest Police Station and/or Hospital according to situations
- Discipline can be brought in Traffic Management System
- All of these things will be done automatically, so everything will be faster and efficient
- Cost effective than existing VTS system

Though it has many advantages, it has a little bit of limitations as well.

- Server Timeout
- GPS inaccuracy and limitations
- False sensor triggers
- High latency in rural areas

The number of advantages is far greater than the number of drawbacks. So we can say our system is better to be implemented.

V. Conclusion

Traffic Monitoring has become very necessary these days to reduce accidents which may cause catastrophic damage sometimes. To manage it, our proposed system will play a vital role. Because it is more adequate, efficient and cost effective. Moreover, it can bring discipline in traffic management system as well. It can make the whole process hastier than past proposed systems. In a word, it will help to ensure to reduce the life risk after accidents take place. Though it has some drawbacks, the number is far less than its advantages. A feedback system can be applied to analyse the wrong trigger of the sensors and upgrade the sensors with those data to make the sensors more efficient in future.

References

[1] P. A. Shinde and Y. B. Mane, "Advanced vehicle monitoring and tracking system based on Raspberry Pi," in Proceedings of 2015 IEEE 9th International Conference on Intelligent Systems and Control, ISCO 2015, 2015. S. R. Nalawade and S. Devrukhkar, "Bus Tracking by Computing Cell Tower Information on Raspberry Pi,"

[2] A. Zanella, N. Bui, A. Castellani, L. Vangelista, and M. Zorzi, "Internet of Ihings for Smart Cities," Internet of Things Journal, IEEE, vol. 1, no. 1, pp. 22–32, 2014.

[3] Blue Eyes Intelligence Engineering Sciences Publication Retrieval Number: F3569048619/19©BEIESP IoT based Implementation of Vehicle Monitoring and Tracking system using Node MCU Boddapati Venkata sai Padmaja, Venkata Ratnam Kolluru , Syam Sai Kota

[4] F. J. Martinez, C.-K. Toh, J.-C. Cano, C. T. Calafate, and P. Manzoni, "Emergency Services in Future Intelligent Transportation Systems Based on Vehicular Communication Networks," Intelligent Transportation Systems Magazine, IEEE, vol. 2, no. 2, pp. 6–20, 2010.

[5] Y.-K. Ki and D.-Y. Lee, "A Traffic Accident Recording and Reporting Model at Intersections," IEEE Transactions on Intelligent Transportation Systems, vol. 8, no. 2, pp. 188–194, 2007.

[6] P. J. Zehler, "Method for Setting The Geolocation of a Non-GPS Enabled Device," 2013, uS Patent 8,467,990.

[7] S. Almishari, N. Ababtein, P. Dash, and K. Naik, "An Energy Efficient Real-time Vehicle Tracking System," in 2017 IEEE Pacific Rim Conference on Communications, Computers and Signal Processing (PACRIM), 2017.

[8] S. R. Nalawade and S. Devrukhkar, "Bus Tracking by Computing Cell Tower Information on Raspberry Pi," in 2016 International Conference on Global Trends in Signal Processing, Information Computing and Communication (ICGTSPICC), 2016, pp. 87–90.

[9] T. Le-Tien and V. Phung-The, "Routing and Tracking System for Mobile Vehicles in Large Area," Electronic Design, Test and Application," DELTA '10. Fifth IEEE Int. Symp., pp. 297–300, 2010.

[10] L. Atzori, A. Iera, and G. Morabito, "The Internet of Things: A Survey," Computer Networks, vol. 54, no. 15, pp. 2787–2805, 2010.

[11] E. A. Lee, “Cyber Physical Systems: Design Challenges,” in Object Oriented Real-Time Distributed Computing (ISORC), 2008 11th IEEE International Symposium on. IEEE, 2008, pp. 363–369.