A SURVEY ON CAN BASED VEHICLE MONITORING SYSTEM

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Abstract: The paper proposes a survey conducted on the various methodologies used for monitoring vehicles using CAN protocol. Enabling a sustainable mobility is one of the primary goals of the smart city vision where the development of intelligent parking system represents a key aspect. Parking space monitoring and allocation is the solution to the parking problem faced in cities. Through this survey, we have analyzed few fine features and scant flaws in the existing systems. These failing factors affecting the overall performance of the system can be overcome by further research and development.

IndexTerms **- Survey, Smart Monitoring of Vehicle, Smart Car.**

I. INTRODUCTION

Present Automobiles are being developed by more of electrical parts for efficient operation. Generally, a vehicle was built with an analog driver-vehicle interface for indicating various vehicle interface for indicating various vehicle status like Engine temperature, Collision detection, Wheel pressure, Break cable etc. This paper presents the development and implementation of a digital driving system for a semi-autonomous vehicle to improve the driver-vehicle interface. It uses ARM-based data acquisition system that uses ADC to bring all control data from analog to digital format and visualize through LCD. The communication module used in this project is embedded networking by CAN which has efficient data transfer. It also takes feedback of vehicle conditions like engine temperature, Collision detection, etc., and controlled by the main controller.

II. RELATED WORKS

2.1 Electric Vehicle Monitoring System Using MATLAB/App Designer

This paper [1] focuses on the creation of a graphical interface which enables the user to monitor the most important variables from the electric vehicle. The App Designer environment from MATLAB has been the main resource used to develop this interface because it offered an enhanced design environment and an expanded UI component set. At its current development state, it is not a replacement for GUIDE because it has a limited graphics support and some existing graphics component are not supported yet. The data acquisition has been done using the low-cost platform, NI USB 6001. Thanks to this card, the sensor signals will be transferred to the PC, so the user will be able to know what is happening with the variables to monitor. To measure some variables, the signal from the sensors is adapted to the voltage range of the data acquisition card. The usage of several adapters is therefore necessary for the circuits.

Advantages:

- The electric vehicle incorporation could improve the electric system as if the vehicle is recharged at night, this could smooth the demand curve, encouraging the inclusion of renewable sources into the electric network.
- The app will offer the user several tabs where resumes from each variable will be represented by time and another tab to make a first data analysis to get to know how the system worked.

Disadvantages:

- The main inconvenient of the electric vehicle is the development of one of its main components, the batteries. This is the most expensive component due to the high production cost.
- App Designer simplifies the process of developing and provides a useful app even though not supporting some traditional interactive functionality.

2.2 A Novel IOT Access Architecture For Vehicle Monitoring System

This paper [2] presents a prototype of the Internet of Things (IoT) is becoming increasingly important for traffic monitoring, medical treatment, and other industrial applications. With the continuous development of the IoT, more and more "things" will be able to access to the IoT. Considering a large number of heterogeneous "things", how to provide a unified access mechanism to the IoT is a fundamental and key issue. In this paper, we propose a novel IoT access architecture based on field programmable gate array (FPGA) and system on chip (SoC), which can provide a unified access to the IoT for a wide variety of low-speed and high-speed devices with associated extendibility and configurability. We have adopted an IEEE1451.2 standard for this design and applied the proposed design to vehicle monitoring system. The results indicate that the system can provide good performance in the practical application.

Advantages:

- It provides high performance and low power consumption.
- The vehicle monitoring terminal mainly realizes environmental information acquisition, processing, and transmission.

Disadvantages:

- The system only realizes wired connection for a part of IOT devices.
- After running for a long period, it is observed that the system runs in a stable state.

