

Speech to Text Communication Aid for People with Dysarthria and Receptive Dysphasia

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Abstract— There are emerging forms of devices meant to diagnose and train the speech impaired people. A current aid is existent by means of which patients suffering from dysarthria are trained to speak within an estimated period of time. The device that has the flexibility to be implemented in a personal digital assistant, could successfully cooperate with the speech impaired people by converting the text messages of the communicator into synthetic voice output. The discovered disadvantages in the existing methodology are aimed to be overcome in this paper. A novel device is being invented for systematically training patients with dysarthria and receptive dysphasia so as to increase their motor neuron efficiency and brain perception along with guiding them to produce an intelligible speech.

Key words: Dysarthria, Receptive Dysphasia

I. INTRODUCTION

Spoken language communication is an essential factor for leading life. But, as much as 1.3% of world's population cannot use natural speech effectively to communicate [1]. Commonly known speech disorders dysarthria, receptive dysphasia etc. are dominant in 170 per 100000 of the population [2]. For people with dysarthria, pronunciation of words would be very difficult, compared to a normal spoken person and for a person with receptive dysphasia could not easily comprehend an image. The recently developed technological tools for communication, one amongst which is the Voice-Input Voice-Output Communication Aid (VIVOCA) is specialized in converting the disordered speech input from the patient into recognizable, intelligible voice output[3]. Patients with speech impairment feel this mode of communication to be quite disadvantageous, as this method doesn't enhance the speaking ability of a patient, rather tries only to provide an aid through giving out proper corrected version of the patient's disordered speech. So a novel design of a training device involving the concept of speech to text communication is obtained through our project which can train patients pertaining to both dysathria and receptive dysphasia. The principal objective is to enhance the speaking and comprehensive abilities of the impaired patients by means of analyzing their communication rate and accordingly provide them training till the person gains efficiency in perception and speech.

II. SYSTEM DESCRIPTION

The system made use of a user-friendly design and development perspective. The system consists of an arduino board, HC-05 transceiver, timer, alarm, transformer, bridge rectifier and input capacitor 7805 for regulated power supply, 16x2 LCD, USB to UART, computer and a Speech recognition application.

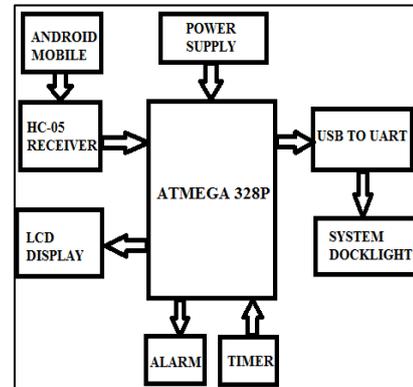


Fig. 1: Block diagram of the device

A. Bridge Rectifier

It's the best and universally accepted form of power supply configuration as far as the rectification process is concerned. The clever use of four diodes makes things very simple, only a single secondary winding of the transformer is all that is required, the core saturation is perfectly optimized resulting in an efficient AC to DC conversion. The figure shows how a full wave rectified power supply is made using four diodes and a relatively low value filter capacitor.

B. Voltage regulator 7805

The voltage regulator reduces the impedance of the power feed as seen by the regulator. This reduces input voltage fluctuations that occur as a function of current demand fluctuations, which the regulator has no control over. The regulator can do a better job of keeping the output steady when the input is steady.

C. HC-05 transceiver

It provides 3 Mbps modulation with complete 2.4 GHz radio transceiver and baseband. It uses CSR Bluecore 04 –External Single Chip Bluetooth System with CMOS technology with AFH (Adaptive Frequency Hopping Technique). The module can work as a Master-Slave circuit as it contains a series of two JK flip flops and can store the state information of the user. When the ENABLE pin is pulled LOW, module is disabled and when it is pulled HIGH, the module is enabled.

D. USB to UART converter

The TXD and RXD pins of the Bluetooth transceiver act as UART interface for communication. UART interface supports for 7 or 8 data bits and the data transfer rates range from 300 baud to 1 megabaud.

E. Timer circuitry

The LM555 timer is implemented in the system to generate a trigger pulse once a minute to indicate that the patient must stop communicating with the system so as to facilitate the communication rate of the patient.

F. Alarm circuitry

The circuit contains a transistor coupled to the arduino board and the flow of current takes place in the transistor whenever a trigger pulse is generated in the timer circuit. The emitter current of the transistor activates the alarm at the end of 1 minute.

G. Arduino

The arduino is an open source platform implemented in electronic design and development. It consists of a physical programmable circuit board, IDE (Integrated Development Environment) software that runs a computer, used to upload and write computer code to the physical board. The arduino uses a simplified version of C++ in the IDE making it easier to be programmed to count the number of words uttered by the patient per minute.

H. 16x2 LCD

The LCD displays the number of words spoken out by the patient within one minute.

I. Computer

It displays the words pronounced by the disordered patient, by means of an UART that is used for serial communication over a computer.

J. Speech recognition application

This mobile application words and phrases spoken out by the disordered person and can pass them on to the program. The application can just use the speech string directly. The standard 'listening' interface is displayed over the application.

III. RESULTS

The patients were able to gain efficiency in perception and could thus cope up with the training process. There had been a gradual development in the speaking ability of patients with receptive dysphasia and dysarthria. The patients with receptive dysphasia could not gain as much efficiency as possible and hence they require more practice in perception of the given images.

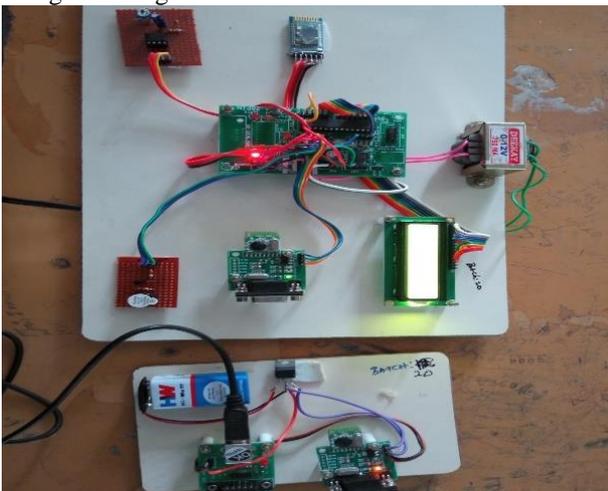


Fig. 2: Results

IV. DISCUSSION

The voice to text communication aid for calculating the communication rate for patients with dysarthria and receptive

dysphasia can be used consistently for improving the speech ability of the disordered people. This technology is an improvised methodology of previous techniques as it enables the disordered persons to speak out confidently. The project provides good precision in calculating the communication rate.

V. CONCLUSION

This paper has described the development of a training kit used to train the patients with dysarthria and receptive dysphasia. The disordered patients can benefit out of the device and their neuromotor functions can be enhanced. Evaluation with a group of potential users showed that they can make use of the device to produce an intelligible speech output.

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Web Resources

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