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Voice controlled autonomous braking system and accident detection system

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Abstract:

We present a paper whereby the human voice may specify continuous control signals to drive the car. Individuals with motor impairments such as those with paraplegia, spinal cord injuries, war-time injuries, or amputations rely on others to assist them there in daily activities. Advances in assistive technologies have begun to provide an increase in independence for these individuals, but there is great potential for further technological developments to significantly improve their abilities, independence, and overall quality of life. One of the greatest challenges faced in assistive technology. However, control options are extremely limited when the target users have little or no use of their limbs.. The android meets robots application used for recognizing voice to control speed of the vehicle. Road vehicle accident take place frequently which cause huge loss of life and property to the country and people. Our goal is to move towards making accessible manipulation of everyday objects to individuals. Using our system, we develop voice control, automatic breaking system and accident sensing system .Voice controlling system is used to drive the vehicle by using android phone. Ultrasonic sensor senses the object in front of the vehicle then microcontroller activates the brake as it receives vibration from the sensors. The alert message is sent to the mobile of the user through GSM modem.

Index Terms: vibration sensing, object detection, voice-based interface, speech recognition, ultrasonic sensor, Global System for Mobile communication (GSM).

I INTRODUCTION

We provide voice control to drive the vehicle automatically by recognizing voice control application A number of technological and sociological improvements have helped to reduce traffic fatalities during the past decade, e.g., each 1% increase in seatbelt usage estimated to save 136 lives.[5] Advanced life saving measures like electronic stability control and significant promise for reducing injuries, e.g., crash analysis studies have shown that approximately 34% of fatal traffic accidents could have been prevented with the use of electronic stability control method. So we have provided vibration sensor to monitor the vibration caused by accidents and this information is transmitted through GSM module. [6]

Automatic collision notification system use sensors embedded in a car to determine when an accident has occurred. These systems immediately dispatch emergency message. Thus it will send SMS through GSM. This system is used to intimate accident information to the owner of the vehicle.

At any instant of time our voice will not be accurate due to some physiological reasons and it cannot be cleared in micro second. So we include anti-braking system and ultrasonic sensor plays a vital role in our system. Initially we calibrate vibration sensor and ultrasonic sensor. This paper represents the principle of an advanced automatic voice recognition system with sensor fusion. It uses the properties of both capacitive and ultrasonic sensors for detecting the obstacles and also for calculating the distance between the vehicle and the obstacle. So the resulting system can achieve measurements with high accuracy and improved short distance measurement and it is used to control automatic braking system for safety applications. In this paper a voice controlled wireless smart car have been presented for elder and physically challenged people. The proposed system has two main components namely (a) voice recognition system, (b) accident detection, (c) anti- braking system. Android Meet Robots software has been used to implement the voice recognition system. On the other hand, Bluetooth modules have been used to implement the wireless system. The main goal of this system is to control Car motor direction by using voice

commands. Unexpected hurdles on road may cause more accidents and due to bad road conditions, fuel consumption of the vehicle increases, causing wastage of precious fuel. All these reasons urge that it is important to get information of such bad road conditions, collect this information and distribute it to a Government body.

II PROPOSED METHODOLOGY

The proposed system exhibits speed control operations. The first level is the high speed operation, consider a car which moves in a speed of 70km/hr. The safety distance must be maintained between vehicle and obstacle is considered as 2meters. So if the sensors detect any changes within this range the brake is applied automatically. As the obstacleis moving away, driver can increase speed of the car by voice control.

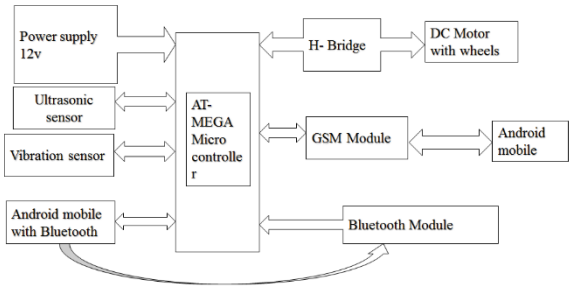

Fig 1: Block diagram

So if the sensors detect any changes within this range, the brake is applied automatically and the speed is reduced.[1]Ultrasonic sensor measure the distance from the ground of selected points of a motor vehicle. The sensor is based on the measurement oftime of flight of an ultrasonic pulse, which is reflected by the ground. A constrained optimization technique is employed to obtain reflected pulses that are easily detectable by means of a threshold comparator. Such a technique, which takes the frequency response of the ultrasonic transducers into account, allows a sub wavelength detection to be obtained. Experimental tests, performed with a 40 kHz piezoelectric-transducer based sensor shows a standard uncertainty of 1 mm at rest or at low speeds; the sensor still works at speeds of up to 30 m/s, although at higher uncertainty. [2]The sensor is composed of only low cost components, thus being apt for first car equipment in many cases, and is able to self-adapt to different conditions in order to give the best results. Realized that this accelerometer can be used to detect the road surface condition. For example, when a bus goes over a pot hole there would be a significant change in the vertical component of the acceleration. (And also in the horizontal component due to braking etc.) They were developed a road surface condition monitoring system that used acceleration sensors mounted on public transport buses to monitor the road surface condition with only a few sensors. These bus mounted sensors gathered vertical and horizontal acceleration data on its route together with the GPS coordinates of the data collection points.[4]

