Voice Guided Vehicle for Handicapped

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ABSTRACT

The objective of this paper is to bring to you a technology that helps those handicapped who don't have healthy hands to run a vehicle by giving the voice commands. In this the driver need not use the steering instead use his voice. This vehicle is only for those handicapped those who can speak well. First the voice is recognized through the microphone then the signal is passed on to the voice processing unit where the voice signal is modified such that the input can be given to the control and processing unit .The control and processing unit is the part where the input is compared with the pre recorded commands and the appropriate output is produced. And towards the conclusion the practical difficulties are described and the possible solutions are discussed

General Terms

Speech recognition, series electric hybrid vehicle Steering

Keywords: speech recognition, voice guided vehicle, handicapped, disabled hands

1. INTRODUCTION

Today many organizations in the world are interested in the development of vehicles which could enable disabled people to enjoy a higher quality of life, and possibly function. There are many people in this world kind of physical disability. The problems that a deaf, blind or disabled person encounters at work are, at times, insurmountable difficulties. Unfortunately the production of accessible facilities for disabled people in the workplace is often either very difficult or very expensive. Because of recent technological advances, the disabled could occupy many positions and could have their professional capacity reconsidered. Any contribution made by electronic systems to encourage the autonomy of the disabled at any stage should be thought of not as a luxury, but as a necessity. The vehicle described in this paper is directed at meeting the needs of those motion disabled persons who cannot drive vehicle manually nor with a steering but they are having healthy legs

Therefore, an electronic system is proposed in an existing vehicle to enable it to be driven by the handicapped persons been developed to compensate for this. The vehicle that is suggested here is a electric series hybrid vehicle to which additional units are added.

This vehicle for is selected for the modification as:

- It gives high efficiency at lower variable speeds
- Filling of fuel and charging are not be done separately
- Electronic operations are simpler
- Reverse in the vehicle can be done by just changing the polarity

These features make series electric hybrid suitable for design.

The modifications or addition includes control and Switching & Steering unit guided by voice ,Voice based indicators and lightning control unit &Voice controlled horn and lightning systems .all these units basically work from the input from the speech processing unit which comprises of microphone and the speech processing software .in the project the speech recognition engine like SAPI the from Microsoft that is able to convert the speech to text that is used as the input to the various inputs to the various units like steering unit and all other units. In the project the various ways to design and operate are described and the achievement of the various operations are thoroughly covered the future aspects are also covered

2. Design considerations

Some of the results obtained in the control of this type of car could be applied from mobile robots used in other applications (i.e. nursing robots, household robots, etc.). The control and safety constraints of the car are real-world modeling, and sensor control, path planning and navigation, task level planning and plan execution, and monitoring and control of the system. Aspects relevant to this kind of system have been included in the design requirements:

- Smooth changes in linear and angular velocities.
- High performance in voice recognition, also in noisy environments.
- A balanced number of command words.
- Reduced power consumption.
- A flexible and reconfigurable electronic system. This will allow for future extensions in a cheap and easy way.
- The steering has to be flexible and controllable in full scale
- The speed of the vehicle has to be studied so that its controllable at permissible speeds

The car has the following modules

- Retina identification or facial recognition unit for opening of doors

- Switching & Steering unit guided by voice
- Voice based indicators and lightning control unit
- Voice controlled horn and lightning systems
- Mechanically operated parts

The voice commands and their performance should be based on the units that are there. A set of only eight commands may be required in the door opening unit as its operations are limited like fully open half open and the various doors Then the "plus" and "minus" commands increase or decrease speed up to certain limits arranged etc the commands are fever but the steering and switching unit has to be much highly sensitive as it has to manage a no of commands including angles swishing etc. also the other unit that is important hare is the mechanical operated one whose design is much important as the accelerator brake and some important functions like reverse gear are all to be operated with the help of legs

3. Hardware Requirements

Voltage regulator
Stepper motor or servomotor& its controller
Microphone
Speech recognition unit
Processor or processing unit
i/o ports

3.1 Voltage regulator

The voltage control unit gives the appropriate voltage to the entire setup as the voltage required is very low compared to the one supplied by the battery so the thing consist s of chopper transformer and similar components like rectifier regulator etc to manage the entire setup of the electronic components

3.2 Stepper motor or servomotor

A stepper motor or a servomotor can be used as both of the motors can be electronically controlled to the angle specified. Stepper motor (or step motor) is a brushless, synchronous electric motor that can divide a full rotation into a large number of steps. And servomotor are used in closed loop control systems in which work is the1 control variable. The digital servo motor controller directs operation of the servo motor by sending velocity command signals to the amplifier, which drives the servo motor. An integral feedback device (resolver) or devices (encoder and tachometer) are either incorporated within the servo motor or are remotely mounted, often on the load itself.

