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Vehicle Monitoring Device Using RFID

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Abstract

The vehicle monitoring device is useful for monitoring vehicles using RFID tags. The use of an RFID tag is to identify whether the person belongs to this organization or not. It is done by collecting the student's data from the organization and distributing these tags to them. The use of it is only those who have this tag are permitted into the gate and these tags will be distributed to the students, only students who have this are permitted. There will be a gate with a sensor it scans the RFID tag and allows those who have the tag. It is one of the most useful technologies that an organization can have.

Keywords

Vehicle monitoring, safety device, vehicle information, speed and sound-based monitoring, RFID method.

I. INTRODUCTION

A large amount of the violated activities happen in educational institutions and private parking areas due to not monitoring the in and out, over speed and rash driving of vehicles on campus. The rate of violations has expanded as more vehicles come onto the ground. To control and screen the speed of vehicles on streets the departments of government have taken vital steps. But it is not enough. As of now, the motor vehicle departments have been provided with laser speed indicators. In any case, a man must be there on campus, which is not an optimal way for checking. Also, the laser tracker is expensive. This paper's purpose was to be based on the previously mentioned points. Here in this paper, we attempted to develop a framework to follow the check-in and check-out and speed of the vehicle in a lot easier, more efficient way. This framework needs to work 24x7 automatically. The principal thought was to utilize a laser module, however, thinking that it is expensive it was dropped. Later we discovered that IR transceivers will help in accomplishing the objective, which is exceptionally

easy to develop and extremely modest, however, it works just if the line of sight is kept up which was the main reason it was dropped. Finally, we found that the RFID module can satisfy our prerequisites with its features such as more financial, high reliability etc.

In this project, employing an RFID module as its vital part, vehicle supervising, and automatic speed control of our vehicle can be accomplished. RFID readers are fixed on the diverse sign boards and RFID tags on the vehicle. When the reader comes into the speed limit area, the vehicle is not allowed in till the speed is controlled.

II. LITERATURE SURVEY

Edward B. Panganiban and Jennifer C. Dela Cruz [1] presented an RFID-based vehicle monitoring system. This paper is about the development of an RFID-based vehicle monitoring system that provides a database for all registered vehicles.

Hu Lingling et al [2] discussed An Intelligent Vehicle Monitoring System Based on the Internet of Things. Compared with the vehicle monitoring system that implements the management in the physical entity dimension of road traffic, this paper presents a vehicle monitoring system based on the Internet of Things.

Deepak K. Sharma et al [3] presented about Role of RFID technologies in transportation projects: a review. Advancement in sensing and transmitting technologies has significantly reduced their cost and increased their use in various industries, including the architectural, engineering, and construction industry.

Rahul B. Pendor and P. P. Tasgaonkar [4] proposed An IoT (Internet of Things) framework for the intelligent vehicle monitoring system. To have safe vehicular traffic across the expressway real-time monitoring has become a vital need for today's Intelligent Traffic monitoring Systems (ITS).

Kichun Jo et al [5] discussed Distributed vehicle state estimation system using information fusion of GPS and in-vehicle sensors for vehicle localization. This paper proposes a distributed vehicle state estimation system to improve the performance of vehicle positioning using a Global Positioning System (GPS) and vehicle sensor components.

A.L. Harvey and H.A. Cohen [6] presented Vehicle speed measurement using an imaging method. The feasibility of a simple imaging technique for measuring vehicle speed was studied.

Shraddha Shah and Bharti Singh [7] proposed RFID based school bus tracking and security system. At present time due to the increase in the number of kidnapping and road accident cases, parents always worry about their children. This paper recommends an SMS-based solution that helps parents track their children's location in real-time.

J Saranya and J Selvakumar [8] discussed the Implementation of children tracking system on android mobile terminals. To focus on implementing children tracking location system for every child attending school.

Nitin Shyam et al [9] discussed SMS (Short Message Service) Based Kids Tracking and Safety Systems by using RFID and GSM. An SMS-based solution to aid parents to track their children's location in real time. The proposed system takes the advantage of the location services provided by the module kit which carry by the Childs in their school bag.

