Smart Gloves For Differently Abled

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Abstract

Communication is the only medium by which we can share our thoughts or convey the message but for a person with disability (deaf and dumb) faces difficulty in communication with normal person. Communication for a person who cannot hear is visual, not auditory. Generally dumb people use sign language for communication but they find difficulty in communicating with others who don't understand sign language. The main aim of the proposed project is to develop a cost effective system which can give voice to voiceless person with the help of Smart Gloves. With the help of these gloves disabled person can also get chance to grow in their respective carrier.

Keywords: *Smart Gloves, Differently Abled*

1. INTRODUCTION

The decreasing ratio of Literate and Employed Deaf and Dumb population is a result of the physical disability of hearing for deaf people and disability of speaking for dumb people so it yields to lack of communication between normal person and Deaf and Dumb Person. It actually becomes the same problem of two persons which knows two different language, no one of them knows any common language so its becomes a problem to talk with each other and so they requires a translator physically which may not be always convenient to arrange and this same kind of problem occurs in between the Normal Person and the Deaf person or the Normal Person and the Dumb person. To overcome this problem, we introduce a unique application. Our application model is a desirable Interpreter which translates. Natural English Sentences as, an text input by Normal Person for Deaf Person and Sign Language, in form of Gesture by a Dumb Person to Synthesized English Words which have a corresponding meaning in Sign Language which interprets a particular thing, as an Audio Output for Normal Person. This will help Normal and Deaf and dumb communities by removing the communication gap between them.

The sign language is an important and only method of communication for deaf-dumb persons. As sign language is a formal language employing a system of hand gesture for communication (by the deaf).

In this project Flex Sensor Plays the major role, which are placed on fingers, as fingers bends it changes resistance depending on the amount of bend on the sensor.

2. ARCHITECTURE*:*

1. *Flex sensors*
2. *Microcontroller*
3. *Decoder/Encoder*
4. *Gesture recognition section*
5. *Voice section*

2.1. Flex Sensor

Signed letters are determined using flex sensor on each finger. The flex sensors change their resistance based on the amount of bend in the sensor as shown in figure. As a variable printed resistor, the flex sensor achieves great form-factor on a thin flexible substrate. When sensor placed in gloves is bent, it produces a resistance output correlated to the bend radius—the smaller the radius, the higher the resistance value. They require a 5-volt input and output between 0 and 5V. The sensors are connected to the device via three pin connectors (ground, live, and output).

In device, sensors are activated in sleep mode. It enables them to power down mode when not in use.

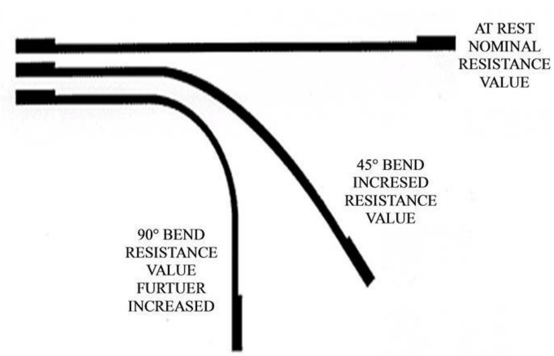

Figure: 1

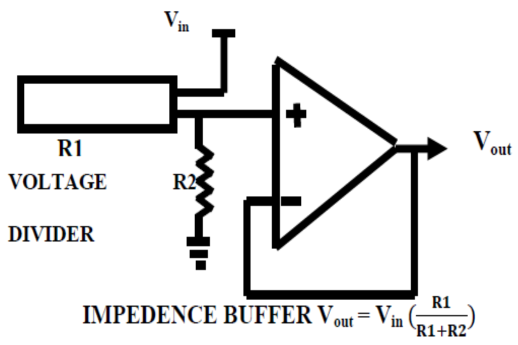

Figure: 2

Figure shows circuit of basic flex sensor which consist of two or three sensors are connected. The outputs from the flex sensors are inputted into op-amps and used a non inverted style setup to amplify their voltage. The greater the degree of bending the lower the output voltage.

By voltage divider rule, output voltage is determined and given by

Vout = Vin *R1 / (R1 + R2), where R1 is the other input resistor to the non-inverting terminal.

