Simplified Integrated Microcontroller Based Assistant

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A R T I C L E I N F O

A B S T R A C T

In recent years, the automobile industry focusing on controlling the various parts of the car through voice for intelligent transportation system. Technology development on the cars has been growing so rapidly. The main objective of the project is to implement the Voice based system for various controls of vehicles such as open and close of car's door, child lock of car doors, raise or lower the car windows, turning on/off headlights and control of wipers. The above set of features are available in High-end Luxury cars like Morris Garage's, Volvo, Benz, etc. these features can be achieved through ADAS technology, Network connection is needed to do this operation and an E-Sim will be installed within the automobile to access the internet, Monthly fee will be collected from the user to avail these facilities. This project focuses on removal of network connectivity for controlling the various parts of the car. This can be achieved by integrating V3 module Voice recognition module with Arduino which eliminates the need of internet. In Midrange cars switches to control various parts are available in the center control unit of the car which is placed besides the driver seat. The driver can't concentrate on controlling of these parts while driving which may end in an accident. To overcome this issue, our proposed module is connected to the central control unit and a mic mounted under the steering. Through voice command the controls will be happening automatically. The voice recognition module will validate the command or signal given by the passenger and sends the control command to the appropriate switches. With this technology, drivers can easily use a variety of in-vehicle functions for a comfortable drive while driving and without taking their eyes off the road. It gives a hands-free way to control the various parts of the car. The response is faster than the physical activity.

Keywords : Intelligent Transportation System, In-Vehicle Functions

I. INTRODUCTION

Simba (Simplified Integrated Microcontroller Based Assistance) is the control of the electrical appliances that are connected in the car through the speech commands. Many advancements in speech recognition have been driven by the need to keep the public safe while still acknowledging a device-dependent culture. That's especially true when it comes to vehicles. Whether it's operating the elements connected in the car, the impulse to take our eyes off the road has become second nature. In-car speech recognition systems have become an almost standard feature Many advancements in speech recognition have been driven by the need to keep the public safe while still acknowledging a device dependent culture. That's especially true when it comes to vehicles.

Voice Recognition Technology is basically the task of identifying what is being uttered by a speaker in text form. The utterance can be an isolated word or sentence or may even be a paragraph. The algorithm implemented as a computer program converts a speech signal to a sequence of words. Digital Assistants such as Amazon's Alexa, Google's Google Assistant, Apple's Siri, and Microsoft's Cortana are making a huge difference in daily life by changing the way people interact with their devices, homes, cars, and jobs.

These technologies allow us to interact to a computer or device that interprets what we're saying and respond to our question or command.

The voice commands through the mic are passed to the voice recognition module. The voice recognition module gives the digital signal as the input to the Arduino based on the condition given by the user to the processor it process the data and performs the control action as the output. The leading Automobile manufacturers are trying to offer the smart features like self-driving, AI voice controlling features, etc.

The MG – MORRIS Garages is the first Automobile company which offers the smart connect and voice control features with a bot called MG Astor, which has the ADAS (Advanced driver assistant system) Technology. The voice control function of the MG is a smart system recognizes more than a hundred. Voice commands. You can operate the navigation, adjust the temperature of the climate control, play your favorite music, adjust volume control, etc.

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Voice Recognition is a subfield of computational linguistics dealing with the recognition and translation of spoken language into text by computers, a process known as "speech to text" in some cases. The systems are a fusion of languages, computer science, and electrical engineering influences. The phrase "speech recognition" refers to the process of converting spoken words into text in general; however, subfields such as voice recognition and speaker identification specialize in identifying both the spoken content and the speaker.

OBJECTIVE:

- To access the Electrical devices like windows, wipers, head lights, etc.
- To improve the driving Experience of the mid-range cars.

International Journal of Scientific Research in Science, Engineering and Technology | www.ijsrset.com | Vol 10 | Issue 2

429

- To reduce the chances of getting deviated from the road.
- To ensure the safety of the passengers.

WORK ON THE THESIS:

By 2030, speech recognition will feature truly multilingual models, rich standardized output objects, and be available to all and at scale. Humans and machines will collaborate seamlessly, allowing machines to learn new words and speech styles organically. 72% of automotive executives reported that voice assistants were essential for business and customer engagement strategies.

Another study shows that more than 60% of people who have used a voice assistant while driving factor in the availability of a car voice assistant in their purchase decision. A third of those surveyed in the Capgemini report said they would pay a premium for an embedded voice assistant in their car. Customized car voice assistants are also a feature that may be a considerable driver in car purchasing decisions.