R.K. Pateriya and Sangeeta Sharma [10] presented The evolution of RFID security and privacy: a research survey. Recent technical research on the problems of privacy and security for Radio Frequency Identification (RFID). RFID technology is already used widely and is increasingly becoming a part of daily life.

Chonghua Li [11] Automatic Vehicle Identification (AVI) system based on RFID. Based on the expatriate of the identification principle, the system structure, and the characteristics of the RFID, this paper introduces the structure, technical target, and application of the AVI system Based on the RFID.

LI Xiangmin and FENG Xu [12] Ntelligent Toll Collection System Based on RFID Technology. During this work, an occasional value and economical technique known as an IoT-based toll gate system using Arduino automatically collect the toll from moving vehicles after they cross the toll plaza tract.

Eldho Paul et al [13] presented Auto Surveillance Using IoT. Users can connect things, systems, networks, services, and, in particular, control systems using the Internet of Things (IoT).

M Amutha et al [14] presented Machine Learning and Advanced Technology Based Patient Health Monitoring System. The Web of Things (IoT) enables people to achieve higher levels of automation through means of building systems, sensors and interconnected tools, and the Internet. In intensive care units, silence checking is an important and fundamental activity, as even a slight delay in choosing a treatment for a patient can lead to endless helplessness or, in some cases, death.

B. Thiyaneswaran et al [15] presented IoT based air quality measurement and alert system for steel, material and copper processing industries. The air quality of industry gets affected due to industrial processing like the heating of metals such as steel, and copper. The burning and processing alter the level of nitrogen dioxide (NO_2), Carbon Monoxide (CO), Carbon Dioxide ($C0_2$), methane (CH4), and Liquid Petroleum Gas (LPG).

III. PROPOSED METHODOLOGY

3.1 System Implementations

Fig 3.1 Block diagram of vehicle monitoring below shows how RFID reader systems and speed sensors help identify vehicles for safety-based purposes.

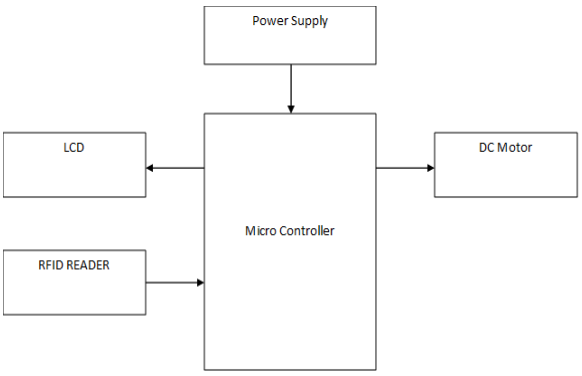

Fig. 1 Block diagram of vehicle monitoring

Fig. 2 16X2 LCD

3.1.1 LCD Display

Currently, we often use devices that are LCD based such as DVD players, CD players, digital watches, desktops, etc. To reduce the utilization of CRTs they use these in screen-focused industries nowadays. The working principle of LCD 16x2 blocks the light rather than dissipates it. This device saves power by consuming less power and being thinner by being space efficient. Compared with LCDs the CRTs are heavier and cathode ray tubes use enormous amounts of power.

3.1.2 LCD 16×2

Fig. 3.2 16X2 LCD, the LCD stands for Liquid Crystal Display. Simple programmable, animations, less expensive, even animations and special are some of the benefits of using this module. This electronic display module is widely used in various applications to display the output. For this device to display the speed limit and other basic output is displayed through this LCD.

3.1.3 LCD 16×2 Pin Diagram

Fig 3.3 16×2-pin-diagram is exhibited below.

