



Review on Parkinson Disease Detection Techniques

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Abstract: In this paper many techniques are reviewed through which Parkinson disease can be diagnosis. These techniques are based on different-different data sets like images, speech signals. After Alzheimer's disease, Parkinson's disease is ranked as 2nd most frequent neurodegenerative deformation. There are many symptoms of Parkinson disease like slowness in movement, stiffness, low balance muscle rigidity. It generally occur after the age of 50. It becomes more dangerous as the age of person increases. Cause of PD are still unknown. To improve the condition of patients the diagnosis techniques are developed and some therapies are suggested to give them good quality of life.

Keywords: Parkinson disease, detection techniques of PD.

I. INTRODUCTION

Parkinson Disease is a progressive neurodegenerative deformation of basic sense organs, most of all it disturb motor system. It generally affect the person after the age of 50. Its symptoms are mostly sloth of body movement, muscle rigor, vibration. PD breakdown the nerve cells which produces chemical material in the brain called dopamine[3]. Dopamine role as a neurotransmitter, a chemical discharged by nerve cells to send signals to other nerve cells. The another medicinal indication of PD is the deposition of unusual protein amount called Lewy bodies in the brain and it damage many neurotransmitter systems. Causes of Parkinson disease is still unknown[3].

PD is increasing very frequently in those countries where average age of people is grater then 50. It becomes more cruel as the age of the person increases. The number of patients living with Parkinson Disease are more then 10 million in allover the world. Many diagnosis methods are developed for Parkinson disease using speech signals or image processing[2]. Voice deterioration investigation has been used as an powerful way for initial detection of Parkinson's disease because 90% patients of PD have voice debility. The medication for PD are mostly therapy and regular exercise which are highly priced[4].

It becomes serious diseases that affect the basic sense organs of the patient. As long as the number of people infected with PD are increasing it is crucial to study the disease genuinely [12]. Festinating gait is generally seen motor syndrome of Parkinson's Disease patients. In this analysis the nature of festinating gait is observed through an accelerometer-based sensing system which is actualize on a vest. A accurate and fast way to diagnose PD would be most welcomed [12].

II. LITERATURE SURVEY

Parkinson's disease is a progressive neurodegenerative disorder. Risk of Parkinson disease increases with the age of person, most probably it occurs after the age of 50. so it is generality spreading in those countries in which length of life of the person is increasing. Cerebral complications are

general in Parkinson disease and diagnose those problems is an essential field of research. In this paper they analyze the latent for using objective, automated methods based around a simple figure copying exercise administered on a graphics tablet to people with Parkinson's disease. For this they use a multiobjective evolutionary algorithm to analyze a capacity of regression models and these models produce a combination of features derive from a patient's digitized drawing. This access is adapted to review the predictive regression models that capture a patient's degree of motor and cognitive dysfunction and the results of this access shows that analytic ratio of motor and Cerebral decline can be predicted, even if changing degree within distinctive patient subpopulations. From modeling point of view linear models presents to be higher guessing in contrast to polynomial models [12].

Festinating gait is generally seen motor syndrome of Parkinson's Disease patients. In this analysis the nature of festinating gait is observed through an accelerometer-based sensing system which is actualize on a vest. The disclosure algorithm is based on the analysis of gait similarity from the data measured by accelerometers. Clear-cut indications were scheduled to check the sharpness of festinating gait nature. This system disclose the upper body lean ahead slant while walking, as well as it could be used for long-term course monitoring tool for the progress of festinating gait. This tool support users to see the enlargement of the radical nature of festinating gait and to have good medication on PD earlier. In the proposed system a step symmetry index on gait pattern is presented for the detection of fast shuffling footsteps. The single and double-side fast shuffling footstep can be recognized using average and standard deviation of step symmetry [2].

Voice destruction study has been used as an productive mechanism for initial detection of Parkinson's disease (PD). This paper describe a powerful way to forecast Parkinson's disease accurately using voice samples with Extreme Learning Machine. This system is compared with reliable dataset from UCI repository. The efficiency of this system is 90.76% for differentiate between Parkinson diseased subjects and healthy subjects and 0.81 MCC for the training dataset. This technique is also compared with

existing techniques like Neural Network and Support Vector Machine and results shows that this method is reliable for diagnose the Parkinson’s disease. The given system is an powerful approach to achieve an specific predictive model for telemonitoring of Parkinson’s disease using Extreme Learning Machine (ELM). To identify PD subjects accuracy of the system is 81.55%. This study depicts that constant vowels give ample clue to forecast Parkinson’s disease. It is a reliable model because of its simple construction and built in learning of the data [4].

