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Implementation of Solar Powered Voice Recognition Robot

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ABSTRACT

The speech recognition system is a useful and easy to use programmable speech recognition circuit. It uses a microphone to convert given voice to a electrical signal and this signal is recognized using a voice recognizer and it produces an output, which is used by a controller to produce a control output. This output is used by a motor to drive the motor. This project uses Arduino Uno board with ATmega328 as its controller. A solar panel is connected to the battery which gets charged in the day time and the stored energy can be used for robot operation. This robot can be moved forward and reverse direction. It can also move left and right directions using geared motors some of the applications which can be made are controlling home appliances, robotics movements, Speech Assisted technologies, Speech to text translation, and many more.

KEYWORDS :

I. Introduction

Voice Recognition, also known as the Speaker Recognition, has two categories: speaker identification and speaker verification. Speaker identification is used to determine which one of the people speaks, i.e. "one out of more election", and speaker verification is used to determine whether a person specified speaks, i.e. "one-on-one recognition". According to the voice of different materials, voice recognition can be divided into the text- dependent, and text independent technology. The text-dependent voice recognition system requires speaker pronounce in accordance with the contents of the text. Each person's individual sound profile model is established accurately. People must also be identified by the contents of the text during recognition to achieve better effect. Text-independent recognition system does not require fixed contents of words, which is relatively difficult to model, but is convenient for user and can be applied to a wide range.

Nowadays robots are having wide applications in various fields. In many industries robots are used for performing different functions. Robots are more accurate and efficient compare to human being. Use of robots in industries can increase the quality of products and their production rate. As compare to earlier days today robots are used in various areas such as defense, medical field, astronomy field etc.

Voice based robotic control is an interesting project, mainly used for industrial and surveillance applications. It gives exact concept of controlling a robot by a voice instruction. Robot is capable of understanding and synthesizing human speech for communication. A voice recognition unit built around a high speed processor that ensures various operations of the system to be performed by voice command. A few of commands recommended for operation are listed as: START, STOP, FORWARD, REVERSE, RIGHT, LEFT, SLOW, FAST,OK, UP, DOWN etc.

The advantages of speech activated robots are hands-free and fast data input operations. In future, it is expected that speech recognition systems will be used as man- machine interface for robot in rehabilitation, entertainment etc. Normally a handicapped person cannot operate manual controlled robots. These peoples can only depend on their voice. So we decided to select this type of robot which is based on voice recognition principle.

II. BLOCK DIAGRAM

The experimental set up for this system is shown in figure1.

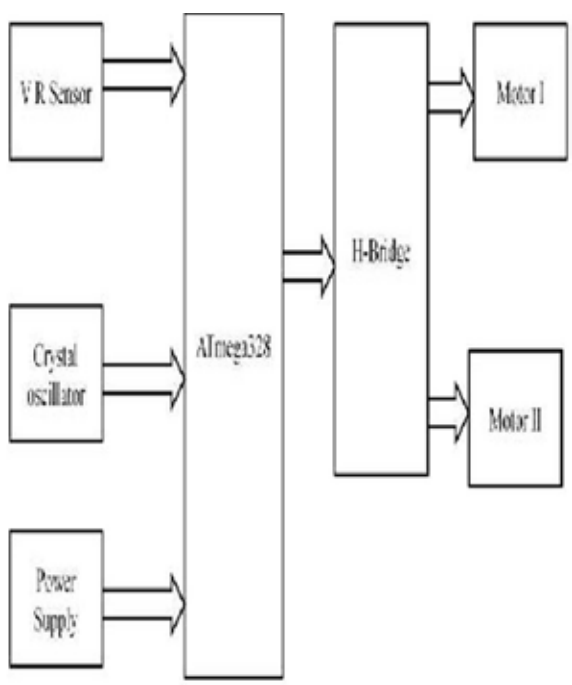

Figure. 1: Block diagram of VR robot

EasyVR is a multi-purpose speech recognition module designed to add versatile, robust and cost effective speech and voice recognition capabilities to virtually any application. EasyVR is the second generation version of the successful VRobot module and builds on the features and functionality of its predecessor. In addition to the EasyVR features like 32 user – defined Speaker Dependent (SD) triggers and a cost of build in user independent (SI) commands, the shield has additional connectors for the microphone input, an 8 ohm speaker output, audio line – output/ headphone jack and access to the I/O pins of the EasyVR module . A programmable LED is also included to show feedback during recognition tasks.