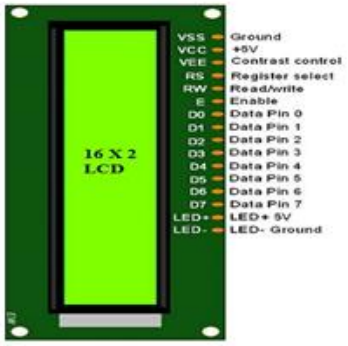

Fig. 3 16×2-pin-diagram

3.1.4 Data Register

The data register's main purpose is to store the information to be exhibited on the LCD. On the screen of LCD, the ASCII value of the character is the data that is to be shown.

- The commands of LCD 16X2 are mentioned below.
- Interfacing of a 16X2 LCD with Arduino is discussed to display on the screen. A library like Liquid Crystal makes it easy to manage displays that are well-matched through the driver like the Hitachi driver. Here, the following circuit explanation

displays any text on the LCD & displays the time in sec once the Arduino board was reset.

- Includes those pins like Read/Write pin, display contrast pin, LED backlight pins, Enable Pin, Data pins from D0 to D7, RS (Register Select) pin, and power supply pins.
- The LCDs compatible with Hitachi control can be done using two modes like 4-bit/8-bit. Here, the 4-bit mode needs 7 I/O pins, whereas the 8-bit mode needs 11 pins using the Arduino board. The 4-bit mode is used to display the text on the LCD. The following will explain how to control an LCD using a 4-bit mode.

The components required for interfacing 16X2 LCD with Arduino include the following.

- Arduino board
- Breadboard
- LCD Screen
- Hook-up Wires
- Pin headers
- Resistor – 220 ohms
- Potentiometer – 10k ohm

3.1.5 Circuit Diagram

Before interfacing the LCD screen to the Arduino board, a pin header strip needs to be soldered to pin-14 or 16 of the LCD. We can notice this in the following circuit diagram. The following pins need to connect to wire the LCD to an Arduino board.

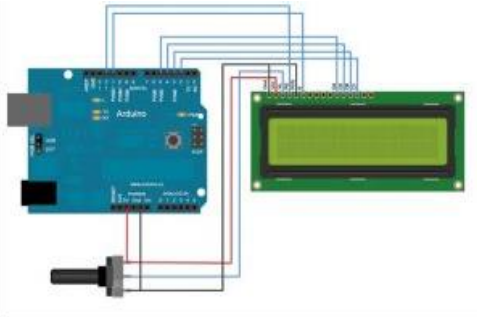

Fig. 4 Interfacing LCD with Arduino Board

3.1.6 EM-18 RFID Reader

Similar to a Bar code reader, an RFID reader is used for the identification of people and mostly object presence when the RFID tags are attached to them.

Fig. 5 EM18 RFID Reader Module

RFID systems are of two systems called active, and passive based on how they are powered and transmitted.

3.1.6.1 RFID Tag

Fig. 6 RFID tag

RFID method tagging is a system for identification and tracking purposes. The tagged objects use radio frequency identification devices. An RFID tagging system consists of a tag, a system application for data collection, and a read/write or only read device. These tags consist of mainly two parts: an antenna for receiving and transmitting the signal and an integrated circuit. The information/data in the tag is stored in non-volatile memory. They help to track the authorized vehicles in this monitoring device. This is to monitor the vehicles in a closed campus to prevent unauthorized or suspicious vehicles from entering the premises. It helps the campus free from any unfortunate events and ensures better security.

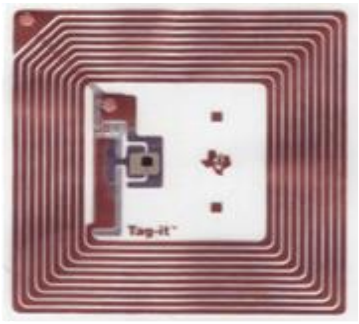

Fig. 7 RFID Inside

3.1.6.2 RFID Reader to PC/Laptop Communication

The output of the reader is displayed on the serial terminal of the PC/Laptop.

