

Automated Speed Control Using Throttle Valve

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Abstract

Intelligent instruments are used in every part of our lives. It won't take much time to realize that most of our tasks are being done by Electronics. They will perform one of the most complicated tasks that a person does in a day, that of driving a vehicle. As the days of manned driving are getting extremely numbered, so are those of traffic jams, dangerous and rough drivers and more importantly, accidents. According to Mr Willie D. Jones in the IEEE SPECTRUM magazine (September 2001), a person dies in a car crash every second. Automation of the driving control of vehicles is one of the most vital needs of the hour. This technology can very well implement what was absent before, controlled lane driving.

The ultimate aim of this project is to automatically control the speed of the vehicles at speed restricted areas such as school and hospital zone etc. This project is mainly developed to avoid accidents due to high speed vehicles and also to enable the public to cross the road without any danger from high speed vehicles. Usually the drivers drive the vehicles at high speed without considering the public in speed limited areas too. Even though the traffic police control them we cannot achieve full response from them. Also it is not possible to monitor those areas at all time to regulate their speed. Thus this project paves way for controlling the speed of the vehicles within certain limit in those restricted zones without the interruption of the drivers. Here we use RF communication method for controlling purpose. In order to implement this in public then we want to attach the RF receiver along with the vehicle and the Transmitter with these Zones. These transmitters are programmed to send the coded signals continuously with

certain delay in between. Whenever the vehicles enter into these zones their receivers will receive this code and then the speed of the vehicles is controlled automatically by taking control action in the throttle valve. This will reduce the over speed to the desired speed limit.

Keywords: *Throttle Valve, Transmitter, Intelligent instruments*

1. INTRODUCTION

1.1 Objective

To design a system this controls the speed of vehicles in Accident prone areas.

1.2 Introduction to the project

As the days of manned driving are getting extremely numbered, so are those of traffic jams, bad and dangerous drivers and most importantly accidents. Automation of the driving control of vehicles is one of the most vital need of the hour. This technology can very well implement what was absent before, controlled lane driving. Considering the hazards of driving and their most pronounced effect on vehicles our AUTOMATIC VEHICLE SPEED CONTROL SYSTEM is exactly what is required.

Safety is necessity of man's life. Due to the accident cases reported daily on the major roads in all parts of the developed and developing countries, more attention is needed for research in designing and efficient car driving aiding system. It is

expected that if such a device is incorporated in our cars as a road safety device, it will reduce accidents on our roads and various premises, with reduction in loss of life and property. When it comes to the use of a motor vehicle, accidents that have occurred over the years tell us that something needs to be done from an engineer point of view. According to the 2017 edition of the Small-M-report on the road accidents statistic in Malaysia ,a total of 6,026 people were killed in 2010 and the fatality spring up to 6,276 in 2016 from accident cases reported in 250,429 and 341,252 cases of accidents for 2010 and 2016 respectively. The obtained results show that , high rate of accidents is reported each year. Till yet, government implemented the technique of catching the culprit who involved in accident via CCTV footage. This system was efficient in catching the culprit but failed to reduce the loss of life and property.

But the system we are designing overcomes all the ill-effects of above mentioned

system as it prevents the loss to take place by avoiding accidents.

1.3 Block Diagram

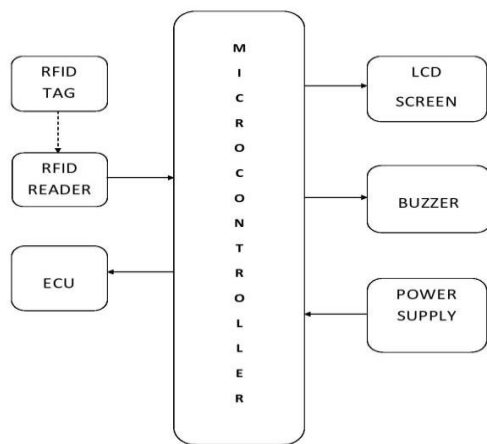


Fig 1.1 Block Diagram of Project Model

1.4 Software

ARDUINO IDE (Integrated Development environment)

Arduino is an open source computer hardware and software company, project, and user community that designs and manufactures single-board microcontroller and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture

of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself (DIY) kits.

2. INTRODUCTION TO RFID TAGS

Radio Frequency identification (RFID) is the use of a wireless non-contact radio system to transfer data from a tag attached to an object, for the purposes of automatic identification and tracking. Some tags require no battery and are powered by the radio waves used to read them. Others use a local power source. The tag contains electronically stored information which can be read from up to several meters (yards) away. Unlike a bar code, the tag does not need to be within line of sight of the reader and may be embedded in the tracked object.

Types of RFID Tags:

RFID tags that include power source are known as active tags versus those without a power source which are passive tags. A passive tag is activated momentarily by the radio frequency (RF) scan of the reader. The electrical current is just enough for transmission of an ID number.