A. *Hardware Description*

The system architecture can be divided into two sections as hardware architecture and software architecture. In the following sections I give a brief idea about the both of the architectures. The brain of the embedded system part can be developed on 32bit microcontroller with ATMEL processor (ATMega238). The programming of this controller is done using embedded C language. The system model consists of the following basic components (i) automatic speech recognition system, (ii) control units, (iii) sensing system, and (iv) application and car motor direction.

i.*Automatic Speech Recognition System*

Automatic speech recognition (ASR) system can be defined as an independent and controller-driven transcription of spoken language that allows a computer to identify the spokenwords captured from a microphone or telephone and convert it into written texts. The main components of an ASR are (i) a microphone, (ii) speech recognition software, (iii) a mobile, and (iv) a Bluetooth. The ultimate goal of ASR is to allow a computer to recognize in real-time,with 100% accuracy, all words that are spoken by any person, independent of vocabulary size,noise, speaker characteristics or accent. Through a speech recognition program/application, the android mobile is able to process words one says and turn them into text that is displayed on the serial communication monitor. There are many research activities on the speech recognition system. The fundamental reasons of these research activities are (i) accessibility for the deaf and over hearing, (ii) cost reduction through automation, and (iii) searchable text capability.

Microcontroller, GSM and Sensors are the fundamental components of the proposed project. They are used for all three purposes i.e. voice recognition, accident detection reporting and anti-braking system. The project kit will be mounted below the vehicle. The components that take part in detection and reporting are vibration transmission, microcontroller, GSM. The vibration sensor operate at 196kbaud rate and ultrasonic transmission operate at 150kHz.

ii. Sensing Unit

In this unit ultrasonic sensors and vibration sensors are attached to the ATMEL processor. Ultrasonic and vibration sensors are used here for sensing the distance and vibration. This sensors continuously tracks the distance from the obstacles in its vicinity, and it transmit the information to the AT Mega 238 controller. Controller reads ultrasonic sensor readings from UART(RX) and vibration sensor readings from ADC channel in-build in arduino[4]. Finally these information are processed in the controller and it communicate information to the receiver section. The values are transmitted to the receiver section through Serial Peripheral interface.

iii.Control Unit

This unit consist of gear motor, Bluetooth and H-bridge attached to the second ATMega238 controller. This controls the automatic braking system depending upon the distance measurement. Braking system works with the help of a gear motor. The inbuilt Bluetooth in the android mobile transmit audio signal to the controller and it reads Bluetooth values from UART. Then automatically apply the brake depending upon the ultrasonic.[1]

iv. Application and Car Motor Direction

We use four voice commands here. They are activate command mode activate, forward, backward, left turn and right turn. Each command hold for 5 seconds. Command mode activate: Used to awake the total system. After a second it goes to sleep mode.
F1 for forward 1second,
F2 for forward 2 seconds,
F3 for forward 3seconds.
This is similar to B1,B2,B3 (backward command), L1,L2,L3 (left turn command), and R1,R2,R3 (right turn command),

B. Software Description

We use two software namely ARDUINO GENUINO Version 1.6.13 and AMR VOICE Arduino genuino programming platform. It`s also used to calibrate and monitor ultrasonic and vibration sensor.The Arduino is programmed in such way that if it receives the ultrasonic and vibration pulse from sensors and generates character "0" and "1".The sensor represents"0" as "off" and "1" as "On" Then the program will wait for 50ms after transmitting a new data. The receiver module is connected with the switching circuit of the motor rotating direction. We connect pins of the receiver module to the Car motor the program waits for receiving a character (i.e.) if the program receives character "F1" it turns ON the gear motor. If the program again receives the same character, it will turn OFF the gear motor by using the switching circuit. Similar procedure is followed for switching ON or OFF the other motor direction. The components that take part in detection and monitoring are sensors, microcontroller and GSM.