2.3 Smart Vehicle Monitoring System For Air Pollution Detection Using WSN

This paper [3] presents a Wireless Sensor Network (WSN) which plays an important role in the application of environmental monitoring. Mostly air pollution being major issues as cause many hazardous effects on the ecological system of human being. Therefore the need for monitoring air pollution around the city and the public transport buses and cars are a very important problem today. Basically, environmental monitoring methods have difficulties in wired sensor network but by using WSN it is possible to achieve the challenging issues by implementing internet/intranet. This proposed research concentrates on measuring the gas level of air contamination around the cities and reduces the manpower and also increases the overall flexibility of sender and receiver. The main objective of the proposed system for the moving vehicles is monitor the NO2, Humidity, Temperature, CO levels of air contamination by using the NO2 sensor, Humidity sensor, Temperature sensor, CO sensor. In our proposed work MANET(Mobile Ad Hoc Network) routing algorithm is used which has nearly 28 mobile nodes(Vehicles) provide a coverage area of 300meters around the city. The sensor data of the vehicles will be sent to the smartphones of the appropriate drivers to monitor effectively. The result of the proposed method includes the following parameters such as data type, the speed of transmission, coverage of the system, coverage area size, and No.of vehicles to closely monitor the proposed system.

Advantages:

- The gas sensors were placed on the traveling vehicles without using wired or infrastructure network. Information exchange between the source and destination will be more efficient, fast and secure by using Wi-Fi and GPRS.
- WSNs are being utilized in numerous areas of healthcare, defense such as military target tracking and inspection, government and ecological services like natural tragedy relief, hazardous environment discovery.

Disadvantages:

- It must use cloud network for storing a large number of data records of different vehicles.

2.4 Cloud-Based Vehicle Monitoring System in VANETs

Integration of Cloud computing with VANET is supposed to be the next big thing because of its scalability and reliability. In vehicular ad hoc networks (VANETs) the network services and applications (e.g., safety messages, vehicle navigation data) require an exchange of vehicle and event location information. This paper proposes a new VANET-Cloud-integrated service called CVMS: (Cloud-Based Vehicle Monitoring System in VANETs) as service in which, vehicles moving on the road serve as witnesses of designated events, capture the real-time video or photo of the specific location, route or a deadly accident. A group of vehicles with mounted on board navigation units collaborate to form the vehicular cloud and sends the real-time data to the central cloud using the roadside cloud. The proposed real-time cloud-based video capture system has experimented with various scenarios of video-based

road services. The algorithm for efficient lane changing, navigation data transferring from vehicular cloud to the central cloud in a real-time environment has been implemented on a simulator of an onboard camera based embedded system. The goal of this service is to recognize and track faulty vehicle, emergency vehicles, video and photo capturing of any event, route or location. The presented work demonstrates the potential of our proposed system for enhancing and diversifying real-time video services in road environments.

Advantages:

- Every vehicle is capable of determining its own location and mobility information with the help of GPS enabled to OBU with the motorized camera.
- The information is sent to the vehicular, central cloud and then to the administrative office is authentic and can be accessed only after the person enters the correct credentials.

Disadvantages:

- The OBU is resistant to any damage that is to be caused by the climate change and cannot be tampered.

2.5 Study on Embedded Software Applied to Vehicle Intelligent Monitoring System

This paper [5] focuses on Combined GPRS network data transmission, the advanced GPS satellite positioning and other key technologies, an embedded vehicle intelligent monitoring system could be achieved. This paper introduced the development of main device driver, application program design of embedded video capture card, GPS, and GPRS. This build of the embedded software system will help to achieve the intelligent vehicle monitoring system and improve the degree of networking. With the embedded μC/OS-II real-time multi-threading technology to solve the problem of multi-task parallel processing in the system, in order to ensure system stability, reliability and flexibility, make the system more practical application value.

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Advantages:

- By using multi-process and real-time of the operating system, solve the problem of system processing parallel multi-tasking; ensure the stability, reliability, and flexibility of the system.
- A successful transplantation of embedded operating system reduced the embedded software development cost of the vehicle monitoring system. Improve the efficiency of system development.

Disadvantages:

- It is highly expensive.
- Users without a mobile application will not get the service.