In this paper different ways to diagnosis of Parkinson’s disease at its initial state using voice are described. Main motive of this research is to give a good working and economical system for the detection of Parkinson’s disease. As we know there is no cure for PD and existing therapies are highly priced for PD. These therapies may give little bit peace to the patients and help them to improve their quality of life. Our speech carry various features which have essential disparity between healthy people and Parkinson’s patient such as pitch, jitter shimmer, Mel-frequency Cepstral Coefficient (MFCC), glottal pulse and formant. All these features are diagnosis and tested for healthy and PD patients [5]. According to this analysis:

1. The pitch of PD patient is higher then normal person in males.
2. Normal person have less Formants disparity from PD patients
3. Normal persons have less jitter and Shimmer values as compared to PD patients [5].

As we know there is no cure for Parkinson’s Disease, patients need to attend reclamation programs continuously, so that they can attain good of life. But at some point they got bored from this process and give up. Exergames is a program in which character-based, virtual reality exercises are provided in the form of games and these games engage players to train in a non-linear mode by giving them training which varies from one game loop the next. This game carry a number of gestures drawn from current PD special training schedule that advocate big and purposive action, meant to better postural balance and reflexes as well as improve the global movability of upper and lower limbs. When limbs movements of patient match with the programmed gesture, a 3D cartoon avatar behave respectively. Conclusively, this game decision making wish to enhance patient’s cognitive reaction. An exergame is designed and developed clear for PD patients with warm to gentle motor symptoms to practice on their own [6].

III. PARKINSON DISEASE DETECTION TECHNIQUES

1. An Accelerometer-based Festinating Gait Detection Algorithm:

Festinating gait is generally seen motor syndrome of Parkinson’s Disease patients. Rapid shuffling steps and the trunk flexed forward while walking is the most obvious symptom of festinating gait. Nature of festinating gait is continuous but it is challenging to inspect it in a short period of time. Sadly there is no observation engine is developed for forecasting continuous development of fasinating gait nature. In festinating gait the nature of this disorder changes after long period of time that’s why it is not noticed by people themselves easily. Besides, clinically there is no tool

for the evaluation of the motor symptoms for PD. Two movement disorders are given by festinating gait while working are as follows[2].

- i. Flexed forward upper trunk
- ii. Rapid shuffling steps

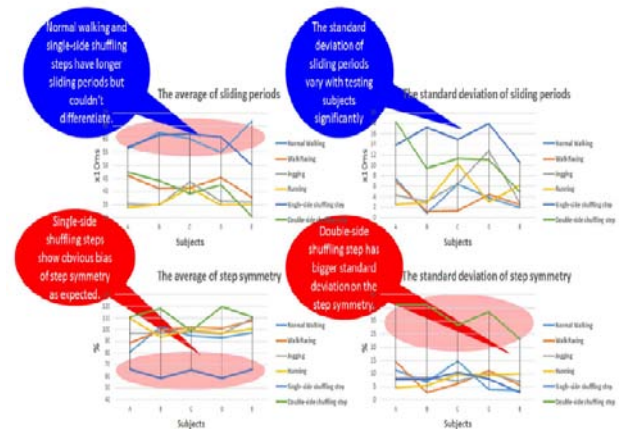


Figure 1. Analysis of six walking patterns: normal walking, walking race, jogging, running, single-side shuffling step, and double-side shuffling step with five volunteer testing subjects

Hence detection system needs to be capable of performing gait analysis and can measure the inclination angle of the upper body. For that a wearable device is implemented called posture monitoring vest with 3-axis accelerometers on it for posture monitoring and physical activity detection. The vest carry three locations of accelerometer, first is on the chest for upper trunk inclination angle measurement and another two located on the side of the body for gait analysis and detection of rapid shuffling steps.