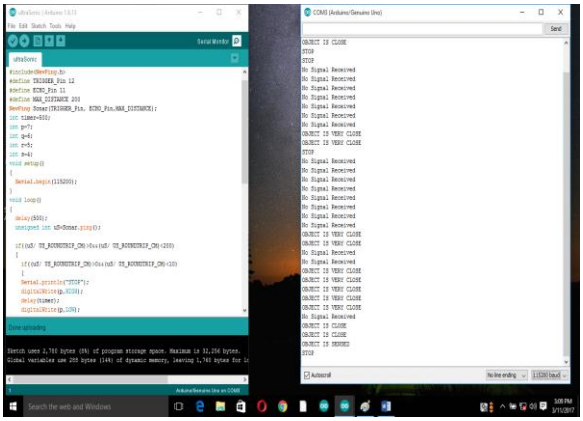

Fig 2: Calibration of vibration sensor

The vibration sensor detects car casing vibration and ignition vibration. So, we have to calibrate the sensor to detect the high range of vibration caused by accident. For that purpose we have to create manual vibrations. We can take the rest vibration level, ignition vibration level, sudden brake vibration level, vibration caused by engine, vibration caused by chases before setting the accident vibration level. In our sensor we set150KHz vibration level in the ATMega238 controller. (Shown in fig 2).

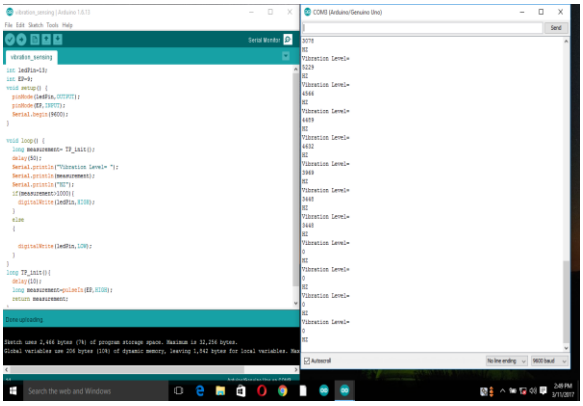

Fig 3: Calibration of ultrasonic sensor

We calibrate ultrasonic sensor to detect the obstacle in the roads and adjustment is done by controller. We have to set the sensor in the correct place in the car (shown in fig 3). Then the voice recognition app converts the audio signal into text file. If the text match the text in the program it executes.

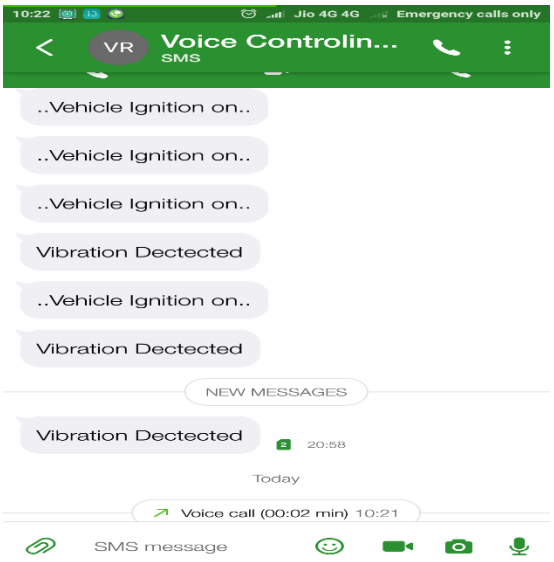

Fig 4: SMS output screen in an Android mobile

The SMS has vibration detection alert message that detects accident. This is shown in fig 4. Thus, in this way, detection and alert message of the accident have been transmitted in real time.

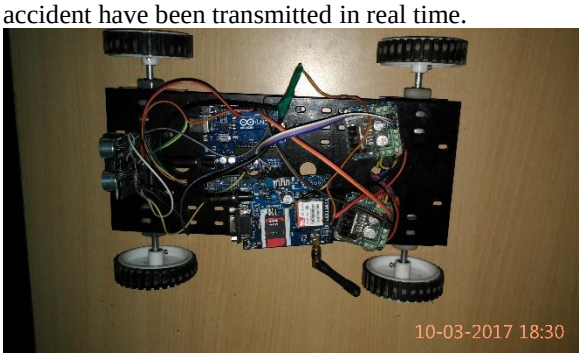

Fig 5: voice control robot

III CONCLUSIONAND FUTURE ENHANCEMENTS

This paper represents voice control driving scheme to implement Automatic Braking system and vibration detecting system based on sensor fusion indented to use in vehicles that can solve the problem where drivers may not brake manually. So, vehicles can reduce speed automatically, if obstacle interfere in-front of ultrasonic sensors. This system provides high accuracy with accurate measurements. This system is very suitable in case of tight parking and heavy traffic conditions. We have implemented voice controlled Arduino based car automation system. Weused speech recognition system to implement this work. The AMR voice software have been used to implement the voice recognition system. The main advantage of the system is that it does require training of voices for all time. Voice must be clear and audible for execution. At the same time AMR voice software has been used to support mobile communication. The system is designed for elder and physically challenged people so, they can monitor and control the car motor direction with their limited ability. The project provides user-friendly interface. Our goal is to focus on customers, services and integration for end users. It reduces the manual operation. In future they may provide GPS for accurate information to detect the location.

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