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Design and Elimination of Driving Distraction

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ABSTRACT—Driving is already a complex task that requires varying degrees of cognitive and physical stress. With the advancement of technology, the automobile has become the work place of media consumption, communication center and interconnection. The car's futures have also increased. As a result, the user interaction in the car becomes crowded and complicated. This increases the number of distracted driving and increases the number of traffic accidents caused by distracted driving. This paper focuses on two main aspects of the current automobile environment, multi-modal interaction (MMI) and advanced driver assistance system (ADAS) to reduce interference. It also provides in-depth market research for the future trend of smart car technology. After careful analysis, it has been found that a fun filled with many underlying picture information screen, one with a large number of small button at the center of the stack, and terrible voice recognition (VR) led to a high cognitive load, and these are the cause of driver distraction. While VR has become a standard technology, the current state of technology focuses on functional design and sales driven approaches. Most automakers have focused on the virtual reality better, but perfect in the VR is not the answer, as there are inherent challenges and limitations in respect to the in-car environment and cognitive load.

Keywords: Distraction, Multitasking, Automotive components, Attention, Virtual Reality, Navigation, Human interaction.

I. INTRODUCTION

Over the past decade, researchers have found that the risk associated with in-car use is difficult to define. Indeed, it is one of the main causes of global traffic accidents. When the design of an early accident prevention system was found to be ineffective for the driver's alarm, solving the problem became critical. It must be noted that progress has been made in this field. This study aims to through the study of relevant literature, to introduce readers to the main problems, and invites readers to further study the presented topics by keeping up-to-date with the recent projects carried out in this community.

The latest advances in Automotive and telecommunications have enhanced connectivity in this era. With the advent of smart cars, human competition has come a long way, and almost all the information you want can be obtained online. But using smart phones and cars at the same time is a bad combination that has cost people their lives.

Therefore, in order to eliminate or reduce the risk of accidents, real-time fatigue detection system is indispensable. Drivers must have the physical skills to control direction, speed up and slow down, as well as psychological skills to avoid or successfully deal with emergencies. An effective driver also has an intuitive understanding of the basic operation of the vehicle handling and can drive responsibly.

II. LITTERATURE REVIEW

This part state the related work of automotive user interfaces and how automated car and AI have impact on it,Although some people think that security is the responsibility of the driver, or education is the answer, but others propose laws to standardize the use of vehicles (in particular, some people claim that only an emergency call should be legal) while the vehicle is moving. The best way to eliminate danger, however, is to design it, and [green, 2000] offers a three-way strategy to reduce the risk of collapse to the lowest level. This strategy is summarized as follows

An active voice control that can improve the user's speed; the invention allows the vehicle operator to maintain control of a vehicle safely at the same time, thereby making a high degree of sophistication in that control. A voice-driven control system that enables vehicle operators to control and/or communicate without diversion. The system is interactive, and the integrated voice synthesizer in the

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system responds to the user's command input and prompts the user under certain circumstances.

At its core, Artificial Intelligence is a complex algorithm that mimics how the human brain learns. Instead of hard-coding an autonomous car with thousands of "If-Then" statements, software engineers create an algorithm that outlines to the car's onboard computers various examples of what is right, wrong, safe, and unsafe for the car to perform.This type of approach to automotive engineering may seem counter-intuitive, but in reality, artificial intelligence algorithms are the only solution to the dynamic driving conditions of public roads.

There is no way for engineers to hard-code every possible variable or situation a car may face in a daily drive. Instead, engineers rely on the ability for the autonomous car to collect information and then process it through the fluid Artificial Intelligence algorithm.The real power of this approach is realized because autonomous cars have one advantage that human drivers don't have; self-driving cars have the ability to share their experiences and readings with other cars instantaneously.Information and situations encountered by autonomous cars along every mile driven are shared with other vehicles so that each computer can adapt its algorithm to the environments faced by other vehicles.

III. TYPES OF DISTRACTION

The following are three types of problemsthat cause driving distraction and their definitions:

- **Visual distractions** can be expressed in multiple ways. The first form is when your eyes are not on the road (withdrawal of attention). It can be divided into two categories: general and selective, according to [brown, 1994] classification, or, accordingly, unusual paths (Eyes-off-the-road).

