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Communication System for Speech Impaired Person

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Abstract

The system is designed for the vocally impaired people who can only share their thoughts using their hands and eyes. The system integrates various patterns which will be delivered in form of voice when an impaired person makes a gesture. The system is compact and inexpensive for easy availability and handling predicting market in India. System uses central controller as microcontroller and associated circuitry to implement the design. System provides a glove with sensors for a person to wear which is worn while making gestures. The analog output from this glove is taken through ADC terminal of microcontroller and manipulations are done to interpret the correct output voice for corresponding gesture made by user. Further design also proposes a glass having light sensor by photodiodes monitoring eyes of the user for integrating more and more gestures because impaired persons also use their eyes for communicating.

Keywords: Microcontroller, ADC, light sensor, photodiode.

1. Introduction

The main objective of this project is to provide the basic communicating capacity to speech impaired people in India at a reasonable price. Market of speech synthesis is very vast in India people are in an extreme need of devices like this to make their life easy. Profit should not be the only criteria linked with this project. This will enhance learning standards of speech impaired people in India.

Market analysis show that there are not only a limited number of such solutions but also they are quit costly these devices are sold by the name speech generators and can do a appreciable job but have limitations because user need to know symbols and press them accordingly on screen for proper speech synthesis also the number of words or voice outputs are limited and of course cost is the biggest problem. Cost of these synthesizers can vary between 200$ to 1000$ which is not at all feasible in India where

diseases like autism, cerebral palsy, or Down syndrome etc are big problem among low earning groups.

Our system will bring turmoil in the market because of its simplicity portability and its scope for improvement. The number of people suffering from speech/hearing impairment is around 4.42 million in India and their condition is even worse than these numbers.

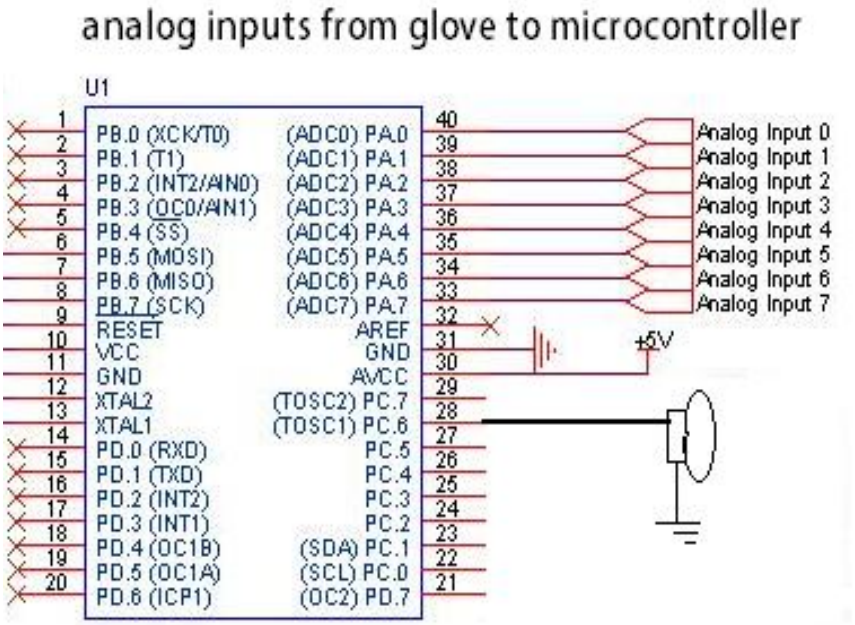
2. Project Description

2.1. CIRCUIT

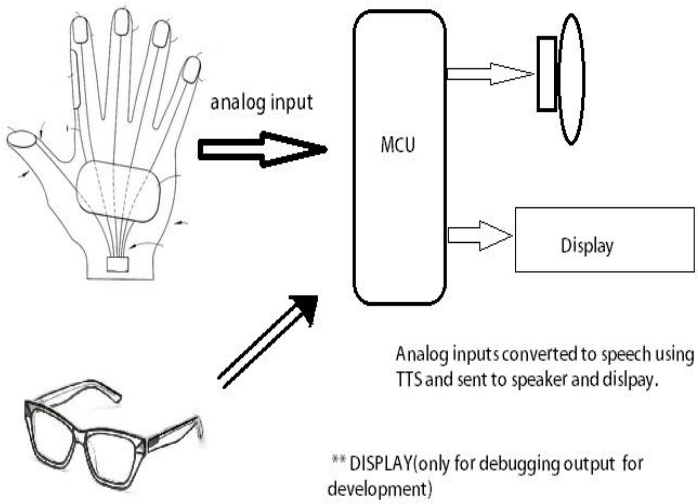
Circuit contains two main modules one with the glove and the glasses with sensors to simulate different gestures by varying analog voltages and the other module is the microcontroller with TTS (test to speech) system and the output speaker. A display may also be used for accurate testing of the prototypes. There may be an additional circuitry needed for integrating larger voice outputs because memory of typical microcontrollers is less than 1 Megabytes.

Glove will contain resistive strips which will be used as potentiometers to provide different voltage when gloves is disturbed form its original configurations, strips will be used on the parts of finger which moves the most during a gesture made by person. Glasses monitor eyes for their movement. Using analog inputs from a photodiode implanted to its corners, it will help integrating many other instructions.

Circuit:



Block diagram of implementation



Gloves

The gloves contain simple strips of resistive material on the joints of the fingers and palm this resistive material will change its resistivity according to the movement of the fingers and palm. The analog voltage is fed into the ADC of microcontroller which will analyse the patterns in the voltages with the set constraints and then match it with the corresponding sign or word user is trying to say.

3. Glasses (Spectacles)

The glasses will have simple LDR or IR sensor in on the corner of each eye this sensor will continuously emit IR on the eyes the white part of the eye is reflective and the dark or brown iris is not, this will help sensor to differentiate between various positions of eyes while user moves eye for communication. This combined with glove's input will give more freedom to both user and designer to integrate more and more instructions.

4. Microcontroller

Microcontroller converts and detects the analog signals from gloves and glasses and matches it with previously defined values and uses test to speech synthesis to provide an output on the speakers. Production should go with a microcontroller which has a huge variety and size of analog inputs and also which is inexpensive so 8051,Atmel mega32,ARM etc are the best choices.

The above components will work together and synthesize the voice using TTS. The inputs form glove and glasses will be manipulated using ADC and microcontroller will match corresponding digital data to predefined gestures and it will output the correct voice onto the speakers. The voices will will be saved in database in form of .wav

format which will be played for any gesture user performs. E.g.-this sytem is used on railway station where text is converted into speech(TTS), like announcing arrival of a train. Only difference is that here we use real time analog data to synthesize speech.

5. Conclusion

This project is a classic example of analog to digital conversion which is a profound step in every digital communication system. I have tried to use analog signals directly from user and convert it into useful instructions or signal for their further manipulations. Systems with gesture technology are already been invented but most of them uses image processing but i have focused more on analog signals and reduce cost since image processing requires more hardware which is not feasible to carry for a person. Project works fine with few inputs as I have taken readings but lacks the need of memory for integrating higher voice outputs which can be eliminated using memory chips.

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