International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 06 Issue: 07 | July - 2022 Impact Factor: 7.185 ISSN: 2582-3930

INTELLIGENT BRAKING SYSTEM USING INTERNET OF THINGS(IoT)

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Abstract
This work is intended to identify the hauzardness of the vehicle using Internet of Things (IoT). Inspite of this, the most popular Antilock braking system (ABS) Traction Control and Stability Control was designed and applied on a car to make the driving process safety using embedded system design. Most of the accident occurs due to the delay of the driver to hit the brake, so in this project work braking system is developed such that when it is active it can apply brake depending upon the object sensed by the ultrasonic sensor and speed of vehicle. Currently, vehicles are often equipped with active safety systems to reduce the risk of accidents, many of which occur in the urban environments. include All these systems employ different types of sensors to constantly monitor the conditions of the vehicle, and respond in an emergency situation. An intelligent mechatronic system includes an ultrasonic wave emitter provided on the front portion of a car producing and emitting ultrasonic waves frontward in a predetermined distance. An ultrasonic receiver is also placed on the front portion of the car operatively receiving a reflective ultrasonic wave signal. The microcontroller is used to control the braking of the vehicle based on the detection pulse information to push the brake pedal and apply brake to the car stupendously for safety purpose. Proposed arrangement used for intelligent braking system has a Internet of Things (IoT) of potential applications especially in developed countries where research on smart vehicle and intelligent highway are receiving ample attention.

Keywords: Internet of Things(IoT), Antilock braking system (ABS), Ultrasonic sensor, Mechatronics.

Introduction

Methodology

2.1 Braking System

Braking systems of commercial vehicles were always given the highest importance concerning safety issues and in particular active safety. Inappropriate braking of these vehicles may cause heavy accidents due to relatively longer stopping distances and higher energy output of brakes particularly in the case of vehicle combinations. The traditional medium used for brake system can be now controlled with the speed and precision offered by modern electronic abilities.

2.2 Intelligent Braking System (IBS):

Intelligent Braking System (IBS) introduced in commercial vehicles providing rapid brake response and release for every single wheel therefore ensuring safety. The extremely rapid response time provided by the electronic control can be used for crucially shortening the braking distance by introducing advanced control of braking system operation. Such a complex task imposed to the control of braking system cannot be based on the driver abilities and need to be done independently of the driver. An improved IBS braking forces management would certainly enable to reach the given task. The advanced strategy for the braking force management, proposed here, is based on intelligent controlling of the braking forces distribution between the front and rear axle of power-driven vehicle and/or between towing/trailer combination and/or between tractor/semi-trailer. Intelligent braking system has a lot of potential applications especially in developed countries where research on smart vehicle and intelligent highway are receiving ample attention. The system when integrated with other subsystems like automatic traction control system, intelligent throttle system, and auto cruise system, etc. will result in smart vehicle maneuver. The driver at the end of the day will become the passenger, safety accorded the highest priority and the journey will be optimized in term of time duration, cost, efficiency and comfortability. The impact of such design and development will cater for the need of contemporary society that aspires quality drive as well as to accommodate the advancement of technology especially in the area of smart sensor and actuator. The emergence of digital signal processor enhances the capacity and features of universal microcontroller. An intelligent mechatronic system includes an ultrasonic wave emitter provided on the front portion of a car producing and emitting ultrasonic waves frontward in a predetermined distance. An ultrasonic receiver is also placed on the front portion of the car operatively receiving a reflective ultrasonic wave signal. The reflected wave (detected pulse) gives the distance between the obstacle and the vehicle. Then a microcontroller is used to control the speed of the vehicle based on the detection pulse information to push the brake pedal and apply brake to the car stupendously for safety purpose.

2.3 **Internet of Things:**

The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another. The devices do most of the work without human intervention, although people can interact with the devices -- for instance, to set them up, give them instructions or access the data.