- **Cognitive distraction** seems likely to be that mobile devices are particularly sensitive to the effects of cognitive overload, as they may be deployed on multiple task Settings and size limits. This aspect of usability is often overlooked. This is due to the driver's attention focused on answering the phone, frustration, or simply daydreaming; listen to long or complex auditory information, which may lead to based on expected and not the actual situation of the selective filtering information.

- **Manual distraction** leads to the inability to fully control the vehicle, such as placing your hands on the steering wheel, eating a sandwich, entering your phone or plugging in the power adapter. When you combine this whole thing, especially texting, it makes it very dangerous. Texting and driving became a compulsion to our human being stick to a mobile phone screen and threatening the lives of other road users.

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A. Problem statement

A general conclusion that can be derived from the "Tri-Level Study", and is confirmed by other subsequent studies, is that a major part of crashes is not caused by careless people who voluntarily infringe the rules of the road, but by well-intentioned drivers committing a series of mistakes. In [Green, 2000], interesting data about the causal relationships between device use while driving and crashes are presented and various studies about cellular phones and navigation systems are mentioned.

In order to solve this problem accurately we implement a survey to collect different type of informationthat might be helpful in the design stage. Below are the result gotten from it.

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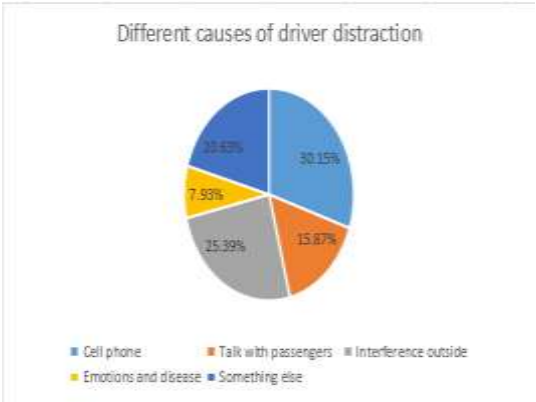
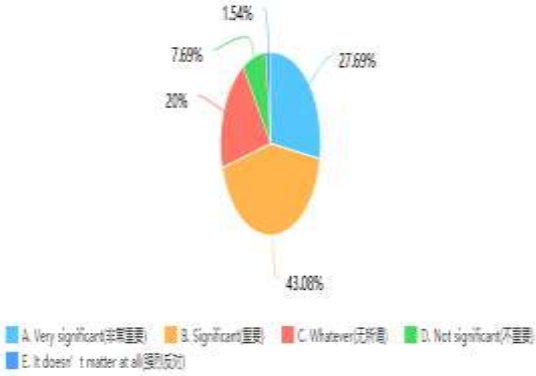


Fig. 1 shows different cause of driver distraction.



Figrue.2 shows the different degree significance of in-car voice interaction

Fig. 3 shows different degree of the keystroke utilization.

B. Proposed Solution

This phase is where the framework is been define; in other to help eliminate the problem of distracted driving, we proposed the implementation of an in-car voice command system. The main objective here is to circumvent driver distraction by enabling the driver carry out major activities merely by the use of voice and also to facilitate the user experience. This voice command will not only provide safety for the driver, but will add convenience to everyday life. "Eyes on the road" is a fundamental principle to be considered when designing interactions for current in-vehicle HCI. Therefore, the software architecture of an in-car voice command will feature the following: The voice command will be connected to the vehicle navigation system, the phone and all gestures present in the vehicle.

C. Methodology

The system architecture can be divided into two sections as hardware architecture and software architecture. In the following sections we 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

- Automatic speech recognition system,
- Control units
- Sensing system and
- Application and car motor direction.

Hardware Description

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 spoken words captured from a microphone and converts it into written texts.

The main components of an ASR are (i) a microphone, (ii) speech recognition software 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,

There are many research activities on the speech recognition system. The fundamental reason of these research activities is to reduce driving distraction through automation. Microcontroller and Sensors are the fundamental components of the proposed project. They are used for all three purposes i.e. voice recognition, accident detection reporting system. The project kit will be mounted in the vehicle. The components that take part in detection and reporting arevibration transmission, microcontroller. The vibration sensors operate at 196kbaud rate and ultrasonic transmission operates at 150 kHz. Sensing Unit 576 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.