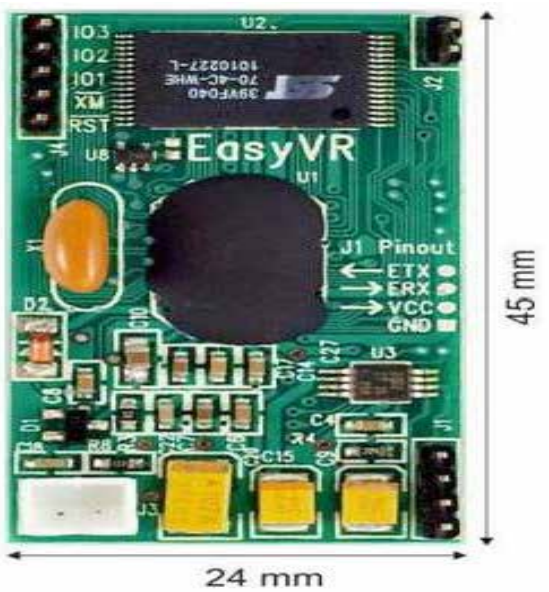

Figure. 2 Voice Recognition sensor

The initial configuration at power on is 9600 baud, 8 bit data, No parity, 1 bit stop. The baud rate can be changed later to operate in the range 9600 - 115200 baud. The communication protocol only uses printable ASCII characters, which can be divided in two main groups:

1. Command and status characters, respectively on the TX and RX lines, chosen among lower-case letters.
2. Command arguments or status details, again on the TX and RX lines, spanning the range of capital letters.

Each command sent on the TX line, with zero or more additional argument bytes, receives an answer on the RX line in the form of a status byte followed by zero or more arguments. There is a minimum delay before each byte sent out from the EasyVR module to the RX line, that is initially set to 20 ms and can be selected later in the ranges 0 - 9 ms, 10 - 90 ms, and 100 ms - 1 s. That accounts for slower or faster host systems and therefore suitable also for software-based serial communication.

Since the EasyVR serial interface also is software-based, a very short delay might be needed before transmitting a character to the module, especially if the host is very fast, to allow the EasyVR to get back listening to a new character. The communication is host-driven and each byte of the reply to a command has to be acknowledged by the host to receive additional status data, using the space character. The reply is aborted if any other character is received and so there is no need to read all the bytes of a reply if not required. Invalid combinations of commands or arguments are signaled by a specific status byte, that the host should be prepared to receive if the communication fails. Also a reasonable timeout should be used to recover from unexpected failures.

The ATmega32 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega32 achieves throughputs approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed.

An H-Bridge is an electronic power circuit that allows motor speed and direction to be controlled. Often motors are controlled from some kind of micro controller to accomplish a mechanical motion. The micro controller provides the instructions to the motors, but it cannot provide the power required to drive the motors. An H-bridge circuit inputs the micro controller instructions and amplifies them to drive a mechanical motor. Dc geared motor is used for the movement of Robot in forward, Backward, left and right direction. This motor is having 60 rpm. It also has good torque to move the robot. Power supply required for this motor is 12V. A gearing mechanism is used to reduce the speed and hence torque is increased. Output of the motor is connected to the tyre. Most DC Motors can rotate in two directions depending on how the battery is connected to the motor. Both the DC motor and the battery are two terminal devices that have positive and negative terminals. In order run the motor in the forward direction, connect the positive motor wire to the positive battery wire and negative to negative. However, to run the motor in reverse just switch the connections; connect the positive battery wire to the negative motor wire, and the negative battery wire to the positive motor wire.

The most common method of speed control is PWM or pulse width modulation. Pulse width modulation is the process of switching the power to a device on and off at a given frequency, with varying on and off times. These on and off times are referred to as "duty cycle". The end result of the PWM process is that the overall power sent to the motor can be adjusted from off to full on with good efficiency and stable control. While many robot builders use a microcontroller to generate the required PWM signals, the 555 PWM circuit explained here will give the novice robot builder an easy to construct circuit, and good understanding of pulse width modulation. It is also useful in a variety of other applications where the PWM setting need only be changed occasionally.