2.6 Development of Remote Vehicle Monitoring System for Surveillance Applications

This paper[6] describes a portable sensing system that can be placed adjacent to a road and can be used for vehicle counting, vehicle classification, and vehicle speed measurements. The proposed system can make these traffic measurements reliably for traffic in the lane adjacent to the sensors. The developed signal processing algorithms enable the sensor to be robust to the presence of traffic in other lanes of the road. Vehicle classification into pre-defined classes such as cars, trucks, and tractor trailers typically requires measuring the size or length of the vehicle.

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Advantages:

- The developed sensor system is compact, portable, wireless
- Used to monitor the number of vehicles and speed of the vehicles passing on the road which can be used for the survey.

Disadvantages:

- The accuracy rate is not100%

2.7 Advance Vehicle-Road Interaction and Vehicle monitoring System using Smart Phone Applications

In this paper[7] an efficient vehicle road safety and location monitoring system is designed for tracking the vehicle location as well as to notify the driver about road conditions. The proposed tracking system combines smartphone application with

microcontroller based system which is embedded with an acceleration sensing module and a navigation system. A microcontroller is used to gather geographic coordinates of the vehicle, locate acceleration variations and to transmit an update to the database. On the basis of this data, the smartphone application will display the instantaneous location of the vehicle to the user. Highlighting feature of this system consists of a sensing module which will evaluate the road condition in real time as well as analyses the accident zone on a particular road from the data stored in the database and provides the evaluation result to a smartphone.

Advantages:

- The user can efficiently monitor the vehicles continuously.
- cost-efficient.

Disadvantages:

- The disadvantage of smartphone application is that it may not always be very accurate.

2.8 Design and Implementation of Mobile Vehicle Monitoring System based on Android Smartphone

The paper[8] presents the design and implement a mobile vehicle monitoring system using Android smartphones. Users can observe their vehicles' information using a mobile screen anytime, anywhere. Our proposed design is composed of small the GPS/GNSS receiver terminal, modern data acquisition modem, cellular data transmission network, and the smartphone application. We comprehensively discuss the key technologies in terms of hardware and software aspects employed in the system including possible indoor positioning wireless technologies. The designed system in the paper is implemented and tested in practical experiments. Experimental results have proved that the proposed monitoring system is correct and feasible for vehicle owners.

Advantages:

- The proposed monitoring system is feasible for vehicle owners.
- There is no need for the user to use additional components to make use of this system.

Disadvantages:

- Less Battery life.
- Obstacles like buildings and trees can deflect the signal.

2.9 Vehicle Location System and Monitoring as a Tool for Citizen Safety Using Wireless Sensor Network

In this paper[9], a WSN architecture for locating and tracking that eliminates the need for handover when a sensor node moves through the WSN is proposed. The proposed architecture considers two PAN conformations, one that is responsible for communicating the sensor nodes with nodes access point (AP) and the other forming a backbone network between the AP and the coordinator node. The results obtained after developing experiments in a real environment support the operation and benefits of the proposed architecture.

Advantages:

- This system is of low cost.
- Easy deployment and low power consumption.

Disadvantages:

- Communication speed is comparatively low than the wired network.
- Wireless sensor networks keep distracting by other wireless devices.

2.10 Implementation of Microcontroller based Driver Assistance and Vehicle Safety Monitoring System

This paper[10] measures various driver assistance parameters such as eye blinking, heartbeat, and alcohol consumption, and various vehicle parameters such as engine temperature, the presence of harmful gases, obstacle distance, and vehicle location. The

proposed system is built using Arduino UNO board consisting of ATmega328P microcontroller. Arduino Integrated Development Environment (IDE) tool is used to develop the necessary software. An LCD display is used on the dashboard side to display the monitored values and necessary action is taken by the microcontroller for the safety of the driver and vehicle. A GPS receiver is used in the vehicle to determine its location. This position information is sent using GSM modem to the police/owner in the form of Google map position link, when the driver or vehicle condition is abnormal, so that vehicle can be tracked.

Advantages:

- Provides good portability

Disadvantages:

- Sensors are very sensitive to variation in the temperature.