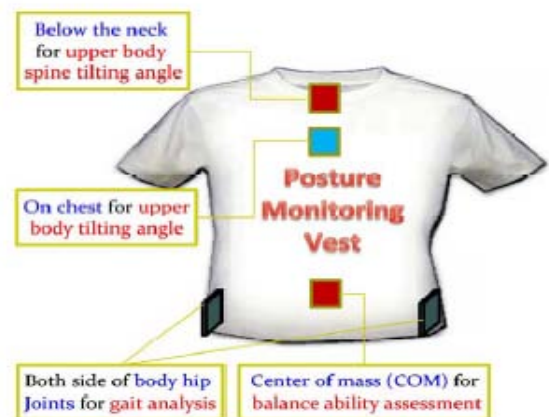


Figure2. sensor location

2. Parkinson's Disease Severity Estimation Based on Speech Signal Processing:

Besides the general motor symptoms of PD, patients commonly develop a multi-modal disruption of motor speech realization mentioned to as hypokinetic dysarthria(HD). According to the past research, HD influence the area of vocalization, articulation, prosody, speech fluency and faciokinesis. In short the given voice deformation respective with HD in PD have been observed: increased acoustic noise [1], decrease voice strength, noisy

breathy speech condition[7],increased voice vibration[8], decrease variability of pitch and loudness combined with speech rate abnormalities [9], imprecise consonant articulation [10], unintentional introduction of pauses [11], rapid repetition of words or syllables [11], sudden deceleration or acceleration in speech. At the latest, analyst have concentrate on the prognosis of scientific rating scales calculating severity of PD and its progress. A model is proposed that can differ healthy and patient speech by assessment of hypokinetic dysarthria with a major target on estimation of PD severity using the audio analysis of voice signals. Degree of severity of PD is estimated according to the Unified Parkinson's Disease Rating Scale, motor subscale: UPDRS III. Methodology used in this diagnostic technique is firstly speech corpus done, after that features are extracted from samples of voice, then well differential features are extracted and these extracted features are mapped to UPDRS III [3].

3.Exergames for Parkinson's Disease Patients:

Exergame is presented for PD patients named as Balloon Goon game. It is a game that helps PD patients to improve their quality of life by doing exercise in the form of game. The reports is presented on the design and implementation of a Kinect-based exergame tailored to PD patients with mild to moderate symptoms. Patients in this category suffer from mild postural instability and motor impairment [6]. It is a score-based game in which the user pops balloons dropping randomly along four vertical posts via controlled arm and leg gestures reminiscent of “punches” and “kicks”. As shown in the figure.

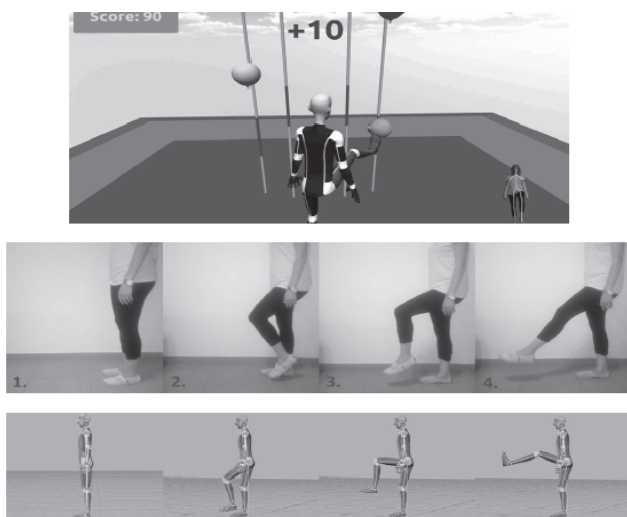


Figure3. kick animation during gameplay

Balloons falling along the two inner posts can be popped using arm extensions (“punches”), while leg extensions (“kicks”) pop balloons falling along the outer posts. To encourage bilateral movement and score maximization, balloons falling along the left/right two pillars can only be popped by left/right hand and foot movements. Admissible arm and leg gestures trigger predefined animations of a virtual cartoon character. There are three levels of game, each level increases the difficulty of the game. When user went to higher level then speed of game will increases and more number of balloons will be there. The third level is more enjoyable and popular in motor and cognitive capabilities and reaction time because it includes higher

value balloons as well as “bomb” balloons. If it is misfired the balloon then score will decrease. For increasing their interest the score are displayed on the screen regularly also and after game completion. In addition, game-embedded decision making triggers the player’s cognitive reaction [6].

V. CONCLUSION

This paper is describing the study of Parkinson disease and its diagnosis techniques, as we know there is no cure for PD is identified yet. But there are many models are developed for the detection of Parkinson disease. So we have studied these techniques and described some models in our paper. After studying these techniques we have analyzed that voice recognition systems are the best way to early detection of Parkinson disease. Because most obvious symptom of Parkinson disease is voice rigidity, degradation of voice strength, increased voice vibration, decreases the pitch voice. It is also a easy and cheapest technique as compared to others. As a future work, we will study more Parkinson disease detection techniques and enhance our research area and present some valuable work.

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