ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 3, March 2015

Detection of Parkinson'S Disease by Speech Analysis

Ch.Rajanikanth [1], A.Amardeep [2], B.Kishore[3], Shaik Azeez [4]

Student, Department of ECE, Lendi Institute of Engineering And Technology, Vizianagaram, India[1]

Student, Department of ECE, Lendi Institute of Engineering And Technology, Vizianagaram, India[2]

Student, Department of ECE, Lendi Institute of Engineering And Technology, Vizianagaram, India[3]

Assistant Professor, Department of ECE, Lendi Institute of Engineering and Technology, Vizianagaram, India[4].

ABSTRACT: - Parkinson's Disease (PD) is a degenerative disorder of central nervous system. PD occurs when nerve cells or neurons, in the brain die or became impaired. The main symptoms are shaking, stiffness, slowness of movement and unsteadiness. PD is incurable disease. PD is also called as IDIOPATHIC PD. Its main affect lies on SUBSTANTIA NIGRA. Speech analysis is one of ways of diagnosing this disease depending on pronunciation of vowel sound. This project's core idea is to identify and indicate whether the person has the disease or not. And we are going to implement this project under the platform of the MATLAB software. The design of this project is executed through some of the respective sequential modules. The initial step is to take the respective person's voice as the input and to this input, the desired or framed noise is to be added and processed. After the processing, the added noise is removed and compared and cross-checked with reference signal, which is free from PD. Finally the presence or absence of the Parkinson's disease of respective person is will be indicated in the output module.

KEYWORDS: **SUBSTANTIA NIGRA, IDIOPATHIC.**

I. INTRODUCTION

Parkinson's disease (PD) is the second most prevalent neurodegenerative disorder after the Alzheimer's disease and about 1% of the people older than 65 suffer from this disease. About 90% of people with PD have disordered speech and such disorders are associated to motor impairments such as rigidity, bradykinesia, hypokinesia and tremor. Perceptually, speech and voice of people with PD are characterized by reduced loudness, monopitch, monoloudness, reduced stress, breathy, hoarse voice quality, imprecise articulation, among others. All these symptoms are grouped and called hypo kinetic dysarthria. Voice problems are typically one of the first symptoms of PD, and while the disease is progressing, other speech problems appear affecting different speech characteristics, such as prosody, articulation, and fluency. There are works focused on the automatic classification of speech of people with PD and people without any speech disorder or neurological disease, also called healthy controls (HC) however, the real contribution of the features considered on those works remains unclear.

The typical Parkinson's gait develops over time as a result of the features of Parkinson's disease such as bradykinesia (slowness of movement), loss of postural reflexes, and rigidity (increased tone). The gait of a person is his manner of walking and normally, a person will walk upright, with steady steps and even strides, and arms swinging by his sides.

The distinctive gait of a person with Parkinson's disease comprises of features such as stooped posture, slowness to start walking, short shuffling steps and a tendency to run with reduced arm swing . Since the causes are confused, the treatment slows down the illness evolution and attenuates the invalidating symptoms (the tremor). The mechanism by which chronic, high frequency, electrical Deep Brain Stimulation suppresses Parkinson an tremor is unknown. Alternative treatments and techniques were proposed and developed.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 3, March 2015

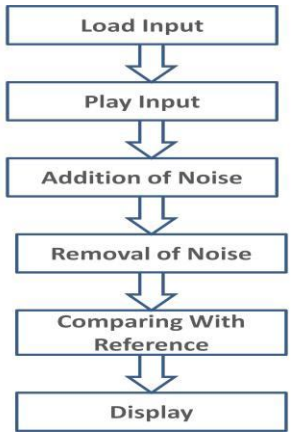
II. PD EFFECT S ON HUMAN VOICE

PD is characterized by the loss of dopaminergic neurons in brain. This loss results in dysfunction of basal ganglia pathway which is an essential part of the circuitry that mediates motor and cognitive functions. As a result of dopamine loss in basal ganglia, there can be a number of motor symptoms such as rigidity, akinesia (loss of control over voluntary muscle movements), bradykinesia (abnormal slowness in muscle movements), rest tremor, postural abnormalities, and speech dysfunction.

Physical symptoms that can occur in the limbs can also occur in the speech system. These symptoms are classified as hyperkinetic dysarthria (HKD) . "Dysarthria" refers to a speech disorder due to a change in muscle control. Hypokinetic means reduced movement. Thus, hypokinetic dysarthria is reduced movement of the muscles used for speech production.

