

VISUAL AND AUDITORY FEEDBACK FOR STUTTER CORRECTION AND MANAGEMENT IN CHILDREN

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ABSTRACT

Stuttering is a disorder is a speech disorder which involves the involuntary repetition or prolongation of sound. The diffident speech also pays a way for psychological problem and causes a lack in confidence Hence Stuttering correction plays a very important role in the society for the people those suffering from stuttering. Its common in children than in adults. This project aims in constructing positive feedback as the methodology for stuttering correction by play backing the sound (voice) and comparing it with the standard template using LABVIEW and MATLAB programming. Since it involves children, great deal is put forward to produce attractive positive feedback for stutter correction and training. This work involves the construction of specgram to observe the difference between the normal and stammered voice and further analysis was done by determining the peak values of the waveforms obtained for voice signal. To validate these results, the stuttering correction was done for different words for different subjects. Finally, we made correction to the stuttering patient by designed a visual hue (screen) and we motivated the patient to speak normal without stuttering.

Keywords: Stuttering; Sluttering ; Specgram, MFCC ,Visual Feedback , Auditory Feedback.

I. INTRODUCTION

Stuttering or stuttering is a type of speech disorder .It is coupled with involuntary sound repetition. It also encompasses the abnormal hesitation or pausing before speech. Men are more affected than the women. It also tends to persist into adulthood though the symptom starts at the early stage of childhood. This paper focus on stuttering correction to the people who face several problems in the society such as disfluency, discomfortness in speech etc., due to stuttering. These problems can be overcome by a using a simple technique to make the patient become stammer free and to improve their communication with better fluency. Stuttering is also characterized by prolongation of sound, syllables, words or phrases as well as involuntary silent pauses or blocks in which the person who stutters is unable to produce sounds .vowels and semivowel are pulled for long time .Some time the constantants like k,g,t is also repeated. Stuttering leads to vocal spasms. This struggling in speech causes Stressful social situations[3]. Anxiety is the next critical term for the stutters [9]

Children with mild stuttering are often unaware of their stuttering. In more severe cases, children may be more aware. When the stutter are asked to speak the anxiety builds up with different facial expression[4]. Stuttering is broadly classified as developmental stuttering which occurs between the ages of 2 and 5 years and acquired stuttering secondary to brain damage. Stutter induces psychological stress in children in school ages . It creates creates panic and frustration in children appearing in the public. Some children with stuttering problem keep them away from the crowd thus becoming socially isolated.

Stuttering is diagnosed clinically and there is no specific test that can confirm the diagnosis[6]. Stuttering therapy aims to reduce stuttering to some degree in an individual, although there is disagreement about acceptable treatment outcomes from stuttering therapy. Therapy is generally a variation or combination of Fluency-shaping technique Stuttering modification therapy. This work involves a positive visual hue feedback technique for managing the stutter

II. LITERATURE SURVEY

Humans communicate and express their view and idea through speech. Voice can be synthesized and recognized by virtual instrumentation technology LABVIEW [patil].Andrews et al. obtained the real time samples from three adults male and some of the speech characteristics such as articulation and speech rate was analyzed . Speech of the stutter will have long pauses and frequent repetition of few words[8] .K.N Arjun et al have utilized Mel Frequency Cepstral Coefficient to extract the feature set of speech signal acquired .In [Chee]the author discusses the techniques and methodologies for extracting the words which are prolonged and

repeated by analyzing the speech signals using Linear Predictive Cepstral Coefficient [LPCC]. The author has also utilized the linear discriminant analysis classification and k nearest neighbors [kNN] for recognizing the prolonged words. [Ooi Chia] have discussed the speech parameterization methods. The authors used both MFCC and LPCC for identifying the stuttered speech. Linear discriminant analysis (LDA) and kNN classifiers were used to classify the speech signal. According to these authors, LPCC offers better performance than LPPC. By providing proper auditory feedback, the stutter correction can be made. The authors of [10] have discussed the effect of the auditory feedback when given to the stutters. They have used non-altered auditory feedback, delayed auditory feedback, frequency altered feedback.