Table 2.1 Specifications of RFID tag used in Project

	Passive tag
Frequency	13MHz
Brand name	REES52
Manufacturer Series Number	MFRC-522
Item Weight	30.0 grams



Fig 2.1 RFID Tag

2.2 RFID Reader

A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects. Radio waves are used to transfer data from the tag to a reader.

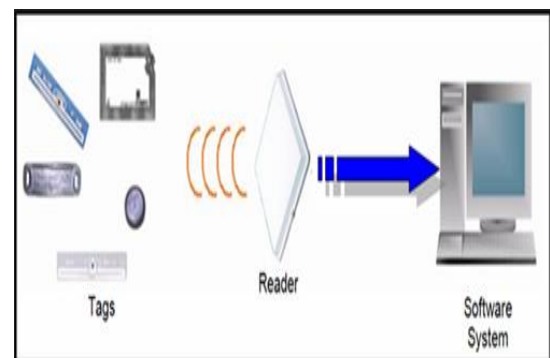


Fig 2.3 Working of RFID system



Fig 2.2 RFID Reader

2.3 Microcontroller Arduino

Arduino is a single-board microcontroller meant to make the application more accessible which are interactive objects and its surroundings. The hardware features with an open-source hardware board designed around an 8-bit Atmel AVR microcontroller or a 32-bit Atmel ARM. Current models consists a USB interface, 6 analog input pins and 14 digital I/O pins

that allows the user to attach various extension boards.

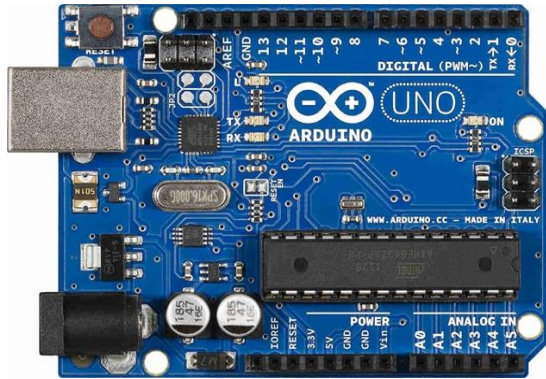


Fig 2.4 Arduino Atmega328

2.4 Throttle Valve

A throttle body is a butterfly valve located between the air intake filter and the intake manifold. It regulates how much air can go into the engine, based on driver input through the gas pedal. As more air flows into the engine, it injects more fuel, thus allowing for more power.



Fig 2.5 Throttle Valve

Servo Motor

A servo motor allows a precise control of the angular position, velocity, and acceleration. It's like you're at the steering wheel of your car. You control precisely the speed of the car and the direction.



Fig 2.6 Servo Motor

3. EXPERIMENTAL STUDY AND WORKING

3.1 How to Control Servo with Arduino UNO

The servo motor has three leads, with one more than a DC motor. Each lead has a color code. So you have to connect the brown wire from the micro servo to the GND pin on the Arduino. Connect the red wire from the servo to the +5V on the Arduino. And finally, connect the orange wire from the SG90 servo to a digital pin (pin 9) on the Arduino.

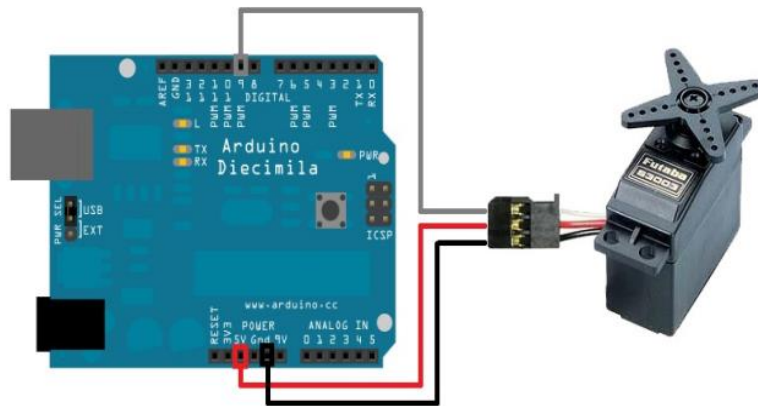


Fig 3.1 Connecting Servo Motor with Arduino

3.2 Signaling of RFID:

Signaling between the reader and the tag is done in several different incompatible ways, depending on the frequency band used by the tag. Tags operating on LF and HF bands are, in terms of radio wavelength, very close to the reader antenna because they are only a small percentage of a wavelength away.

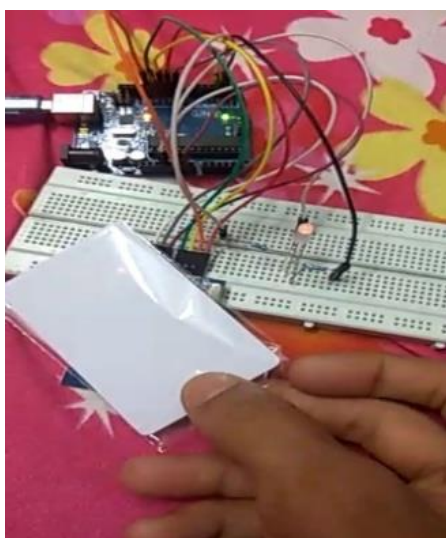


Fig 3.2 Signalling of RFID

3.3 Programming with Arduino

The Arduino integrated development environment (IDE) is a cross-platform application written in Java, and is derived from the IDE for the Processing programming language and the Wiring projects.

