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# Research and Design of Embedded Vehicle Monitoring System Based on Web Technology

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**ABSTRACT**: Embedded systems are pervasive in the infrastructure of our society for diverse tasks. In this project, we research and design an embedded Vehicle Monitoring system based on Web Technology. To achieve this purpose, we use Level Sensor, Pressure Sensor, Tilt Sensor, Gas Sensor, and Alcohol Detector. By these sensors, we check the various parameters of the vehicle system such as Liquid Level, State of Vehicle, Pollution by Vehicle, alcoholic taste of driver etc. These sensors provide the information to the Arduino (ATMEGA 328P-P0). We use Pentium 4 Processor in this project. To monitor the parameters, we use Web Technology.

We directly connect the sensor and the monitoring equipment to achieve remote management and real-time data transmission, so realize the resources and information sharing and increase the efficiency and reliability.

To improve the level of supervision and management for cargo transport vehicles, especially trucks carrying coal, it is important to develop transport vehicles remote monitoring system. Through a dynamic monitoring of the transport vehicles, manager can ensures that the vehicles are traveling in accordance with the approved lines. Once vehicles appear in accident, manager can quickly locate the accident point, implement treatment timely. It has provided a powerful management support with a rapid reacting capacity for the regulatory authorities, transport companies by information technology.

**KEYWORDS**: vehicle transport, remote monitoring, sensors, mobile communication.

## I. INTRODUCTION

Embedded systems are pervasive in the infrastructure of our society for diverse tasks such as studying environmental phenomena, Instrumenting and managing large-scale systems, and aiding security. Rapid changes in process technology demand production systems that are themselves easily upgradeable, into which new technologies and new functions can be readily integrated. An embedded system often consists of a generic processor, mission-specific hardware modules and software modules that execute on the processor and interact with hardware modules.

Container is the main tools of cargo carriage in contemporary society, including common dry cargo container, tank container, and refrigerated containers. Tank containers are used for most of the transport of hazardous chemicals, such as Liquefied Petroleum Gas (LPG), liquefied natural gas (LNG), liquid chlorine, toluene, p-Xylene, etc. Transport companies also require such technology to monitor their Vehicles and control them. Same things are for the government Vehicles in Security, Police and Administration.

In this project, we monitor the vehicles based on web technology. In this, we use the Gas sensor, Level sensor, Tilt sensor, Alcohol Detector, Dash Sensor, and Pressure Sensor etc. Arduino (ATMEGA 328P-P0) and Pentium 4 Processor is used for inputs acquisition and Storage. We can also check the Track Playback of the vehicle. To monitor the available information, we are using Web Technology (ASP.Net).

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## II. RELATED WORK

The innovation in technology today has made our lifestyle much easier and fun. This research work proposes and implements a solution for enhancing public transportation management services based on RFID and GSM. The system consists of three modules: In-BUS Module, BUS Stop Module and BASE Station Module. The microcontroller based In- BUS Module consisting mainly of a GSM modem and RFID Readers on the entry and exit gates. When driver press the INIT button, IN-Bus module sends the bus number and license plate number to BASE station and starts transmitting its location to BASE Station Module about a particular bus location out of BUS stops. BASE Station Module equipped with a microcontroller unit and GSM modems interfaced to PCs is designed to keep track record of every bus, processes user request from Android mobile application about a particular bus location out of BUS stops and updates buses location on bus stop's LCD display. BUS Stop Module is installed at every bus stop and consists of a GSM modem, RFID tags and LCD display all interfaced to a microcontroller. This module receives bus location information coming towards that stop from BASE Station module and displays the information on a LCD display. The aim of such application is to detect critical situations and to warn the control room. We propose a comparative study of two methods of modelisation/classification of acoustical segments. The problem is quite similar to the "'audio indexing"' framework, nevertheless the environment here is very noisy. We present two general frameworks based on Gaussian Model Mixture (GMM) and Support Vector Machine (SVM) to achieve shout detection in railway embedded environment.

## III. PROPOSED ALGORITHM

### *A. Design Consideration*

**Hardware Environment:**

The complete system is developed around Arduino microcontroller which is developed by Atmel Technologies in 2005 year to perform control action. Arduino microcontroller ATMEGA328P interfaced with different sensor like pressure sensor, level sensor, speed sensor, tilt sensor, gas sensor, dash sensor and alcohol detector as well as Pentium P4 processor for web page access.