III. MATERIALS AND METHODS

Acquiring and filtering the signal

The software for stuttering correction is designed using LABVIEW and system. The sound signal is acquired using a microphone which is initialized and acquired using the acquire sound block diagram of LABVIEW. The signals are properly filtered in lab view. The FIR band pass filter with fast Fourier transform is used to process the acquired sound signal. This filter offers better spectral variation control. The speech signals are time normalized for good recognition of the words spoken. Then the sound is played from the sound output device using finite sampling. Fig 1. depicts the block diagram of LABVIEW front panel for the acquisition of sound signal.

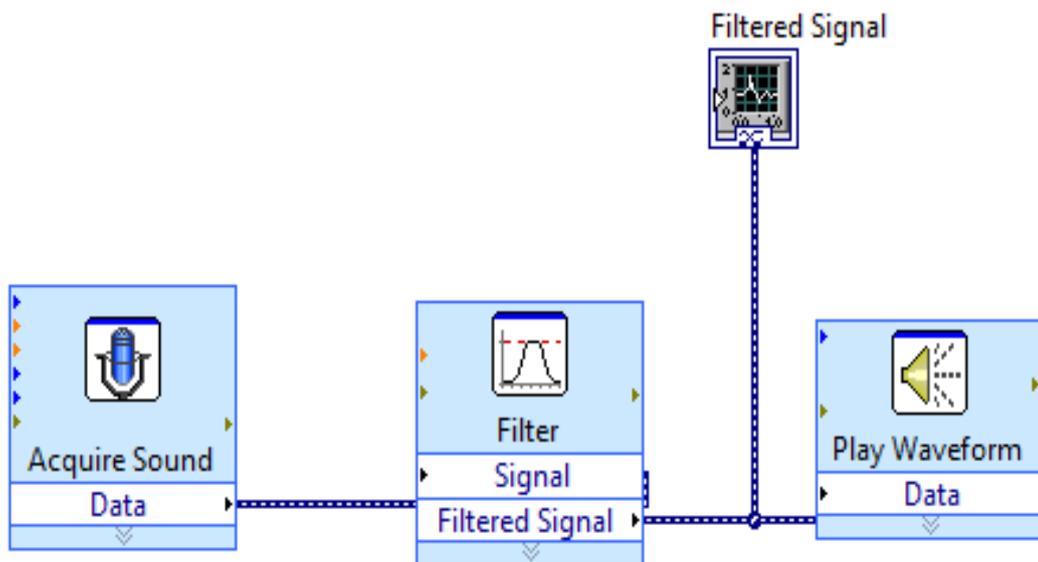


Figure 1: Acquisition of sound signal

Auditory and visual feedback

The recorded sound templates for specific words are built and the user selects the word which to be practiced by the stutters by using a play sound file block diagram of LABVIEW. The file is converted into .wav file and played to the user for practice of the words. The user listens to those words thus achieving the auditory feedback.

Comparing sounds

After giving the auditory feedback to the patient, the stutterer is asked to speak. The spoken word is read using wavread in MATLAB script. The sampling rate and sampled data are obtained. The discrete Fourier transform of the sampled data is calculated. MFCC is applied and the features of the signal are obtained. The power spectral density is also obtained. The spectrogram was plotted for both the voice (sounds) and the difference between the normal and stammered voice were observed from the spectrogram patterns.

From the spectrogram the corresponding waveforms were also obtained for analysis.