Description:

The rfid rc522 consists of 7 pins

The GND pin is connect to the GND pin of the arduino and 3.3V is supplied to the RFID from the arduino. The SDA pin is connected to digital pin 10 , SCK is connected to the digital pin 13 , MOSI is connected to the digital pin 11 , MISO is connected to digital pin 12 and reset pin of RFID is connected to digital pin 9 of the Arduino.

The ground pin of the servo is connected to the ground pin of the arduino and voltage

of 5V is supplied to the servo from the arduino. The signal wire of the servo motor is connected to digital pin 6 of the arduino.

4. RESULTS

4.1 Experimental Results

This section describes empirical tests in a private driving circuit in order to validate the speed control architecture proposed in this paper. Two experiments were performed: the first to determine the reliability of the detection of RFID tagged traffic signals from the vehicle moving at different speeds; and the second to effectively evaluate the intelligent speed control adaptation to the information on the circumstances of the road provided by the signals

4.2 Test Environment

The experimental tests have been performed in a private driving circuit in the Centre of Automation and Robotics (CAR) of the Spanish National Research Council and Polytechnic University of Madrid (CSIC-UPM) facilities. A simple setup to demonstrate the validity of RFID-based automatic vehicle speed control was arranged, with the circuit and the position of traffic signals shown in the aerial view of . Each signal was configured to convey different target speeds to the vehicle's driver (five signals were used for the tests),

as described below. The data of the RFID-tagged traffic signals is detailed in. RFID tags were attached to the front and the back parts of the traffic signal's plate at a height of 2.05 m over the ground, while the readers were in one side of the car, at 1.6 m and 1.4 m of height.

4.3 Tag Detection Result

A simple experiment was performed to check how reliably a traffic signal could be detected from a moving vehicle. The car, equipped with two readers on its right side, circulated close to a traffic signal placed in one intersection of the CAR circuit, at three different speeds (6, 12 and 24 km/h). Tag detections were recorded by the onboard computer, while the position of the vehicle was determined with high accuracy by the car's DGPS system shows the results of the tag activity, with the origin of the time axis chosen at the moment when the car passes right by the traffic signal.

4.4 Autonomous Behaviour

To test the control system proposed, a commercial vehicle—a Citroën Berlingo van with electric-powered motor—was instrumented to allow the automatic control of the vehicle's actuators. The vehicle's automatic control was designed in a way such that the longitudinal and lateral control blocks are independent.

The test consists in traversing the circuit of the adjusting the speed of the vehicle automatically attending to the information provided by the traffic signals equipped with RFID tags. The vehicle's speed is kept at a normal value—as indicated by signal 1—in straight portions of the road until detection of curve warning signals—signals 2 and 4—which indicate the proximity of a sharp bending curve, for which the driver is required to reduce the vehicle's speed. Signals 3 and 5, placed at the exit of the curves, indicate that the vehicle can accelerate again up to the normal speed limit of the road.

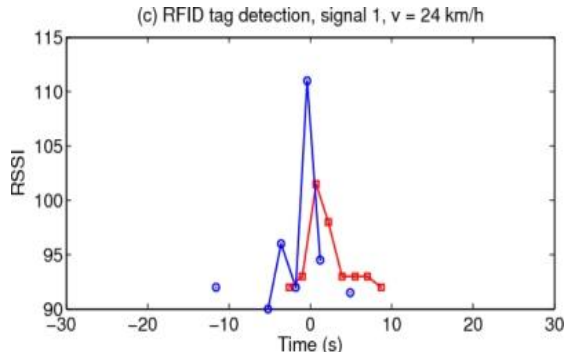


Figure: 4.2

CONCLUSIONS

The system shows promising results, since active RFID technology permits to detect the presence and identity of the traffic signals reliably and sufficiently in advance, so corrective actions on the vehicle's behaviour can be taken. In the empirical trials in our installations, the vehicle's

speed was successfully changed as a result of the detection of the signals, increasing the driver's safety. The technology developed can assist human drivers in difficult road circumstances, as well as a complement ISA or CWS systems if the car is already equipped with them.

In our experiments, only the test vehicle was present on the road. In normal driving situations, we can expect other vehicles circulating nearby and possibly blocking or attenuating some of the RFID transmitting signals, especially with large vehicles like trucks. In this aspect, more experimentation is needed to know how this circumstance will affect the vehicle's control performance. A possible solution is the use of redundant RFID tags (since their cost relatively low), placed at different locations near the traffic signal, to guarantee RF signal reception in unfavourable conditions.

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