**1. Sensors:**

Sensor is basically transducer they convert one form of signal into another form. For example electrical signal are converted into mechanical signal or movement or vice versa. A sensor gives real time signal interfacing.

- Pressure Sensor: The pressure sensor is used to monitor the load carrying by vehicle.
- Level Sensor: The Level sensor is used to monitor the fluid level. Using IR pair level measurement is done.
- Tilt Sensor: By using this Sensor we can monitor the position or angle of the vehicle with respect to earth.
- Speed Sensor: The tachometer principle is used for the speed measurement of the vehicle.
- Gas Sensor: This sensor is used to measure the concentration of carbon monoxide (CO) exhausted from Vehicle. MQ7 Gas sensor is used for this purpose.
- Alcohol Detector: This is used to check the status of the drivers to avoid the accidents due to the Alcohol Consumption. MQ3 sensor is used to monitor the alcohol concentration.

**2. Arduino Microcontroller ATMEGA328P**

Arduino is 8 bit and an open-source computer hardware and software microcontroller, user that designs and manufactures microcontroller-based kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project is based on microcontroller board designs, manufactured by several vendors, using various microcontrollers. These systems provide sets of digital and analog I/O pins that can be interfaced to various expansion boards and other circuits. The boards feature serial communications interfaces, including USB on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) based on the Processing project, which includes support for the C and C++ programming languages. The first Arduino was introduced in 2005, aiming to provide an inexpensive and easy way for novices and professionals to create devices that interact with their environment using

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sensors and actuators. Common examples of such devices intended for beginner include simple robots, thermostats, and motion detectors. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits.

**Software Environment:**

Software is divided into two parts as control system and PC remote software.

1. **Microcontroller programming:**

In that we programmed inbuilt ADC and microcontroller with sensor output. At initial state we defined input output port of microcontroller. Then using C or C++ language coding is performed. In this microcontroller, there is no need to generate hex file separately like 8051 microcontroller. Code directly burned into microcontroller.

2. **PC Remote software:**

a. Data acquisition

Microsoft SQL Server is a relational database management system developed by Microsoft. As a database server, it is a software with the main function of storing and retrieving data as requested by other software applications which may run either on the same computer or on another computer across a network (including the Internet).Microsoft has at least a dozen different editions of Microsoft SQL Server, intended at different audiences and for workloads ranging from small single-machine applications to large Internet-facing applications with many concurrent users. SQL Server is Microsoft's relational database management system (RDBMS). It is a full-featured database primarily designed to fight against competitors Oracle Database (DB) and MySQL. Like all major RBDMS, SQL Server supports ANSI SQL, the standard SQL language. However, SQL Server also contains T-SQL, its own SQL implementation. SQL Server Management Studio (SSMS)(previously known as Enterprise Manager) is SQL Server's main interface tool, and it supports 32-bit and 64-bit environments. SQL Server is sometimes referred to as MSSQL and Microsoft SQL Server.

b. Web Application Design

A development server is a type of server that is designed to facilitate the development and testing of programs, websites, software or applications for software programmers. It provides a run-time environment, as well as all hardware/software utilities that are essential to program debugging and development. A development server is the core tier in a software development environment, where software developers test code directly. It is comprised of the essential hardware, software and other components used to deploy and test the software under development, including bulk storage, development platform tools and utilities, network access and a high-end processor.

*B. Description of the Proposed Algorithm:*

STEP 1: BLOCK DIAGRAM

The figure1 shows that block diagram of the project were and the system implementation is discussed below. The main Systems to be implemented are the interface of the circuit with the arduino development board microcontroller. The other interface would be the retrieval of the information from the device and then system and system gives remote processing of data.