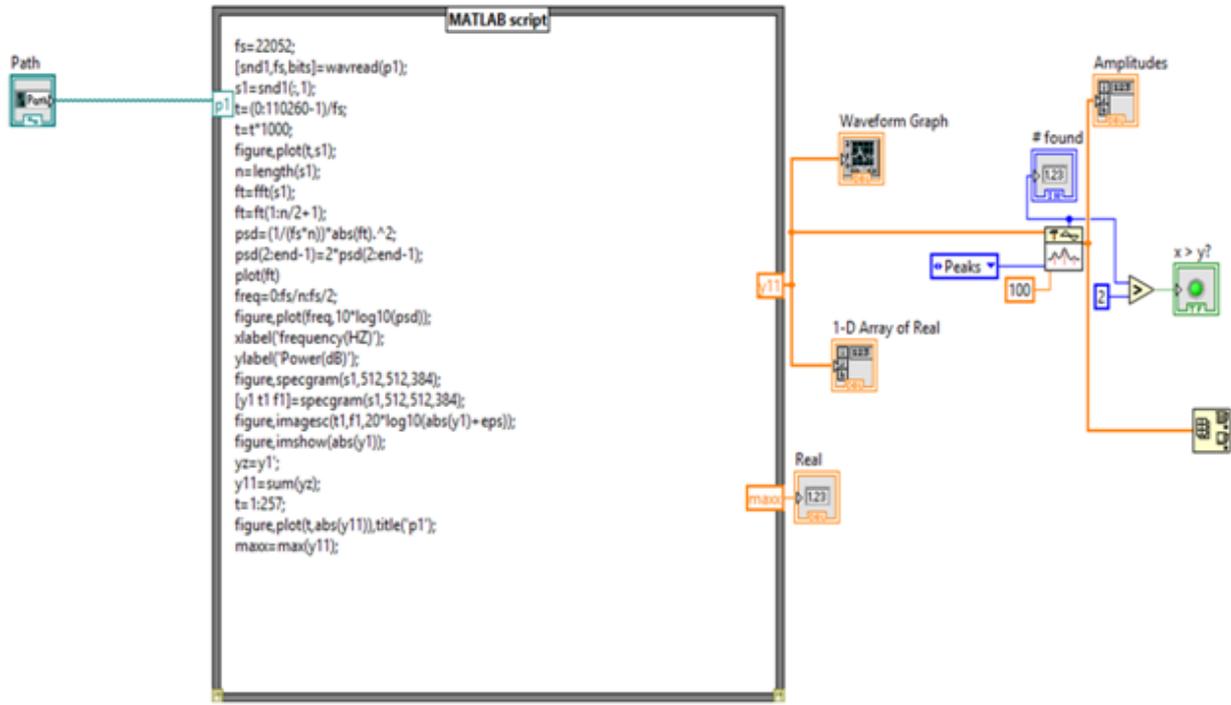


Figure 2: Matlab script for comparing the sound

Designing visual hue

The positive biofeedback is the important module of this paper. This positive feedback enhances the emotion status induces a state of relaxation and improves self regulation and self confidence .Here the positive feedback is designed as an award system when the time of the stutter speech is approximating the recorded standard templates. A an interactive immersive environment is designed in LABVIEW with time taken to pronounce the word. It is a reward based system. As the stutter gets more rewarded his/her confidence increases which indirectly makes them to pronounce much better