According to the Internet, it's "the interconnection via the Internet of computing devices embedded in

everyday objects, enabling them to send and receive data." At a consumer level, these devices can be placed in our cars, phones, appliances, medical equipment, wristbands, livestock and more. At an industrial level, these devices can be in machinery, shipping equipment, vehicles, robots, warehouses and more. But where the devices are located matters less than what they do. And what they do is "talk" to each other, sharing data and getting feedback based on that data and all the other data that is being generated, analyzed and acted on.

One of the most obvious changes manufacturers have witnessed in recent times is the move from mechanical systems to software-driven tools.Many have already made significant progress. What once needed to be prototyped in physical form is now simulated on a screen and product iterations carried out without costly prototyping.Innovation is also coming from software found in mechatronic products that connect directly to the internet. This is transforming products into IoT-driven intelligent devices that are capable of communicating with the manufacturer once they've left the production line.

Components:

3.1 PROCESSOR (ARDUINO UNO)

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions.

3.1.1 **Atmega**

The high-performance Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter programmable watchdog timer with internal oscillator, and five software selectable0 power saving modes. The device operates between 1.8-5.5 volts.

3.2 ULTRASONIC SENSOR

Manu Ultrasonic ranging and detecting devices make use of high-frequency sound waves to detect the presence of an object and its range. These systems either measure the echo reflection of the sound waves from objects or detect the interruption of the sound beam as the objects pass between the transmitter and receiver. An ultrasonic sensor typically utilizes a transducer that produces an electrical output pulse in response to the received ultrasonic energy. In such case, the horizontal aperture angle must be at least 8 degrees for an inter-vehicle distance of 75 meter. The vertical aperture is fixed to be 1 degree and is positioned in such a way to avoid fault reading due to the road conditions.

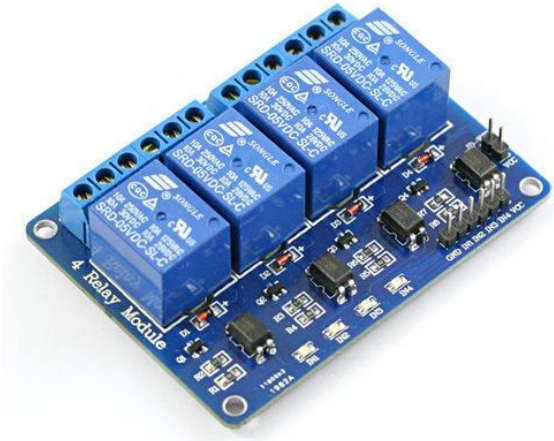
RELAY

This 5V-relay will be exhibited in the following few test circuits. Think of as a switch that is controlled by a signal as to be open or closed. The first circuit that will be tested will only have an Arduino, and a pushbutton switch theoretically connecting to a pull up resistor. However, since we are going to use a push button switch on a board that already has that resistor, we only need to make the required connections to the Arduino board to check the status of the switch based on the controlling signal. The SRD-05VDC-SL-C relay has three high

voltage terminals (NC, C, and NO) which connect to the device you want to control. The other side has three low voltage pins (Ground, Vcc, and Signal) which connect to the Arduino. Relays are normally used in the control panels, manufacturing and building automation to control the power along with switching the smaller current values in a control circuit. However, the supply of amplifying effect can help control the large amperes and voltages because if low voltage is applied to the relay coil, a large voltage can be switched by the contacts.

3.3 FOUR CHANNEL OF RELAY

The 4 Channel Relay Module is a convenient board which can be used to control high voltage, high current load such as motor, solenoid valves, lamps and AC load. It is designed to interface with microcontroller such as Arduino, PIC and etcThe four-channel relay module contains four 5V relays and the associated switching and isolating components, which makes interfacing with a microcontroller or sensor easy with minimum components and connections. The contacts on each relay are specified for 250VAC and 30VDC and 10A in each case, as marked on the body of the relays.