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This sensor 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. Finally this information is processed in the controller and it communicates information to the receiver section. The values are transmitted to the receiver section through Serial Peripheral interface.

Bluetooth and H-bridge attached to the second ATMega238 controller. The inbuilt Bluetooth in the car transmit audio signal to the controller and it reads Bluetooth values from UART.

Application and Car Motor Direction We use two voice commands here. They are activate command mode activate, cancel. Each command holds for 5 seconds. Command mode activate: Used to awake the total system. After a second it goes to sleep mode.

Software Description

We use two software namely ARDUINO GENUINO Version 1.6.13 and AMR VOICE Arduino genuine programming platform. It`s also used to calibrate and monitor ultrasonic. The Arduino is programmed in such way that if it receives the ultrasonic 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. 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, vibration caused by engine, vibration caused by chases before setting the accident vibration level. In our sensor we set 150 KHz vibration level in the ATMega238 controller.

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.Then the voice recognition app converts the audio signal into text file. If the text matches the text in the program it executes.

SMS output screen on the dashboard The SMS has vibration detection alert message that detects accident. Thus, in this way, detection and alert message of the accident have been transmitted in real time. The implementation was done base on the following prototype below:

STORY BOARD

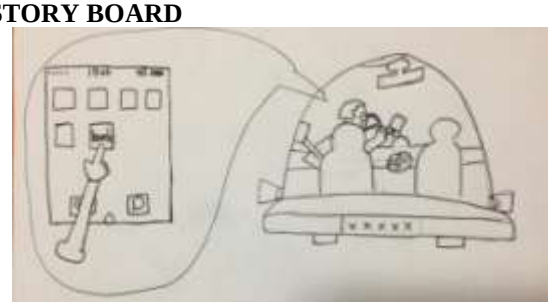

Fig.4lunching the computer to recognize in real-time.

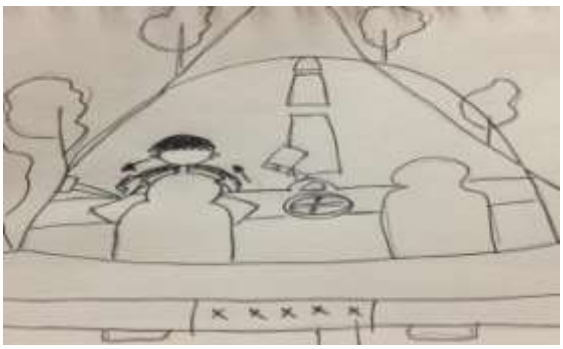

Fig.5 Road detection by the Sensor continuously tracks the distance from the obstacles inits vicinity, detection and alert messages of the accident.

Fig.6 The inbuilt Bluetooth in the car transmit audio signal to the controller

Fig.7 Full controlling and navigation of all gestures at same time.

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IV. USABILITY TESTING

In this part the driver presses the voice control button that is located on the steering wheel in order to activate the system and start a dialogue with voice commands, this has be done while the driver is focused on the road. There is also a help function embedded in the voice command to help the driver provide a range of options in case the driver is unsure of the command he/she wants to use. If the driver wants to exit or cancel the command input, the driver can simply say **'Cancel'**and the session will end.

V. CONCLUSION AND ENHANCEMENT

This paper proposed voice control drive scheme of sensor fusion to implement gestures based on sensor fusion system and vibration test system, in order to solve the problem of car drivers manually controlling of in-car gestures. The system has high accuracy and high precision. This system is ideal for quick use. We have implemented the voice-controlled Arduino automotive automation system. We use the speech recognition system to do this work. AMR voice software has been used to implement speech recognition systems. The main advantage of this system is that it does require all the time training for sound. Sound must be clear and can be enforced. At the same time, AMR voice software is also used to support screen communication. The system is designed to control all gestures and can monitor and control the interface of the car's movement and commands with limited capabilities. The project provides a user-friendly interface. Our goal is to focus on eliminating driving distractions and end-user integration and reduces manual manipulation.

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