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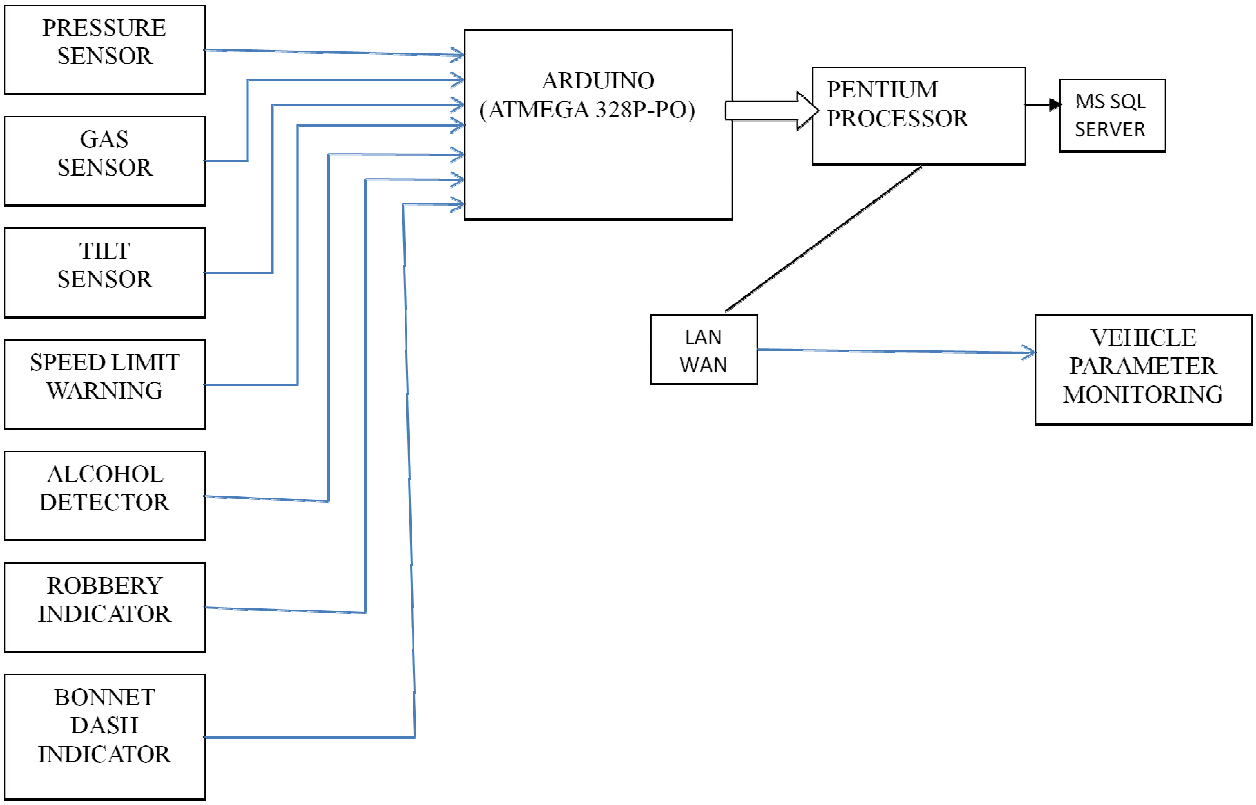


Figure 1 General Block diagram of Proposed Scheme

The system consist of following component

1. Sensor

In this project we are using various types of sensors like pressure sensor, level sensor, gas sensor, tilt sensor, alcohol detector, bonnet dash indicator, robbery indicator etc. to monitor the parameter of vehicle.

2. Controller

It is heart of system it controls different parameters like fluid level, pressure, speed and voltage used and generated. We used Arduino microcontroller board.

3. PC or Laptop

It provides monitoring as well as controlling to remote terminal through web. It also provides the necessary information related to various parameters of vehicle. It also provides graphical display. PC is used for data acquisition and for web application design for user interface and for taking required control action.

In this we are monitoring all the parameters of vehicle like fluid level, pressure of the vehicle means load carrying by vehicle, concentration of co exhausted by vehicle, speed of the vehicle, position or angle of the vehicle with respect to earth and also monitoring the status of the driver by alcohol detector. For protection of transport, cargo, government vehicle continuous monitoring is required. The continuous data from vehicle is taken for level, pressure, speed measurement by using sensors. Then using IR pair fluid level measured, using MQ7 sensor senses the concentration of CO exhausted from vehicle and using MQ3 sensor concentration of alcohol measured. This data is transferred to Arduino Board, act as the process controller and sends data to Pentium 4 processor which analyses data and the sort in various specified columns. This continuous data is transferred to operator has an authorize access through the web page.

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## IV. PSEUDO CODE

**Monitoring Module**

Step 1. Start.
Step 2. Enter the url/link.
Step 3. Enter user ID and Password.
Step 4. Monitor the screen.
Step 5. Different values will be displayed according to the status of that parameter.
Step 6. If the value goes above set point, proper control is fired.
Step 7. Stop.