2.2. Pic Microcontroller

Microcontroller is the heart of the device. It stores the required data and make use of if whenever the person uses the device. This device helps deaf and dumb person to announce their requirement. By this the person who is near can understand their need and help them. PIC microcontrollers can be programmed in Assembly, C or a combination of the two. Other high-level programming languages can be used but embedded systems software is primarily written in C. All output signals generated from flex sensors are in analogue form and these signals need to be digitized before they can be transmitted to encoder. Therefore microcontroller PIC16F877A is used as the main controller in this project.

It has inbuilt ADC module, which digitizes all analogue signals from the sensors and inbuilt multiplexer for sensor signal selection. It supports both serial and parallel communication facilities.

2.3 Encoder/Decoder

The output from the PIC microcontroller is encoded by encoder. The programmed address/data are transmitted together with the header bits Via an RF. It is used to correct the error at the receiver end, if any error had occurred. In the receiver it is decoded by decoder.

2.4 Gesture Recognition Section

The gesture manager is the principal part of the recognition system. It contains data to match with incoming data. The system tries to match incoming data with existing posture. The bend values of the fingers and for each posture definition the distance to the current data is calculated. Then, the position/orientation data is compared in a likewise manner.

2.5 Voice Section

After gesture recognition system, data is sent to voice section. In this, data is matched with feeded data. If the data is matched with feeded data then it is given to speaker and display system.

3. PROTOTYPE USING IC APR-33-A3-C2.1

3.1description

The aPR33A series are powerful audio processor along with high performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). The aPR33A series are a fully integrated solution offering high performance and unparalleled integration with analog input, digital processing and analog output functionality.

The aPR33A series incorporates all the functionality required to perform demanding audio/voice applications. High quality audio/voice systems with lower bill-of-material costs can be implemented with the aPR33A series because of its integrated analog data converters and full suite of quality-enhancing features such as sample-rate convertor.

The aPR33A series C2.0 is specially designed for simple key trigger, user can record and playback the message averagely for 1, 2, 4 or 8 voice message(s) by switch, It is suitable in simple interface or need to limit the length of single message, e.g. toys, leave messages system, answering machine etc. Meanwhile, this mode provides the power-management system.

Users can let the chip enter power-down mode when unused. It can effectively reduce electric current consuming to 15uA and increase the using time in any projects powered by batteries.

Pin Configuration

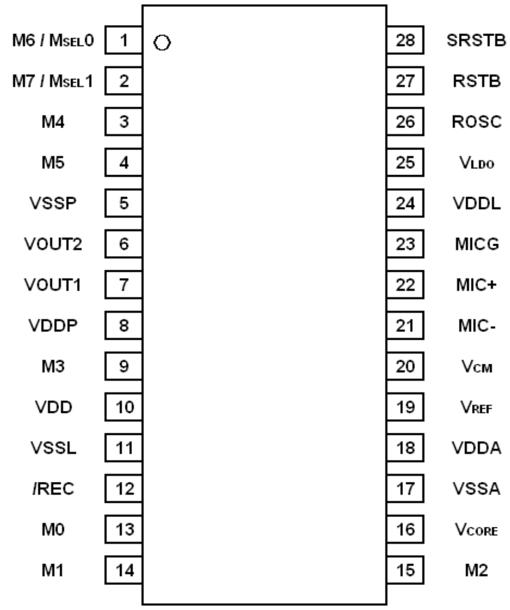

Figure: 1

Pin Description

Pin Names	Pin No	TYPE	Description
VDDP VDD VDDA VDDL	8 10 18 24		Positive power supply.
VSSP VSSL VSSA	5 11 17		Power ground.
V_{LDO}	25		Internal LDO output.
V_{CORE}	16		Positive power supply for core.
V_{REF}	19		Reference voltage.
V_{CM}	20		Common mode voltage.
Rosc	26	INPUT	Oscillator resistor input.
RSTB	27	INPUT	Reset. (Low active)
SRSTB	28	INPUT	System reset, pull-down a resistor to the VSSL.
MIC+ MIC-	21 22	INPUT	Microphone differential input.
MICG	23	OUTPUT	Microphone ground.
VOUT1	7	INPUT	PWM output to drive speaker directly. DAC option.
VOUT2	6	INPUT	PWM output to drive speaker directly. DAC output.
/REC	12	INPUT	Record Mode. (Low active)
M0	13	INPUT	Message-0.
M1	14	INPUT	Message-1.
M2	15	INPUT	Message-2.
M3	9	INPUT	Message-3.
M4	3	INPUT	Message-4.
M5	4	INPUT	Message-5.
M6 / $M_{SEL}0$	1	INPUT	Message-6, Message select 0.
M7 / $M_{SEL}1$	2	INPUT	Message-7, Message select 1.