Approximately 75-90% of individuals with Parkinson disease (PD) have speech and voice disorders at some time in the course of their disease. The most common perceptual speech characteristics include reduced loudness, monopitch, hoarseness, a breathy voice quality and/or imprecise articulation. The exact cause of these speech symptoms is not clearly understood, but they may be related to the rigidity of movement, slowness of movement and reduced amplitude of movement of individuals with PD. In addition, people with PD may not be aware that they are getting softer in their speech and more difficult to understand. These voice and speech symptoms can have a significantly negative impact on quality of life. The presence of speech and voice disorders can effect communication at work, with family or with friends. Seeking an evaluation with a speech-language pathologist experienced with PD as early as possible is important so you can begin an effective treatment program. You will need a prescripttion from your physician for this.

III. TESTING OF PARKINSON'S DISEASE



The design of this project is executed through some of the respective sequential modules. The initial step is to take the respective person's voice as the input and to this input, the desired or framed noise is to be added and processed. After the processing, the added noise is removed and compared and cross-checked with reference signal, which is free from PD. Finally the presence or absence of the PARKINSON's DISEASE of respective person is will be indicated in the output module.

Step-1: Initially, we will load the audio signals in the data base.
Step-2: Now, we will load the input audio signal or we will make the patient to spell any one of the audio signals Present in the Data Base

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 3, March 2015

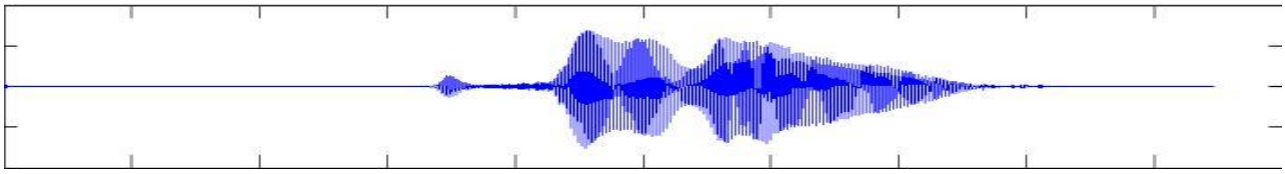


Figure 6.1

Step-3: Next, We will adds any of the noises to the input audio signal for the exact comparison with the data base sign.

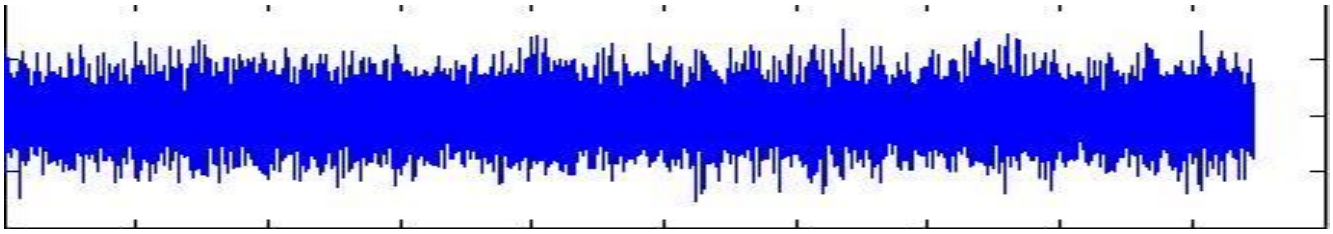


Figure 6.2

Step-4: Now the Noised signal will be denoised by using any of the filters present but we here we will use wavelet Filters with three levels

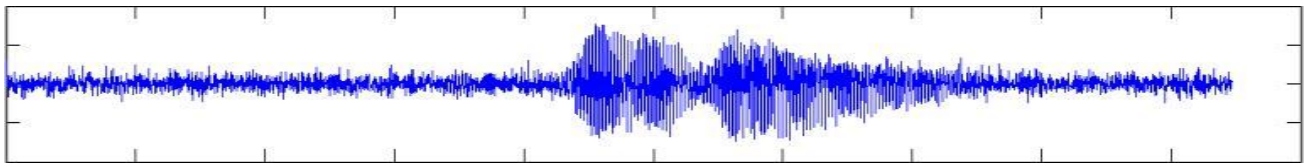


Figure 6.3

Step-5: After De-Noising the signal we will Threshold to a limit for exact SNR values of the signal.
Step-6: Now, the signal will be compared with the Original Signal Present in the data base
Step-7: If both signals are compared i.e. if both are equally spelled then the person is not having Parkinson's disease and if not he is having the Disease
Step-8: This is the operation of the Project.