III. CONTROL MECHANISM

Arduino is a popular open-source single-board microcontroller, descendant of the open-source Wiring platform, designed to make the process of using electronics in multidisciplinary projects more accessible. The hardware consists of a simple open hardware design for the Arduino board with an Atmel AVR processor and on-board input/output support. At a conceptual level, when using the Arduino software stack, all boards are programmed over an RS-232 serial connection, but the way this is implemented varies by hardware version. Serial Arduino boards contain a simple inverter circuit to convert between RS-232-level and TTL-level signals. Current Arduino boards are programmed via USB, implemented using USB-to-serial adapter chips such as the FTDI FT232.

Some variants, such as the Arduino Mini and the unofficial Boarduino, use a detachable USB-to-serial adapter board or cable, Bluetooth or other methods. (When used with traditional microcontroller tools instead of the Arduino IDE, standard AVR ISP programming is used.) The Arduino board exposes most of the microcontroller's I/O pins for use by other circuits. The Diecimila, Duemilanove, and current Uno provide 14 digital I/O pins, six of which can produce pulse-width modulated signals, and six analog inputs. These pins are on the top of the board, via female 0.1 inch headers. Several plug-in application shields are also commercially available.

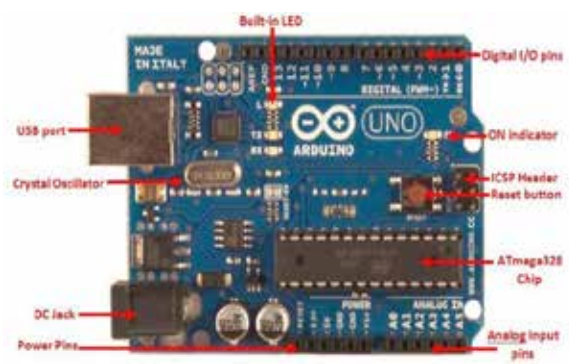

Figure. 3: An official Arduino Board

A solar panel (also solar module, photovoltaic module or photovoltaic panel) is a packaged connected assembly of photovoltaic cells. The solar panel can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications. Each panel is rated by its DC output power under standard test conditions, and typically ranges from 100 to 320 watts. The efficiency of a panel determines the area of a panel given the same rated output - an 8% efficient 230 watt panel will have twice the area of a 16% efficient 230 watt panel. Because a single solar panel can produce only a limited amount of power, most installations contain multiple panels. Solar panels use light energy (photons) from the sun

to generate electricity through the photovoltaic effect. The structural (load carrying) member of a module can either be the top layer or the back layer. The cells must be connected electrically to one another and to the rest of the system. Cells must also be protected from mechanical damage and moisture. Most solar panels are rigid, but semi-flexible ones are available, based on thin-film cells. In the health care domain, speech recognition can be implemented in front-end or back-end of the medical documentation process. Front-End speech recognition is where the provider dictates into a speech-recognition engine, the recognized words are displayed as they are spoken, and the dictator is responsible for editing and signing off on the document.

Figure 4: solar panel

VI. CONCLUSION

A highly reliable and versatile system to accomplish a purpose design specific task such as distribution of medicine and food to the bed ridden patients specially in infected areas of the hospitals and medical centre have been reported. The on-board intelligence helps providing situational awareness a basic requirement of the system to be operated by voice / tele confined for ascertaining a majority of other tasks in open loop environment. The operation by voice command could best be used for handicapped.

The voice recognition software has an accuracy around 75% in correctly identifying a voice command. But it is highly sensitive to the surrounding noises. There is a possibility of misinterpreting some noises as one of the voice commands given to the robot. Also the accuracy of word recognition reduces in face of the noise. The sound coming from motors has a significant effect on accuracy.

It helps physically disabled persons by carrying some objects from one place to another using the arm structure in the robot. This robot guides the blind persons to reach a particular destination by using the voice feature . It is used to guide visitors in an organization by providing information about the facilities available .It can be used in hazardous places. Some of the applications are controlling home appliances , robotic movements, speech to text translation and many more.

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