Consumers are looking for a 24/7 personalized experience when using voice assistants in their cars. A customized voice interaction system that integrates with at home voice assistants and provides fast and accurate responses to queries motivates consumers to use a car voice assistant.

According to Capgemini, 77% of consumers use car voice assistants for entertainment and navigation, 46% book appointments for vehicle services and 45% order niche services, such as food delivery. Future possibilities include using a car voice assistant to play games with the family while driving.

OVERALL BLOCK DIAGRAM OF PROPOSED SIMBA

The block diagram explains the components like v3 module, mic and Arduino (UNO). Our proposed design is about to get the input voice command through the inline mic placed near to the steering wheel and they captured signal .

They transmitted to the v3 module, it amplifies the signal using the usb to tll /com converter . the signal is transferred to Arduino (UNO). The relays are connected to the Arduino, the Arduino send the command to actuate the relay to turn on/off the switches like window, wipers, headlamp, defogger, etc.

V3 MODULE

Voice Recognition Module is a compact and easy control speaking recognition board. This product is a speaker-dependent voice recognition module. It supports up to 80 voice commands in all. Max 7 voice commands could work at the same time. Any sound could be trained as command.

Users need to train the module first before let it recognizing any voice command. This board has 2 controlling ways: Serial Port (full function), General Input Pins (part of function). General Output Pins on the board could generate several kinds of waves while corresponding voice command was recognized.

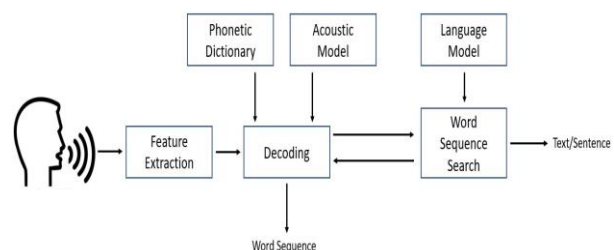## WORKING OF VOICE RECOGNITION MODULE V3:

Fig:3.5Working module of V3

International Journal of Scientific Research in Science, Engineering and Technology | www.ijsrset.com | Vol 10 | Issue 2

430

There are two types of speech recognition systems, speaker-dependent, and speaker-independent. Speaker-dependent systems are designed in such a way that training, sometimes known as "enrollment," is required. This works by having a speaker read text into the system or a succession of discrete vocabulary. The algorithm will then analyze the vocal recordings and link them to the text collection. Speaker independent systems are speech recognition systems that do not rely on vocal training.

ACOUSTIC MODEL

A file containing statistical representations of each of the various sounds that make up a word is known as an acoustic model. A phoneme is a label given to each of these statistical representations. There are approximately 40 distinct sounds in the English language that is suitable for speech recognition, resulting in 40 separate phonemes.

ARDUINO UNO

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (for prototyping) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs.

The microcontrollers can be programmed using the C and C++ programming languages, using a standard API which is also known as the Arduino language, inspired by the Processing language and used with a modified version of the Processing IDE. In addition to using traditional compiler toolchains. The Arduino project began in 2005 as a tool for students at the Interaction Design Institute Ivrea, Italy, aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with

their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats and motion detectors.

MIC

A microphone is a device that translates sound vibrations in the air into electronic signals and scribes them to a recording medium or over a loudspeaker. Microphones enable many types of audio recording devices for purposes including communications of many kinds, as well as music vocals, speech and sound recording. Microphones can be standalone or embedded in devices such as headsets and telephones. The most common type of microphone, the dynamic microphone, uses a coil suspended in a magnetic field that may be attached to multiple membranes for extended frequency response. Dynamic microphones use electrical energy in the form of induction to produce the audio signal. These microphones are well suited to stage performance. The microphone capsule contains a small diaphragm connected to a moving coil. When sound waves hit the diaphragm, it vibrates. This causes the coil to move back and forth in the magnet's field, generating an electrical current.
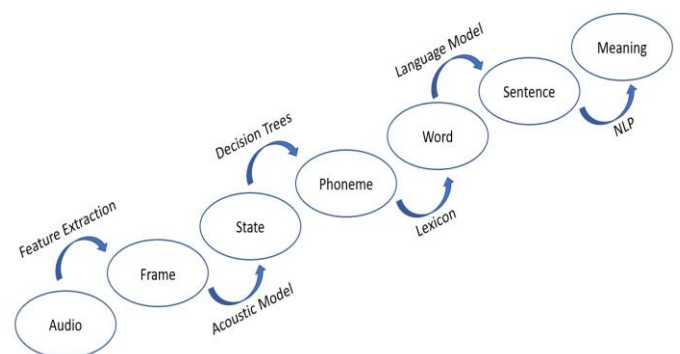
STEPS INVOLVED IN SPEECH RECOGNITION