2.11 RFID based Vehicle Monitoring System

This paper[11] is about the development of RFID-based vehicle monitoring system that provides a database for all registered vehicles using 13.56 MHz RFID module; sends SMS notification to the database using SIM900A GSM module; an integrated barrier gate using Tower Pro MG966R Servo Motor; an integrated HC-SR04 ultrasonic sensor to detect those vehicles entering the specified area and an integrated Arduino camera module that captures vehicle images. It also addresses security constraints in terms of the functionality, usability, and reliability through several tests. Flowchart, block diagram, and wiring diagram were used to document the requirements, analysis, and design of the system. In addition, the performance of the system was done through the perception of respondents using questionnaire. Convenience sampling was used for the selection of the respondents who are the registered vehicle owners. The results showed that RFID-Based Vehicle Monitoring has satisfied its functional requirements by providing its user-desired functions and specifications. The system is functioning well for all technical test. The system was also perceived to be functional, usable, and reliable.

Advantages:

- Not requiring line of sight access to be read.
- Automatic scanning data logging is possible without operator intervention.

Disadvantages:

- RFID systems are often more expensive than barcode system.
- Can be less reliable.

2.12 Internet of Things based vehicle monitoring system

Advances in technologies and availability of economical open source hardware systems are setting a new trend in system designing. Use of technologies like the Internet of Things (IoT) can ease the process of data collection and analysis. The main objective of the paper[12] is to describe a system which can monitor or track the location and vehicle parameters of different test vehicles from a centralized place for research and development purposes and to store data of testing parameters of those vehicles on the server for further analysis and records. System design will be generalized for monitoring different parameters like Location, Vehicle speed, Engine compartment temperature, Fuel consumption and many more. The proposed system uses Open source controller and GPS/GSM/GPRS module for data transfer application.

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Advantages:

- Data: The more the information, the easier it is to make the right decision.
- The computer keeps the track both on quality and the viability of the things at home.

Disadvantages:

- There is no standard compatibility for tagging and monitoring with sensors.
- Privacy is a big issue with IOT.

2.13 Development of a Vehicle Monitoring System based on HTML and ASP.net

This paper[13] describes a vehicle monitoring system client based on HTML and ASP.NET. It involves the HTML technology, ASP.NET technology, etc. with excellent compatibility and expansibility. Their key functions are sort cars according to their colors, query the vehicle list, vehicle state information display, data report, terminal controls, etc. According to the distribution and running state of vehicles to achieve reasonable dispatch, monitor vehicles. It will increase the efficiency, benefit, and safety of the whole system. The system has a broad development prospect and great market potential in public traveler information service system, logistic transportation supervision system, emergency management systems, etc.

Advantages:

- Every browser supports HTML language
- Easy to learn and use.

Disadvantages:

- Security features are not good in HTML
- Need to write a lot of code for making a simple webpage

2.14 An IOT Framework for Intelligent Vehicle Monitoring System

In order to have safe vehicular traffic across the expressway, a real-time monitoring has become a vital need for the today's intelligent traffic monitoring systems(ITS).In this paper[14] we present a design and development of low cost and the reliable Internet of things framework which consists of an array of RFID sensors for the real-time tracking of the vehicle on its transit from one point to another point of the high-speed expressway. The uniquely detecting capability of the vehicle using RFID sensor network makes it a better choice compared to the image processing based systems. In this project, real-time stamps are taken from the array of RFID sensor network and the velocity of the vehicle is approximated in the real-time environment using Euler's algorithms. Here an Arduino platform with an Ethernet connection can be used as a core controller and the resultant data can be viewed on the internet using cloud computing.

Advantages:

- Data: The more the information, the easier it is to make the right decision.
- The computer keeps the track both on quality and the viability of the things at home.

Disadvantages:

- There is no standard compatibility for tagging and monitoring with sensors
- Privacy is a big issue with IOT.