3.3 *Microphone*

A microphone (colloquially called a mic or mike; both pronounced / ma k) is an acoustic-to-electric transducer or sensor that converts sound into an electrical signal. Most microphones today use electromagnetic induction (dynamic microphone), capacitance change (condenser microphone), piezoelectric generation, or light modulation to produce a n electrical voltage signal from mechanical vibration

3.3 Processor or processing unit

The processing core performs the speech recognition tasks,

including speech feature extraction, speaker-dependent templates training and recognition. It can be either pc microcontroller or some other processing devices having enough capability and speed required for the operation. It communicates between various modules in the entire unit and also is connected by various busses throughout which gives the proper output to the modules the various feedback devices are managed and synchronized based on this

3.4 I/O ports

The I/O ports include a serial port, an 8-bit parallel port or a 5-pin serial port. The connections between various modules like face recognition unit and other units are done using buses each unit produces output which are brought to processor and the outputs of the processor are carried over by the busses

3.5 Speech recognition unit

In the speech recognition unit the speech recognition system (Furui, 1989) has the blocks shown in Figure 1. The analog processor consists of a pre-amplifier, a band pass filter and a compressor which ensures that the signal coming from the microphone is free of noise and has a suitable level. This considerably improves the recognition performance when facing noisy environments, or any big changes in the intensity of the words being pronounced.

Next, the signal is introduced into a 7-channel filter bank for frequency analysis. Each filter bank channel consists of a supplementary low-pass filter (LPF), a band-pass filter (BPF), a rectifier, and a smoothing low-pass filter. The output from the smoothing LPF represents an average amplitude time series of waveforms in a passband frequency region uniquely determined for each filter channel. A single analog to-digital converter (ADC) digitizes

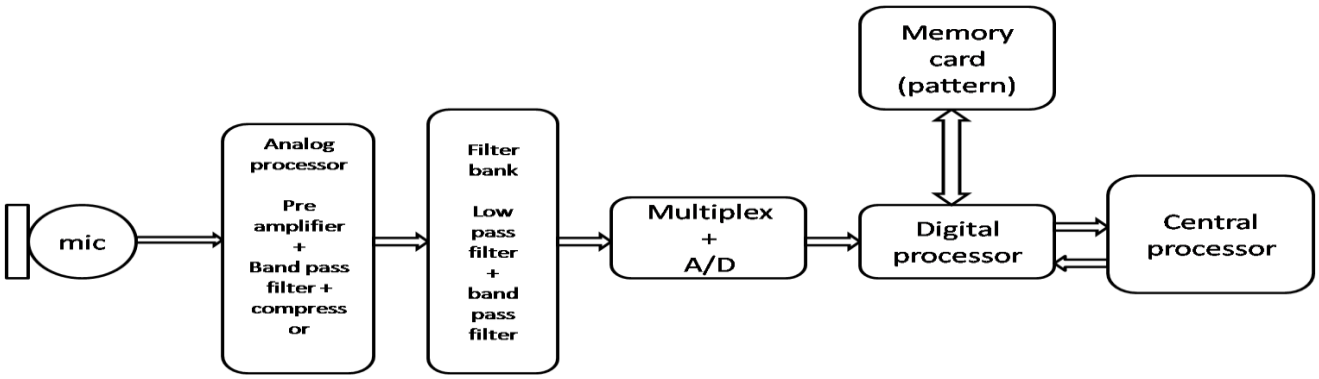

Figure 1.speech recognition unit

the 7 outputs of the smoothing LPFs from a multiplexer, one by one. The ADC digitizes each channel every 20 ms. The input-output digitizing characteristic in the ADC shows non-linearity with an 8-bit compressed output. Reference patterns for the vocabularies to be recognized must be stored in memory before recognition. This function is implemented by a personal memory-card.

