



Parkinson's disease detection using spiral drawing technique and facial expression

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ABSTRACT

Parkinson's disorder is a modern sickness of the apprehensive system marked through tremor, muscular stress and slow, vague movement, mainly affecting middle- elderly and aged people. Parkinson's disorder is a modern sickness of the apprehensive gadget marked through Tremor, Muscular Rigidity and slow, vague movement, mainly affecting middle-elderly and aged people. This Project gives a non-invasive, dependable approach for the detecting Parkinson's disorder through Spiral drawing and facial expression. Parkinson's disorder may be correctly detected at an early level through measuring the modifications in handwritten spiral drawing and detecting the people's face expressions and amassing the information and acting CNN detection can effortlessly be made. Thus, our output will exhibit the early detection of the disorder and may be capable of boosting the lifespan of the diseased affected person with right remedies and medicinal drugs leading to nonviolent life. However, research assessing talents in spotting facial feelings in PD nevertheless record contradictory outcomes. The proposed gadget may be utilized by the overall physicians for the prediction of Parkinson's disorder without the traditional and high- priced diagnostic tools.

Keywords: Parkinson'sNeurodegenerative,Hypomimia, Spiral Drawing, Facial Expression

Introduction

Parkinson's Disease(PD) is a neurodegenerative ailment produced by means of the lack of dopaminergic feature a characterized by means of motor disorders, including tremorbradykinesia, tension and posturalin stability. There presently no goal to take a look at for PD and the fee misdiagnosis is excessive, specifically while the analysis made via the means of a non-specialist: the possibility of erroneous analysis may be as excessive. Cautious evaluation of the primary symptoms, including tremor,bradykinesia and tension growth the analysis are however scientific checks may be motivated by way of mea of the doctor subjectivity

Medical choice help equipment are very exciting for growing objectivity and for supporting in an early analysis. This early analysis could permit the layout of particular remedies for PD patients. A vital study's intention for neurodegenerative illnesses is to perceive correct biomarkers. The method refers back to the device studying algorithms used for function extraction and classification.

The smaller the quantity of records considered; the extra difficulty is the choice. The wonderful element of the use of a smaller quantity of records is that the machine may be much less invasive. All the works protected in Table use a topic-sensible pass validation. This pass-validation method includes dividing the records into schooling and checking out subsetsensuring that there aren't drawings from the equal situation in schooling and checking out within side the equal experiment. This way, we save you the machine from studying particular traits of a topic in place of PD features.

Using a simplified model of the VGG however with an vital distinction: The inputs to the CNN are the spectrum factors in place of the uncooked records directly. This distinction has been very vital to enhance the performance.

Convolutional Neural Network is a Deep Learning set of rules mainly designed for operating with Images and videos. It takes pics as inputs, extracts and learns the capabilities of the photo, and classifies them primarily based totally on the discovered capabilities.A convolutional neural community is used to hit upon and classify gadgets in a photo.

VGG stands for Visual Geometry Group. It is a widespread deep Convolutional Neural Network (CNN) structure with more than one layer. The "deep" refers back to the wide variety of layers with VGG-16 or VGG-19 including sixteen and 19 convolutional layers. VGG16 isan item detection and class set of rules that is capable of classifying one thousand pics of one thousand one-of-a-kind classes with 92.7 accuracy. It is one of the famous algorithms for photo class and is straightforward to use

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LITERATUREREVIEW

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Methodology

Parkinson's disease is detected on the secondary level on (Dopamine deficiency) which ends up inscient if challenges. Also, medical doctors must manually have to look at and advocate scientific analysis wherein the signs a symptoms would possibly range from individual so suggesting medicinal drugs is likewise challenge. Thus, the intellectual problems had been poor characterized and featured many fitness complications. P is normally identified with subsequent scientific strategies as, MRI or CT scan Conventional MRI cannot discover early symptoms of Parkinson's disorder PET scan-is used evaluate pastime and characteristic of mind areas worried motionSPECT scan-can screen adjustments in chemistry, consisting of a lower in dopamine. This result in an excessive mis-diagnosis rate (as much as 25% means of non-specialists) and lots of years earlier than analysis, human beings will have the disorder. Though, the present machine isn't always powerful in early predictive and correct medicinal analysis to the affected human beings.