2.15 Research of Electric Vehicle Security Assurance and Monitoring System

This paper[15] has introduced the security assurance and monitoring system of public electric vehicles' operation. An effective management system based on the GPS and 3G network was designed in this study. The system can be categorized into three parts: center management platform, vehicle terminal, wireless transmission network. The experiment results showed that the system realized functions such as real-time data acquisition, processing, wireless transmission and remote monitoring on 3G network technology.

Advantages:

- The electric vehicle is very responsive and has very good torque.
- The electric vehicle can also reduce the emissions that contribute to climate change and smog, improving public health and reduce ecological damage.

Disadvantages:

- Some model of electric cars is still very expensive.
- Not suitable for cities facing a shortage of powers.

2.16 Intelligent Vehicle Monitoring System using Wireless Communication

The use of mobile phones while driving is one of the most dangerous and widely seen causes of fatal road accidents. The objective of the paper[16] is to develop a device to find people who use mobile phones while driving and evade stringent laws enforced by the government easily. This novel and ingenious technique facilitate the government to take adequate action against those who are violating these laws. To meet the requirements of an intelligent vehicle monitoring system, this architecture integrates Global Position System (GPS), Global System for Mobile communications (GSM) and a Microcontroller in the whole. This device is used to prevent texting and calling of mobile phones while driving vehicles. If the driver is using the phone while the vehicle is in motion, it triggers a signal which notifies the cops with the vehicle's number plate and the location with the help of GPS system. It receives the mobile signal and detects the presence of mobile. This signal eventually triggers the microcontroller with a glowing LED.

Advantages:

- wireless networks are easy to install anywhere based on choice.
- Wireless networks are easy to maintain compare to messy wired counterparts. This will help when the network grows and will have hundreds to thousands of customers.

Disadvantages:

- Wireless signals can be easily hacked and hence it will hamper privacy.
- Wireless networks require careful radio frequency planning at the beginning of the installation.

2.17 Design and Implement of Vehicle Monitoring System Using 3G Technology

In order to promote vehicles working with speed and safety, a vehicle monitoring system using 3G and GPS technology is designed. Intelligent Transportation System (ITS) in this paper[17] aims to realize the information, intellectualization, and socialization of transportation system, and can solve the transportation problems in city effectively. As a key point of ITS—Vehicle monitoring system is paid more attention by more countries recently. A practical vehicle monitoring system is developed and deployed in a certain district of Xi'an, which demonstrates our system can combine the function of vehicle monitoring, scheduling and anti-robbing together with low cost and high efficiency.

Advantages:

- GPS vehicle tracking systems can also monitor the fuel consumption of a vehicle.
- Tracking systems can also help people to map out the shortest routes a driver can take which can help to save time, money and fuel.

Disadvantages:

- The use of GPS tracking devices causes worker resentment especially is they are used to track delivery drivers and the location of the field.
- It is very expensive to install a GPS tracking system especially for small companies and this is one of the major disadvantages of GPS tracking.

2.18 Advanced Vehicle Monitoring System Based on ArcGIS Silverlight

Intelligent Vehicle Services System is currently a hot research issue of the Internet of Things (IoT) application in automotive industry, and real-time monitoring of vehicles is one of the core and key modules. This paper[18] discusses ArcGIS API for Silverlight and its application on Vehicle Monitor System and introduces design principles and framework of Vehicle Monitoring System, as well as map matching and history track algorithm. A vehicle monitoring system is realized by using ArcGIS API, .NET Framework, Visual Studio and Silverlight Tools. At last, design principle of main functions as a split-screen monitor, vehicle location, map mark, electronic fence and historical track realized in Vehicle Monitoring System are introduced.

Advantages:

- Traffic blocking improvement, vehicles emergency dispatch, fleet management and other practical applications demand real-time vehicle monitoring.

- A vehicle monitoring system is developed based on ArcGIS Silverlight, which has a higher interactivity and user experience. The system is now running well, and each function is modularized with high maintenance.