## V. SIMULATION RESULTS

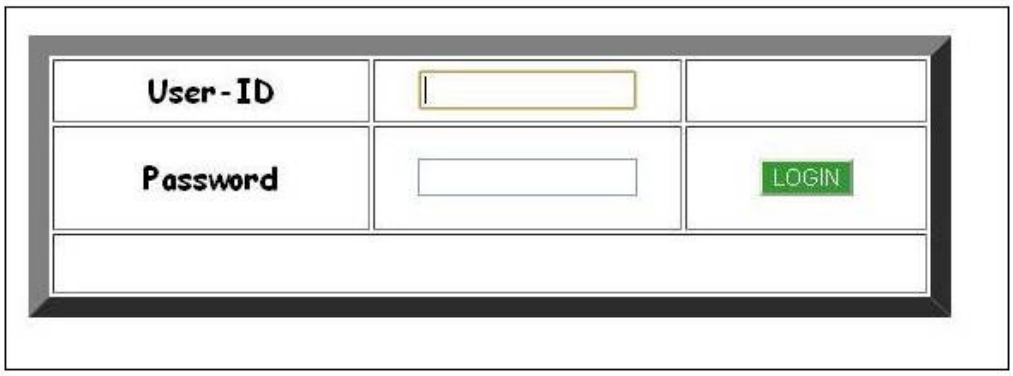


Figure 4: Web Login Form

The results produced with our implementation are very promising. First of all we have to read the sensor values accurately. We are used-pressure sensor, Gas sensor, IR sensor for level, Tilt sensor, Alcohol detector, Bonnet dash indicator, Robbery indicator, Speed detector. All the sensors are producing the results but reading these values together and placing them in proper location in database in the computer is most challenging job. We checked whether the value is varying or not. In the same way we checked whether the value is varying or not for another sensors. And the values are changing in the proper textboxes only. After that we do a microcontroller programming in Arduino ATMEGA328 microcontroller. Set points are defined as per requirement and the sensor values are compared with proper set points. A central server on field is continuously fed with the sensor values in the database. It should be clear that for web monitoring this system is connected to the internet with any of technology. Here we are using static IP to do the server online. On web side administrator is provided with user admin authentication i.e. user-id and password. He can monitor any time on field using any device may be laptop or mobile phone connected to internet.. All results are accumulated in Table.

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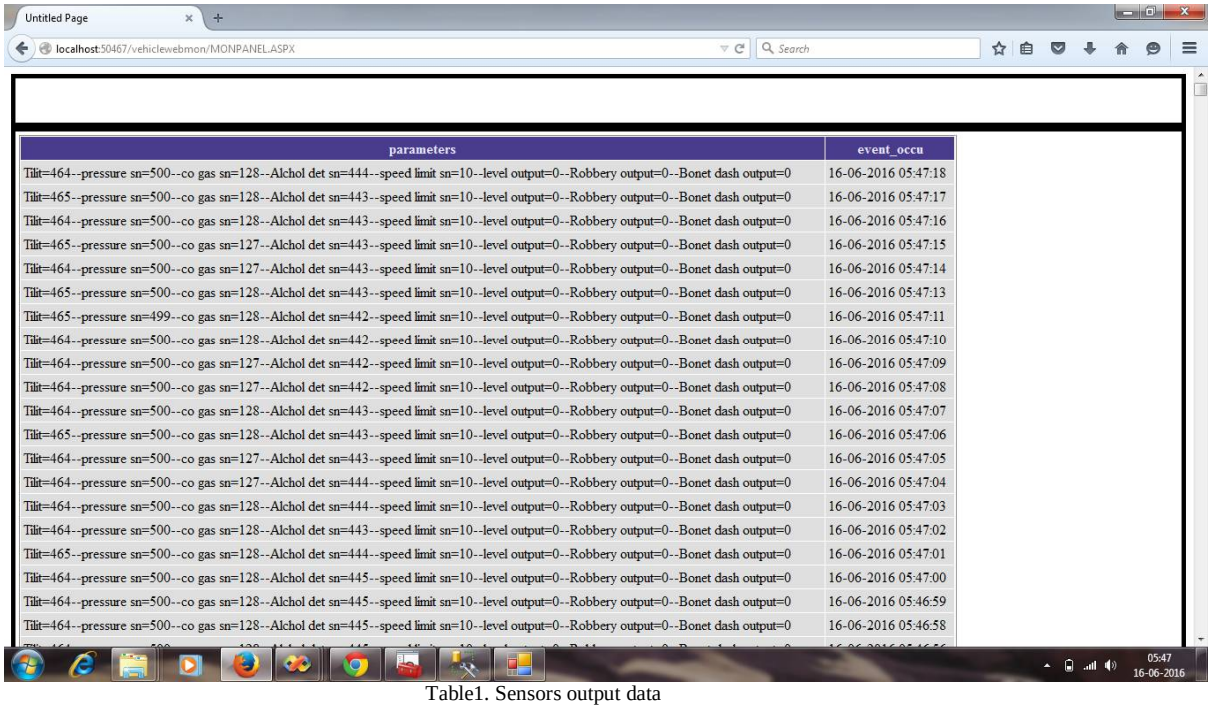