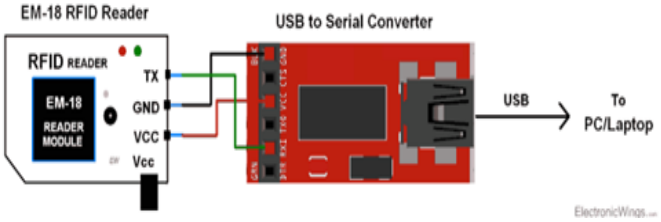

Fig. 8 RFID Serial Interface

Table I

1st 10-Byte Data	Last 2-Byte
Tag no. 0	Checksum

3.1.6.3 IR Sensor

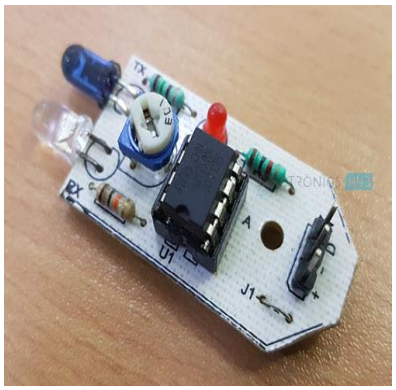

Fig. 9 IR Sensor

This IR sensor is used in the device to detect the speed of the vehicles around/near the campus and doesn't all the authorized vehicles from entering the premises if it is detected at high speed and causing a public nuisance.

3.1.6.4 LM393 Sound Sensor

Fig. 10 LM393 Sound sensor

LM393 is a sound sensor used to detect sound. This sensor is used in this monitoring device for monitoring the vehicles that make unpleasant mechanical noise that disturbs the public and blocks the vehicles from entering the premises.

3.1.6.5 ESP8266

Fig. 11 ESP8266

The ESP8285 chip module has capabilities such as built-in flash memory and the design of single-chip devices capable of any microcontroller access via Wi-Fi. It helps the device transmit the data via Wi-Fi to cross the information from the database.

3.1.6.6 USB to Serial Converter – CP2102 or CH340G

These two microcontroller modules have been advanced by the ESP32 branch of devices. And it helps to upload the code to the Arduino board.

3.1.6.7 PINOUT OF ESP-01

The common ESP-01 module's pinout diagram is shown below.

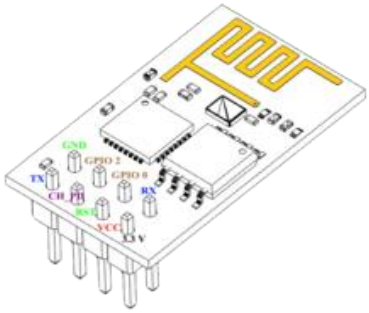

Fig. 12 ESP-01 module pinout

3.1.6.8 AI-Thinker Modules

Node MCU is an open source especially aimed at IoT (Internet of Things) based applications.

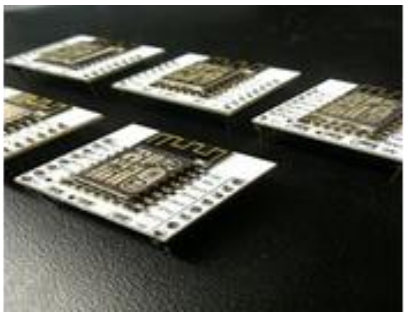

Fig. 13 Ai-Thinker ESP8266 modules (ESP-12F, black colour) soldered to breakout boards (white colour)

3.1.6.9 Brief About NODEMCU ESP8266

The microprocessor module mentioned above operates at an adjustable 80MHz to 160 MHz of clock frequency and supports Real-time operating systems (RTOS). This NodeMCU ESP8266 has 4MB of Flash memory and 128 KB RAM to store the necessary programs and data. The in-built Wi-Fi / Bluetooth, high processing power and Deep Sleep Operating features make it an absolute need for this IoT-based device.