3.3 MICRO CONTROLER:

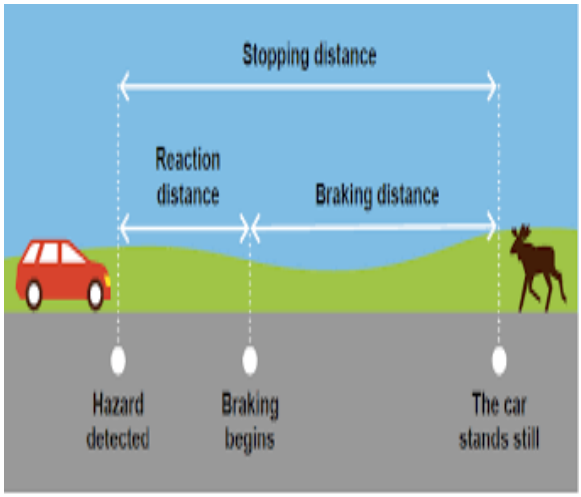
A microcontroller is an integrated circuit (IC) device used for controlling other portions of an electronic system, usually via a microprocessor unit (MPU), memory, and some peripherals. These devices are optimized for embedded applications that require both processing functionality and agile, responsive interaction with digital, analog, or electromechanical components.

The most common way to refer to this category of integrated circuits is “microcontroller" but the abbreviation “MCU” is used interchangeably as it stands for “microcontroller unit”. You may also occasionally see “µC” (where the Greek letter mu replaces “micro”).

WORKING

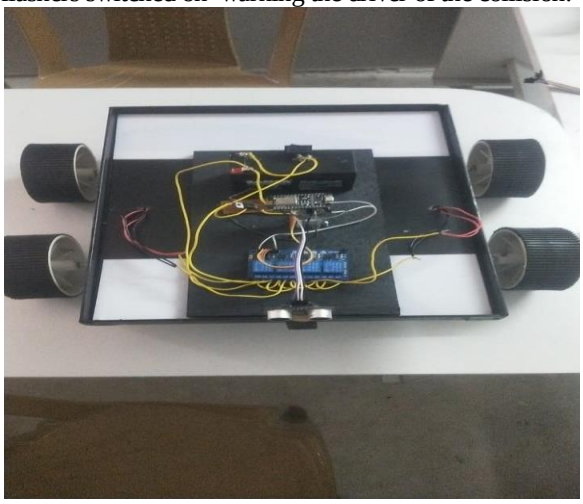
Braking Mechanism

The brake is triggered by means of a servo motor. The servo motor arm is attached to the brake pedal. When the servo motor arm rotates, the brake pedal is triggered and the brake is applied.



Working Mechanism

T When the distance between the car and the barrier falls beyond the acceptable limits of the ultrasonic sensors, the Arduino transmits the feedback signal to the servo motor and the relay switch, as well as to the LCD panel and the LED flashers. The function of the servo motor is the angle at which it has to spin, and the relay control is to shut off the signal by which the unit i. i. The prime mover connected to it is turned off. The difference between the cars and the barrier is seen in the LCD monitor with red color LED flashers switched on warning the driver of the collision.



WORKING CASES

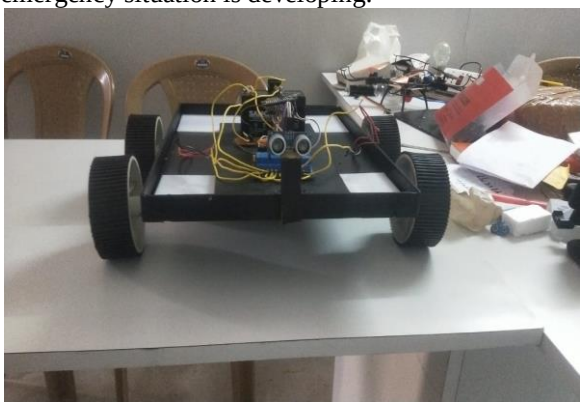
Our projects working on following two conditions or cases

CASE 1: If there is no obstacle in front of vehicle then the sensor output remains unchanged that means LOW and so that motor drives the vehicle as its output is HIGH

CASE 2: If there is obstacle detects by the IR sensor in front of our vehicle then sensor outputs the motor stops running as its value will be LOW and our vehicle will be stops

At present fuzzy logic is used to apply brakes when the obstacle is near to vehicle or the speed of the vehicle is very high. Ultrasonic sensors are placed at front of the vehicle to calculate the distance between the obstacle and the vehicle. This does not consider the obstacles which are side of the vehicle or the obstacles which are out of collision range. The brakes will be applied when the driver fails to act in time. This system will come into play when critical situation arises. The system uses two ultrasonic sensors to and the distance of the obstacle from the vehicle.