Fig:3.6 Step by step process of speech recognition

International Journal of Scientific Research in Science, Engineering and Technology | www.ijsrset.com | Vol 10 | Issue 2

431

HARDWARE AND RESULT DISCUSSION

The Voice control was connected to the Arduino and the mic. The commands will be captured through the mic and sent to the V3 module. The module is connected to Arduino. The Arduino will process the command using the predefined programming codes. The Centre console switch will be connected to Arduino to send the command to the appropriate place to control the objects.
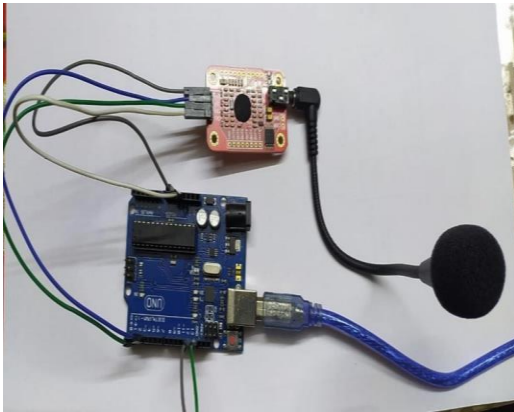

Fig:3.7 Hardware Implementation

The Mic will be mounted under the steering wheel so that the command will be captured accurately, and the command is sent to the V3 module. This module will send the command to Arduino. The Arduino will process the command using the codes which were fetched already. The Centre console switch is connected to Arduino board. The Arduino will send the processed command to the right switch to make the object to respond.

The switch will be triggered by Arduino and the work will be done. For example, the command to switch on the wiper is given, the command is captured through the mic and sent to the V3 module. The V3 module will convert the audio signal to electric impulses. The command is sent to the Arduino. The Arduino will analyze the command. The Arduino will process the command and send the electric impulse to the switch which will be defined in the code. The Arduino send the impulse to the wiper switch and turns ON the wiper. This is the process of capturing the command and the work will be done.

FUTURE SCOPE:

The global medium cars market size was valued at USD 235.7 billion in 2021 and is expected to expand at a Compound annual growth rate (CAGR) of 6.4% from 2022 to 2028. Medium cars or compact cars are gaining popularity as consumers are highly inclined towards having cost-effective, convenient, and environmentally friendly choices, which will drive the market globally. In addition, compact cars provide better fuel effectiveness and are simple to drive and stop in streets comprising heavy traffic.

The majority of automakers are introducing automatic transmissions in medium cars to enhance the entire driving experience with the help of continuously advancing technology, which will further propel the market growth globally. Furthermore, innovative designs and competitive pricing of compact cars from manufacturers to appeal to the consumers of this segment will further boost the market growth in the near future.

DISADVANTAGES OF SIMBA

- Voice Recognization system (VRS) is too slow, especially in high-paced settings.
- VRS can't always connect the dots.
- Inability to spot errors.
- The type of speech needed for accurate results.
- Background noise.

ADVANTAGES OF SIMBA

- No External Connectivity.
- Affordability.
- Stablity.

FEATURES OF SIMBA:

IMPROVED DRIVING EXPERIENCE

- SIMBA is our version of voice assistant. The design is to improve the driving experience of the mid-ranged modern cars, using SIMBA.

International Journal of Scientific Research in Science, Engineering and Technology | www.ijsrset.com | Vol 10 | Issue 2

432

EXPERIENCING LUXURIOUS FEEL

- By using SIMBA, we can experience the luxurious feel of mid-ranged cars as in luxurious cars and drive safely without any distractions.

NO NETWORK CONNECTION

- Basically, SIMBA does not need any network connection to control the devices, which is the required in terms of using ALEXA and SIRI etc.

APPLICATIONS OF SIMBA

- It improves the driving experience.
- It ensures the drivers safety.
- Makes easy to access the equipment present inside the vehicle.
- Differently abled persons can able drive car easily.

II. CONCLUSION

The targeted customers of our product are the midrange cars users who want to experience the high-end features in mid-range cars. The voice recognition module is placed in the steering. Based upon the voice command the side windows, wipers, sunroof, and headlight of a car can be controlled without any network connectivity. The components in our model can be operated vocally. So that everyone can use the advanced features seen in high-end vehicles.

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433

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434