4. Modules

- Retina identification or facial recognition unit for opening of doors
- Switching & Steering unit guided by voice
- Voice based indicators and lightning control unit
- miscellaneous
- Leg operations

4.1 Door opening unit

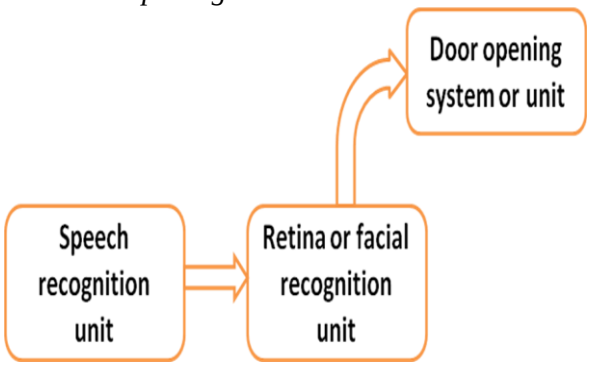

Figure 2.Voice based door opening unit

The door opening unit is the first unit that the driver encounters when he has to enter the vehicle. So this unit must have an easy operation and the security must also be there for the system so in order to make it an easy but secure system the voice recognition unit which help in the thing is used to make system which is as shown in the figure 2 before authentication the speech command meant for the opening of the door is given the authenticating unit is activated. The door opening unit is activated if the match occurs between the authenticated users of the car .the door initially just opens and further the openings can be controlled by the command meant for the opening of the door. Once the driver enters the car he can manage the opening and closing of all the units.this unit should have special units for the operation on the basis of operation in all types of conditions

4.2Switching & Steering unit guided by voice

This unit is the one which controls the switching and the steering of the vehicle in this vehicle the design this is the unit that requires most delicate design features as it handles large no of commands. In this design the series hybrid systems converter or the control unit is used to switch on so now see the series hybrid and its working

In series hybrid system, the combustion engine drives an electric generator instead of directly driving the wheels. The generator both charges a battery and powers an electric motor that moves the vehicle. When large amounts of power are required, the motor draws electricity from both the batteries and the generator. A transmission may not be needed at all and if it is present it can be far less complex, as electric motors are efficient over a wide speed range. Some vehicle designs have separate electric motors for each wheel. Series hybrids can be also be fitted with a super capacitor or a flywheel to store regenerative braking energy, which can improve efficiency by minimizing the losses in the battery. An advantage of a series hybrid is the lack of a mechanical link between the combustion engine and the wheels. The combustion engine can be run at a constant and efficient rate, even as the car changes speed. The requirements for the engine are not directly linked to vehicle speed any more, which gives more freedom in engineering. This makes more efficient or alternative designs possible, such as a micro turbine or a linear combustion engine. During stop-and-go city driving, series hybrids are more efficient than parallel hybrids. A weakness is that the power from the combustion engine has to run through both the generator and electric motor.

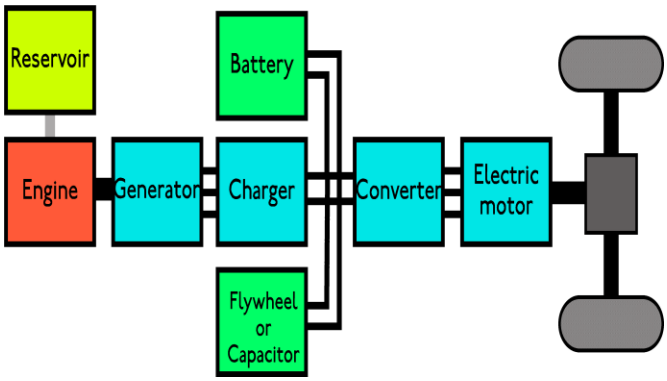

Figure 3.Structure of a series hybrid electric vehicle

During long-distance highway driving, the combustion engine will need to supply the majority of the energy and the electrical transmission of power to the wheels can be less efficient than a conventional, mechanical transmission. The use of one motor per wheel eliminates the conventional mechanical transmission elements (gearbox, transmission shafts, differential). If the motors are integrated into the wheels, the unsprung mass increases, decreasing suspension responsiveness, ride performance and possibly safety. If the motors are attached to the vehicle body, flexible couplings are required. Advantages of individual wheel motors include simplified traction control and all wheel drive.