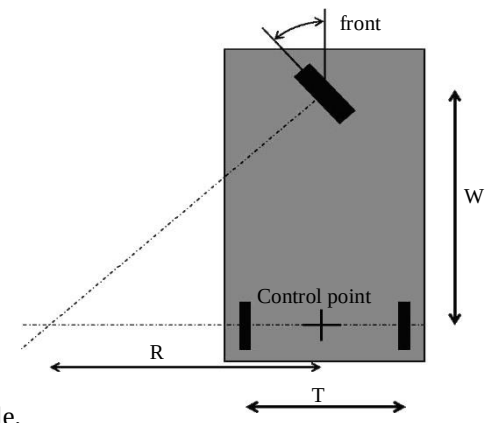
The vehicle is fitted with laser and radar systems, which detect objects ahead and how far away they are, combining with information on the speed and trajectory of the car, which determines whether or not an emergency situation is developing.



EXPLANATION

5.1 PROBLEM IDENTIFICATION

All vehicles have brakes, and they always did. Ever since man discovered the wheel, stopping it was a problem. Carts, wagons and carriages had brakes, usually simple blocks rubbing on a wheel. This established a basic that has yet to change, even with the most sophisticated brake system. All brakes use friction to stop the vehicle. An ABS can be expensive to maintain. Expensive sensors on each wheel can cost hundreds of dollars to fix if they get out of calibration or develop other problems. ABS can only help if the rider applies it in the right time manually and maintains the distance calculations. ABS has its own braking distance. For some, this is a big reason to decline an ABS in a vehicle.



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5.2 Drawbacks in the existing approaches

• ABS can only help if the rider applies it in the right time manually and maintains the distance calculations. ABS has its own braking distance.

• Moreover many commuter bikes in India don't have the option of ABS because it's very expensive.

• Volvo's laser assisted braking could not work effectively in rainfall and snowfall season and laser is easily affected by atmospheric conditions.

5.3 ADVANTAGES OF INTELLIGENT BRAKING SYSTEM (IBS)

IBS prevents lock-ups and skidding, even in slippery conditions. IBS brakes have been provento save lives in some situations by helping drivers keep control of a vehicle.

An IBS shares some of the infrastructure of a traction control system, where new technology helps ensure that eachwheel has traction on the road. That makes it easy for manufacturers to install both of these features at the factory.

Intelligent braking systems coordinate wheel activity with a sensor on each wheel that regulates brake pressure as necessary, so that all wheels are operating in a similar speed range. And help drivers have better control of a vehicle in some road conditions where hard braking may be necessary.

Conclusions

Design of intelligent brake applications basically depend upon effectiveness of Ultrasonic sensor. We have used the previous work on advance braking system and use that to define the basic braking control problem and have developed intelligent control method for this system.Clearly the approaches and conclusions that we present aresomewhat preliminary and are in need of further significant investigations. Approaches and conclusions that we present are somewhat preliminary and are in need of further significant investigations.

Proposed arrangement used for intelligent braking system has a lot of potential applications especially indeveloped countries where research on smart vehicle and intelligent highway are receiving ample attention. We can use this system in the four wheeler vehicle and can reduce the number of accidents taking place on road.The system when integrated with other subsystems like automatic traction control system, intelligent throttlesystem, and auto cruise system, etc. will result in smart vehicle maneuver. In modern industries also for materialhandling trolley and machinery it requires and it is industries need

While making some changes we can use this on any available vehicle. Also improved and precise programming is necessary for real time operation. Application of intelligent braking system for critical dynamic condition need to be analysed.

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