IV. TYPES OF NOISES INTRODUCED:

a) Additive white Gaussian noise (AWGN):

It is a basic noise model used in Information theory to mimic the effect of many random processes that occur in nature.The modifiers denote specific characteristics: 'Additive' because it is added to any noise that might be intrinsic to the information system. 'White' refers to idea that it has uniform power across the frequency band for the information system. It is an analogy to the color white which has uniform emissions at all frequencies in the visible spectrum.'Gaussian' because it has a normal distribution in the time domain with an average time domain value of zero.

b) Gradient noise:

It is a type of noise commonly used as a procedural texture primitive in computer graphics. It is conceptually

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 3, March 2015

different, and often confused with value noise. This method consists of a creation of a lattice of random (or typically pseudorandom) gradients, which are then interpolated to obtain values in between the lattices. An artifact of some implementations of this noise is that the returned value at the lattice points is 0. Unlike the value noise, gradient noise has more energy in the high frequencies.

c) White noise:

In signal processing, **white noise** is a random signal with a constant power spectral density. The term is used, with this or similar meanings, in many scientific and technical disciplines, including physics, acoustic engineering, telecommunications, statistical forecasting, and many more. White noise refers to a statistical model for signals and signal sources, rather than to any specific signal.

It is often incorrectly assumed that Gaussian noise (i.e., noise with a Gaussian amplitude distribution see normal distribution) necessarily refers to white noise, yet neither property implies the other. Gaussianity refers to the probability distribution with respect to the value, in this context the probability of the signal falling within any particular range of amplitudes, while the term 'white' refers to the way the signal power is distributed (i.e., independently) over time or among frequencies.

d) Thermal noise:

Johnson–Nyquist noise (thermal noise, Johnson noise, or Nyquist noise) is the electronic noise generated by the thermal agitation of the charge carriers (usually the electrons) inside an electrical conductor at equilibrium, which happens regardless of any applied voltage. The generic, statistical physical derivation of this noise is called the fluctuation-dissipation theorem, where generalized impedance or generalized susceptibility is used to characterize the medium.

Thermal noise in an ideal resistor is approximately white, meaning that the power spectral density is nearly constant throughout the frequency spectrum (however see the section below on extremely high frequencies). When limited to a finite bandwidth, thermal noise has a nearly Gaussian amplitude distribution.

V. CONCLUSION

The main roadblock in the treatment of Parkinson's is proper dosage of the medications which provide relief from the symptoms. By automatically recording dyskinesia levels through different stages of the patient's medication cycle, doctors can more effectively adjust dosages to each patient's individual requirements. This thesis developed a way to automatically record and analyze such data.

This study investigated the potential of using speech signal analysis to (a) differentiate people with Parkinson‘s disease (PD) from healthy controls, and (b) replicate PD symptom severity as defined by the standard reference clinical metric Unified Parkinson‘s Disease. The extent of speech disorders was quantified using a wide range of speech signal processing algorithms known as dysphonic measures. We demonstrated that we can differentiate PD subjects and healthy controls with almost 99% accuracy. The derived Process may be helpful in (a) facilitating the process of screening patients, (b) avoiding sub-optimization of treatments, and (c) deciding if a treatment change leads to an improvement of a patient’s general condition or not.

REFERENCES

1. 1.Parkinson's UK, http://www.parkinsons.org.uk/about-parkinsons/what-is- parkinsons.aspx, (2013, 03, 22).
2. Web md, http://www.webmd.com/parkinsonsdisease/tc/parkinsons-disease- symptoms, (2013, 03, 22).
3. L.Pezard, R. Jech, E. RuÊzĬicĬka, Investigation of non-linear properties of multichannel EEG in the early stages of Parkinson's disease, Clini Neurophysiol, 122: 38-45, 2001.
4. R. Arefi Shirvan, E. Tahami, Voice analysis for detecting parkinson's desiease using genetic algorithm and KNN classification method, Proc 18th Int Con on Biomedical Enghineering, Tehran, pp. 550-555, 2011.
5. M. Ene, Neural network-based approach to discriminate healthy people from those with Parkinson's disease, Math Comp Sci Ser, 35:112-116, 2008.
6. Center for Machine Learning and Intelligent Systems.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 3, March 2015

BIOGRAPHY

CH.RAJANIKANTH pursuing 4th b.tech. in Lendi Institute Of Engineering & Technology in the stream ECE bearing regd.No 11KD1A0418.

A.AMARDEEP pursuing 4th b.tech. in Lendi Institute Of Engineering & Technology in the stream ECE bearing regd.No 11KD1A0404.

B.KISHORE pursuing 4th b.tech. in Lendi Institute Of Engineering & Technology in the stream ECE bearing regd.No 11KD1A0409.

SHAIK AZEEZ working as Assistant professor in Lendi institute of engg&tech with a five years of experience in teaching field