| parameters | event_occu |
|---|---|
| Tilt=464--pressure sn=500--co gas sn=128--Alchol det sn=444--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:47:18 |
| Tilt=465--pressure sn=500--co gas sn=128--Alchol det sn=443--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:47:17 |
| Tilt=464--pressure sn=500--co gas sn=128--Alchol det sn=443--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:47:16 |
| Tilt=465--pressure sn=500--co gas sn=127--Alchol det sn=443--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:47:15 |
| Tilt=464--pressure sn=500--co gas sn=127--Alchol det sn=443--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:47:14 |
| Tilt=465--pressure sn=500--co gas sn=128--Alchol det sn=443--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:47:13 |
| Tilt=465--pressure sn=499--co gas sn=128--Alchol det sn=442--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:47:11 |
| Tilt=464--pressure sn=500--co gas sn=128--Alchol det sn=442--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:47:10 |
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| Tilt=464--pressure sn=500--co gas sn=127--Alchol det sn=442--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:47:08 |
| Tilt=464--pressure sn=500--co gas sn=128--Alchol det sn=443--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:47:07 |
| Tilt=465--pressure sn=500--co gas sn=128--Alchol det sn=443--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:47:06 |
| Tilt=464--pressure sn=500--co gas sn=127--Alchol det sn=443--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:47:05 |
| Tilt=464--pressure sn=500--co gas sn=127--Alchol det sn=444--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:47:04 |
| Tilt=464--pressure sn=500--co gas sn=128--Alchol det sn=444--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:47:03 |
| Tilt=464--pressure sn=500--co gas sn=128--Alchol det sn=443--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:47:02 |
| Tilt=465--pressure sn=500--co gas sn=128--Alchol det sn=444--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:47:01 |
| Tilt=464--pressure sn=500--co gas sn=128--Alchol det sn=445--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:47:00 |
| Tilt=464--pressure sn=500--co gas sn=128--Alchol det sn=445--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:46:59 |
| Tilt=464--pressure sn=500--co gas sn=128--Alchol det sn=445--speed limit sn=10--level output=0--Robbery output=0--Bonet dash output=0 | 16-06-2016 05:46:58 |

Table1. Sensors output data

Above Table shows the all sensors output value with time and date. The table shows the current status with output values of sensors which is in descending order. We give the reference value to the sensors and according to it become high or low output like Alcohol sensor, pressure sensors etc. If there is high output of Alcohol sensor then we give the control for stop the ignition of car. There is also provision of buzzer for robbery switch if obtain.

## VI. CONCLUSION AND FUTURE WORK

The system is an integrated platform using the Web technology, and other communication technologies to monitor vehicles, but also be applied to other moving objects such as cars, boats, motorcycles, personnel, etc. provide location-based services, operational services, and management services, as well as alarm monitoring for regulatory authorities. Dynamic and real-time monitoring of transport vehicles is a good thing benefits the nation and the people.

Now days Government vehicles like Police, Hospitals, Administrative vehicles are need to be monitored because of mal-functioning in duties. Here we can use our systems to avoid mal-functioning.

This system can control the theft of vehicles by using GPS and Video Camera in project. By using Gas sensors we can maintain the engine of vehicle and we can reduce the pollution. By dash sensors and Tilt sensors, we can provide immediate help to the vehicle in accidents.

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