So the basic diagram of the series hybrid and the modified version of the series hybrid is shown in the figure 3 and figure 4 respectively

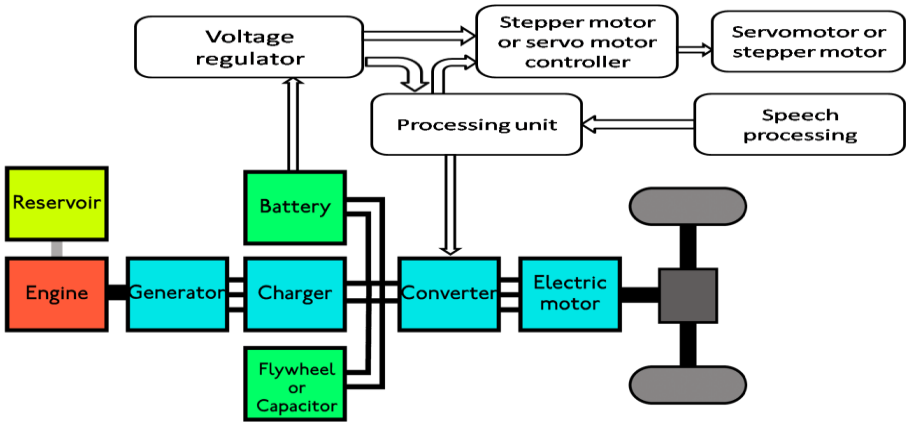

Figure 4 .Structure of a series hybrid electric vehicle

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4.3 Voice based indicators and lightning unit

It includes the various units like indicator lights brake light and other lights inside and outside the car all sort of these can be integrated into one unit under the lightning unit systems this unit would be good if its integrate with the existing system like when turning left if the steering goes beyond certain point the left indicator gets on and

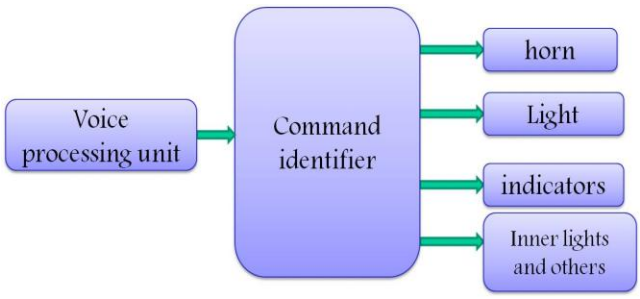

Figure 5. Voice based lightning unit

also autonomous operations may also be allowed as the sometimes the indicators are to be on in stand by conditions and some cannot be defined type situations. the lightning unit can also be equipped with an automatic dimmer circuitry which dims when a vehicle comes from the opposite sides similarly many such conditions and the properties can be imparted and the lightning unit is build

4.4 Miscellaneous

This unit consists of the units that are used like are horn wiper and those important units that are required for the operation the unit also includes functions like opening of fuel tank wiper one working or both adjusting the mirror their positions the bonnet lifting closing and other miscellaneous actions to be performed this unit has to be operated by voice or some additional operations may be added to the leg operated units

4.5 Leg operations

As the person has disabled hands the basic functions also needs some additions as the vehicle used is a electric vehicle type the reversing can be done by changing the polarity so a lever or a part can be added so that the operations are feasible with feet. And he has to perform the operations like braking and acceleration using

his legs and some major locking or braking features are required for the leg operations so proper placing has to be done and also the speed of the vehicle has be lower so that its controllable under all the conditions

5. Working

The working of the vehicle is mainly unit specified and the unit specified has sub commands for each unit which can be used for the units for example let us see the steering. For that various factors are to be considered for turning Suppose the vehicle has to turn to an angle of 30 then it can be either done in the parts or at once based on the amount of turn If the turn is not sharp then special additive or increment type function can be implemented the driver has to learn special conditions to the angle he can give the maximum at once so that safety of the vehicle is not at stake. And also the speeds of operations are also to be determined based on the real time testing

6. Practical difficulties

As it uses voice recognition the vehicle should be noise free. building a noise free is easy nowadays but the vehicle where more than one people can travel is the challenged also the commands may get confused with the normal speech and so the codes may be coded properly and one another solution is using a speaker dependent speaker which will help multiple users inside car else best way would be to design one with one person who is handicapped. The microphone used should be of high quality. Music and all cannot be played inside the car also no mobiles allowed

7. Future Enhancements

In this paper the voice guiding itself is used and the predictive methods are not used and learning is not imparted. in this the neural networks and similar techniques can be used for the predictions With which the person may be able to get assistance which may take appropriate decisions based on learning based on the learning done as the speech engines getting better and better so can be replaced by better ones if available in future so the electronics must be flexible

8. ACKNOWLEDGMENTS

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