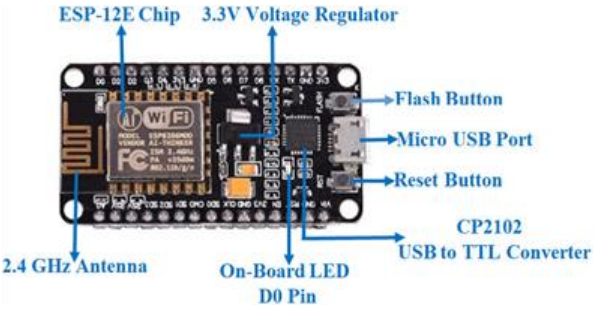

Fig. 14 Arduino UNO

3.1.6.10 Programming NodeMCU ESP8266 with Arduino IDE

The NodeMCU module/Board can be easy to operate since it is easily programmed with Arduino IDE. It takes hardly take few minutes to Program NodeMCU with the Arduino IDE. All that is needed is the Arduino IDE, a USB cable to upload the code and the NodeMCU module/board itself for collecting data from the sensors.

3.1.6.11 DC Motor

To check the speed of the vehicles.

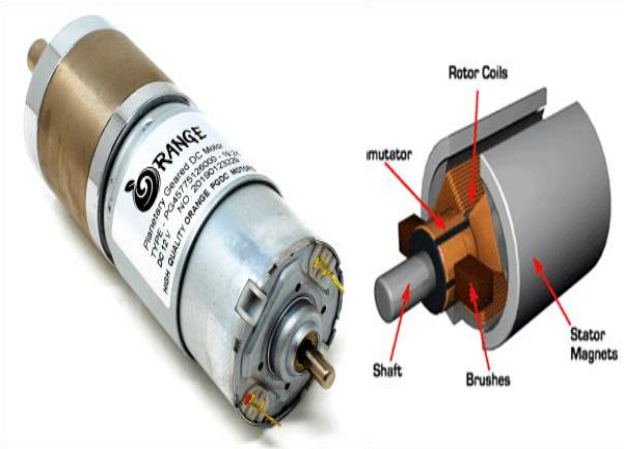

Fig. 15 DC motor

IV. RESULT AND DISCUSSIONS

1. Design calculations condition the balancing of rotating masses, service factor, and gear ratio to reduce the torque, torque, and overhung load for durability, and testing analysis. Types of DC Motors/Gearmotors for IoT projects. Direct currents (DC) power these motors.

a. Spur Gear Motors
b. Coreless & Coreless Brushless
c. Gear heads
d. Stepper
e. Planetary Gear Motors
f. Servo
g. Brushed
h. Brushless (BLDC)

Can use this data to determine which gear motor will be the best appropriate thing to be used in the application. Some of the most frequent specs to consider when stipulating a motor or gear motor would be:

- Voltage
- Revolutions per minute (RPM)
- Power
- Current
- Lifetime likelihood / Duty Cycle
- Torque
- Shaft Diameter and Length
- Rotation (CW or CCW)
- Enclosure Restrictions

2. The speed and the sound sensors used in this device will check the vehicles around the campus and will not allow them inside for their public disturbance activities.

3. The RFID reader checks whether the incoming vehicles are authorized ones that have RFID card on them with the database, opens the gate and permit them inside the premises. If not, the gates will be closed those vehicles are not allowed and stopped from entering.

V. CONCLUSION

This investigation shows the job of reducing vehicle speed and monitoring vehicles and their contributions to the security of the public. It is tracked down that the utilization of the vehicle speed control framework contributes a great deal in limiting the accident rate

that happens because of the carelessness of the driver ignoring the road signboards in specific zones. However, the VSC framework in a vehicle is effective; they help much as far as further developing security, keeping both the traveller safe and the pedestrians on the streets. Considering the automatic VSC system is embodied in school, industrial or medical clinic zones which enables the vehicle to act autonomously to slow down the vehicle when the vehicle comes at a higher speed which limits accidents because of the carelessness of the driver effectively and in a manner more successful. Hence, the above examination concluded that the uses of Automatic vehicle monitoring and speed control system in restricted zones limit unwanted accidents and violations compared to normal behaviour.

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