Figure: 2

3.2 Operation

3.21 message Mode

In fixed 1/ 2/ 4/ 8 message mode (C2.0), user can divide the memory averagely for 1, 2, 4 or 8 message(s). The message mode will be applied after chip reset by the MSEL0 and MSEL1 pin. Please note the message should be recorded and played in same message mode, we CAN NOT guarantee the message is complete after message mode changed. For example, user recorded 8 messages in the 8-message mode, those messages can be played in 8-message mode only. If user changed to 1, 2 or 4 message mode, system will discard those messages.

3.22 Record Message

During the /REC pin drove to VIL, chip in the record mode. When the message pin (M0, M1, M2 … M7) drove to VIL in record mode, the chip will playback “beep” tone and message record starting.

The message record will continue until message pin released or full of this message, and the chip will playback “beep” tone 2 times to indicate the message record finished. If the message already exist and user record again, the old one’s message will be replaced.

3.23 Playback Message

During the /REC pin drove to VIH, chip in the playback mode. When the message pin (M0, M1, M2 … M7) drove from VIH to VIL in playback mode, the message playback starting. The message playback will continue until message pin drove from VIH to VIL again or end of this message.

3.24 Voice Input

The aPR33A series supported single channel voice input by microphone or line-in. The following fig. showed circuit for different input methods: microphone, line-in and mixture of both.

3.25 Voice Output

The aPR33A series support 2 voice output mode, PWM and DAC. The PWM mode use VOUT1 and VOUT2 pin to drive speaker directly without external components to save cost. The DAC mode use VOUT2 pin to output current signal. User can use the signal to drive audio amplifier or mix with other components in their applications to provide larger voice volume. The following fig. show circuit for different output methods: PWM, DAC, DAC with transistor, DAC with audio amplifier AP4890B.

3.26 Busy

The MICG pin will be drove to low during the message record or playback, and drove to high during idle or standby, user can detect MICG status to know chip is busy or not.

3.27 Reset

APR33A series can enter standby mode when RSTB pin drive to low. During chip in the standby mode, the current consumption is reduced to ISB and any operation will be stopped, user also cannot execute any new operate in this mode.

The standby mode will continue until RSTB pin goes to high, chip will be started to initial, and playback "beep" tone to indicate enter idle mode. User can get less current consumption by control RSTB pin specially in some application which concern standby current.

3.3 Block Diagram

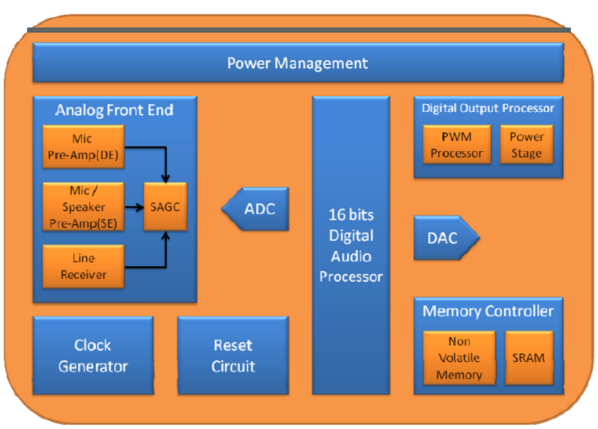

Figure: 3

CONCLUSION

Communication for a person who cannot hear is visual, not auditory. Generally dumb people use sign language for communication but they find difficulty in communicating with others who don't understand sign language. To overcome this problem, we introduced a unique application. Our application model is a desirable Interpreter which translates. Natural English Sentences as, an text input by Normal Person for Deaf Person and Sign Language, in form of Gesture by a Dumb Person to Synthesized English Words which have a corresponding meaning in Sign Language which interprets a particular thing, as an Audio Output for Normal Person.

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