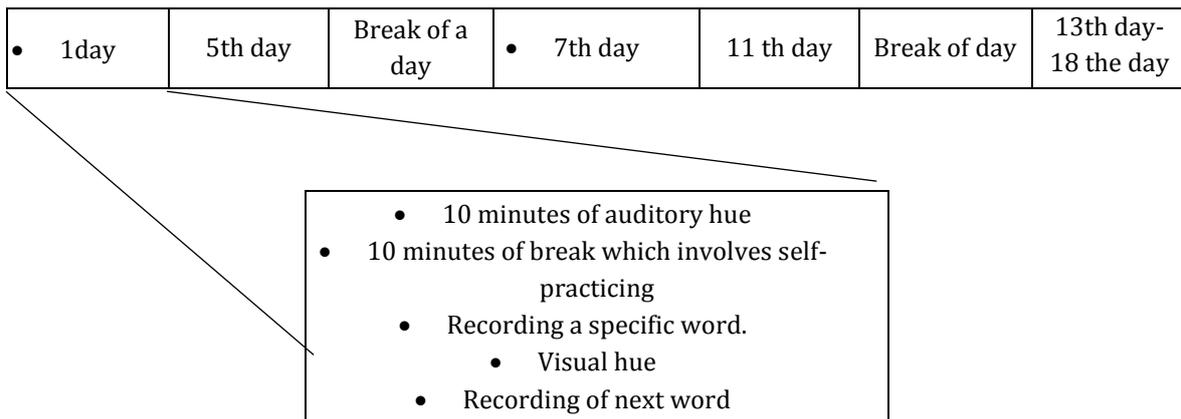


Figure 3: Scheduled auditory and visual feedback training

Training to patient

The stutter training involves the training of 20 days with an half an hour training session for every day .the schedule of training is well explained in the Figure. 3. Both the auditory feedback and visual hue is given to the subject once they approach towards the threshold.

IV. RESULTS AND DISCUSSION

The soundwave form for each and every word during the training is recorded and displayed .The Figure 4 and Figure 5. shows the comparison of wave for the normal and stutters waveform for the word bisyllable word apple

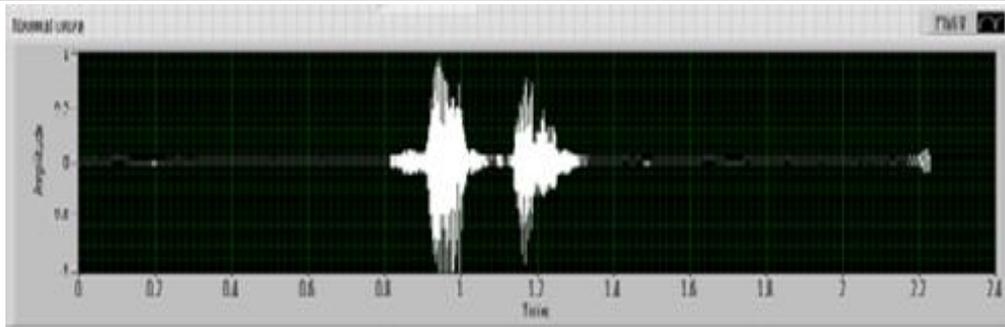


Figure 4: The sound waveform of Normal voice for the word Apple

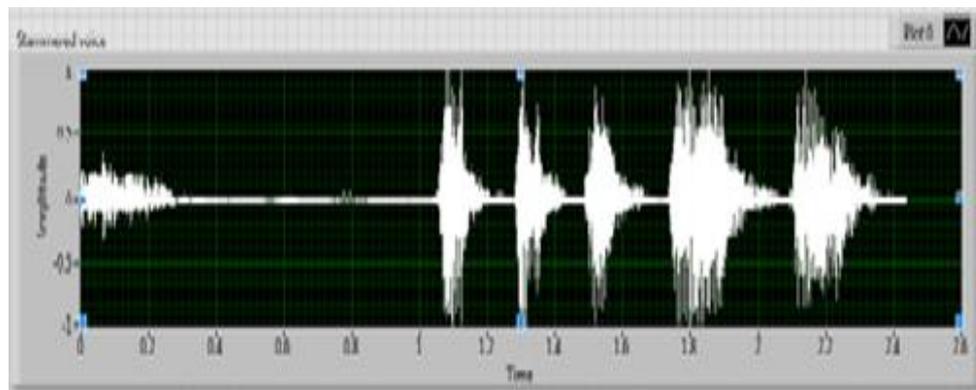


Figure 5: The sound waveform of stutters voice for the word Apple

The features are extracted from these signals using Mel Frequency Cepstral Coefficient and also power spectral density is obtained .These signal are analysed and specgram was obtained Fig 6 shows the specgram comparison.