Disadvantages:

- This system still exists some problems, such as there is a certain deviation in vehicle map matching, and internal data structures.
- The function needs to be improved, the better algorithm should be used to improve its operating efficiency. A scheduling mechanism is also needed to allocate instance object within vehicle monitoring system.

2.19 Application of RFID and GPS technology in a transportation vehicles monitoring system for dangerous goods.

The security of transportation becomes extremely significant with the demanding for road transport of dangerous goods in recent years. It is urgent for China to build a control system with the technology of information management for dangerous goods. A real-time vehicles monitoring system for dangerous goods by using of Radio Frequency Identification (RFID) and Global Positioning System (GPS) technology is put forward in this paper[19], which includes the functions of data acquisition in real time, positioning, tracking and monitoring in transportation.

Advantages:

- The RFID reader is used to identify and read the information of RFID tags on the dangerous goods package.
- It is better than barcodes, as it cannot be easily replicated, and therefore, increases the security of a product.

Disadvantages:

- RFID proves to be too expensive for many applications as compared to other tracking and identification methods.
- It is difficult for an RFID reader to read the information in case the tags are installed in liquid or metal products.

2.20 A Digital Vehicle Monitoring System Based on 3G for Public Security

Along with the rapid development of 3rd generation mobile communication technologies and information technology, the use of digital vehicle monitoring system has significant value for public security. Based on the research and analysis of vehicle monitoring platforms, this paper proposes a secure architecture for digital vehicle monitoring system based on the 3G networks for public security. The proposed system is designed for police departments. This paper[20] analyzes the key technologies of the system such as video management, data security, wireless network, and communication.

Advantages:

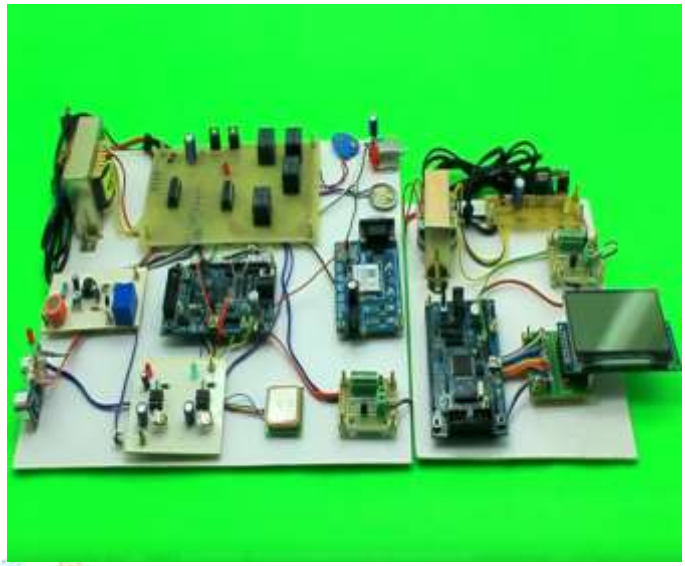
- More options and flexibility in terms of recording and reviewing media.
- More options in terms of being able to manipulate what is recorded.

Disadvantages:

- It's unforgiving if the data is damaged, tends to spoil the whole media packet. E.g. TV if too much data is lost the whole image freezes and scrambled.
- More expensive to fix when it goes wrong.

III. PROPOSED FRAMEWORK

Through the survey, few faults have been observed. Our team has come up with few solutions to overcome these disadvantages which are discussed further in this section. One of the drawbacks of these proposed systems involves the use of GSM which requires the use of a cellphone which has been added to our project, which we are overcoming with the use of CAN protocol. A well designed and RFID system is added which is less reliable in other proposed systems. In addition to the above features that have been included, our system also involves the display of all the problems such as damage of brake cable, the pressure of the tire, detection of collision and monitoring temperature which is absent in other systems.



IV. CONCLUSION

This paper includes the survey conducted on different techniques used for vehicle monitoring system. The main contribution of the study is to analyze the drawbacks involved in each technique and to propose a better solution which has been explained in section III. .Hence, it can be concluded that an efficient model for a smart parking system can be developed.

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