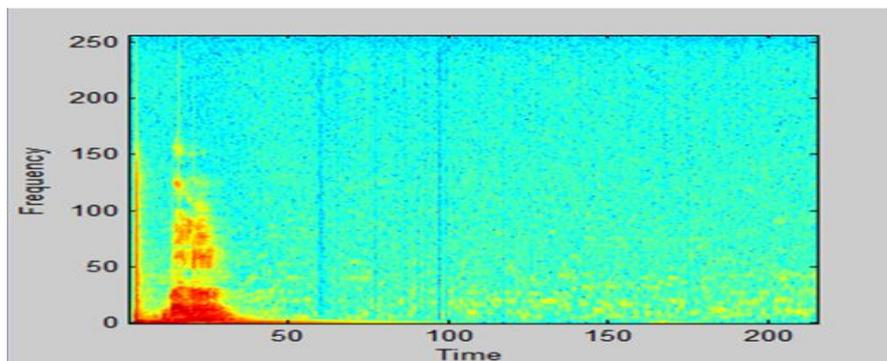


Figure 6: Specgram of the normal person for the word apple

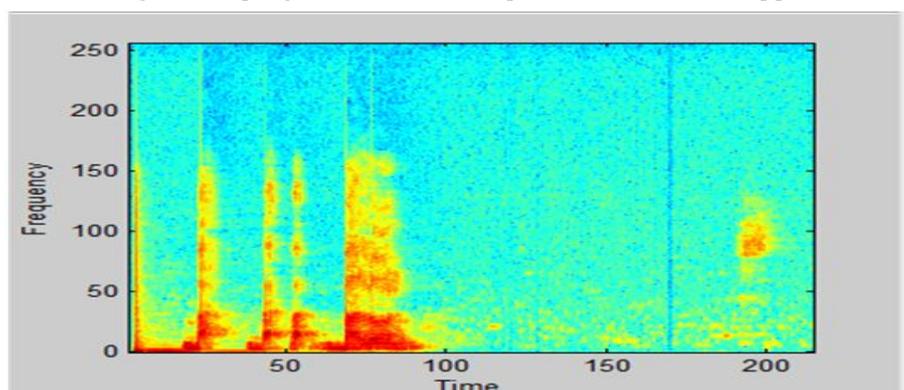


Figure 7: Specgram of the stutters for the word apple

When the training started and the stutter was given with auditory hue of their previous day recording and the standard template the patient were able to identify the way they stuttering and try to correct it to their level maximum .The threshold was set for the patient individually on the performance of the previous day .As the approach closely to the normal visual motivation is given through a reward system .This makes the children very effectively to take the training effectively to correct them .

Table 1. show the time taken for the stutters to pronounce a word .This comparsion show the effectiveness of the treatment.

Table 1: Comparsion of effectiveness of the feedback training

SN.	Day 1	Day5	Day 7	Day 11	Day 13	Day 18
1	1.8	1.6	1.7	1.4	1.2	1.1
2	1.3	1.3	1.4	1.1	1.1	1.1
3	2.1	2.1	1.9	1.5	1.4	1.4
4	1.8	1.7	1.8	1.6	1.5	1.4
5	1.4.	1.2	1.3	1.4	1.2	1.0
6	1.6	1.45	1.4	1.5	1.5	1.4
7	1.4	1.3	1.4	1.4	1.3	1.2
8	2.2	1.9	1.9	1.8	1.6	1.4

V. CONCLUSION

Stutters lack in confidence while speak in public. Stuttering creates a great burden when it comes to children. It stops them in mingling with their peer group.when stuttering is corrected with the earlier stages then it becomes easy for them to communicate .Hence it is necessary to give speech therapy at younger ages. The auditory feedback is evident in correcting the stutters when case of adults . For children along with auditory feedback, visual hue can also be accomodated to provide a postive reward mechanism .This boosts the childrens' participation in the therapy.thus more effective in stutter correction . This research shows that the performance of the stutters increases by the auditory and visual hues .As a future work an immerse environment for the auditory and visual feedback can be designed for training the children with stammering.

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