Proposed System

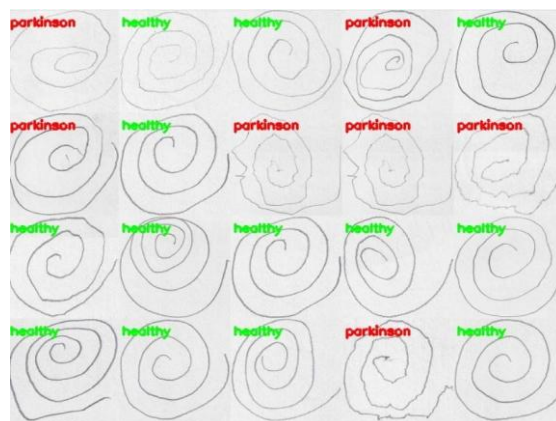
The proposed methods include spiral drawing method and facial features detection that is educated and carried out. Usage of convolution neural communityiftheeachoft approach intimates caution, then it's fartaken in consideration as Parkinson sicknessesthose steps is execut todiscoverthefacialfeaturesoftheman or woman discover the man or woman is havingworrydiseasea additionally to discover the exceptional of spiral drawing.

Advantages

- High Accuracy Rate in detection
- Not much complicated process for affected persons.
- Due to early detection of PD expands the lifespan of disease affected persons.

Spiral drawing technique:

The observable symptoms of PD at an early stage include disorders in handwriting and repetitive tasks of spiral drawing. It is easier to collect spiral drawing samples using a digitized tablet. We proposed detailed analysis of Static and dynamic spirals drawn by PD patients. For this, in-air and on-surface kinematic variables are taken out from data files generated for 25 patients and 15 healthy controls, using mathematical models.



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Fig3.1 Spiral Drawings Collection

FACIAL EXPRESSION DETECTION:**Data Collection**

People with PD usually suffer from loss of facial expression on both sides of the face. Moreover, their eye movement is reduced, like wearing a mask. This symptom is usually called the “mask face”. Motion retardation is one of the main symptoms of PD. When facial symptoms appear, movement in facial expressions is significantly reduced, accompanied by local tremor symptoms of the small tendon group

Implementation:

Dataset- We used a public dataset: the Parkins Disease Spiral Drawings Using Digitized Graphics Tab dataset. This dataset includes spiral drawings from people with PD and healthy people in the control group. The dataset was recorded using the Wacom Cintiq WX graph tablet. This tablet allows showing a PC's screen on its display and interacting with a digital pen. In total, five times were recorded for each drawing. In this work, we use a simplified version of the VGG but with an important difference: The inputs to the CNN are the spectrum points instead of the raw data directly. This difference has been very important to improve the performance. The reason is because the tremor, that is the most prevalent PD symptom, becomes more apparent in the frequency domain. To the best of knowledge, this work shows the best results on the Parkins Disease Spiral Drawings Using Digitized Graphics Tab dataset considering a subject-wise cross validation. The paper is organized as follows. Section reviews the material and methods used in this study, including a description of the dataset and the CNN. Section describes the experiments and the obtained results. Section includes the main discussion. Finally, the section summarizes the main conclusions of the paper.

Materials and Methods:

This section describes the dataset used in this study, the signal pre-processing and the CNN used for PD detection from drawing movements. Every recording includes information about X-Y-Z coordinates, pressure, and grip angle obtained from the API functions of the device. Recorded information: x-y-z coordinates, pressure and grip angle. All the subjects performed three types of handwriting recordings. The first one was the Static Spiral Test (SST). In this type, subjects were asked to retrace three wound Archimedean spirals that appear in the screen. The second type was the Dynamic Spiral Test (DST). Unlike SST, for DST, the Archimedean spiral appeared and disappeared for a few seconds, forcing the subject to keep in mind the image while drawing. The last test was the Stability Test on Certain Point (STCP). In this test, a red Electronics of point is situated in the middle of the screen.

IMPORTING THE DATASET:

The dataset for two categories (Spiral drawing and Facial Expression Detection) is collected from a data science website called Kaggle. These data are collected and placed in different folders with respective disease name and uploaded for pre-processing.

DATASET PRE-PROCESSING:

In data pre-processing, the enhancing and resizing of images is done because the dataset images are individually varied from their size so to train the data, image resizing is mandatory. Enhancing techniques: grayscale conversion and histogram equalization.

TRAINING:

After data pre-processing the CNN training model is created using VGG-16 Architecture. The accuracy of the model is optimized using hyper parameter adjustment.

TESTING:

After training the dataset the model file is created and during classification test image is imported and pre-processed and CNN prediction is done using the model file and the result is classified.

OUTPUT DESIGN

Pre-processing: After cropping out the face region, we performed histogram equalization so as to avoid illumination change.

Then an ellipse shaped mask is used to remove some of the corner regions such as the collar, for reducing the unnecessary effects of these regions. The masking step, however, is not employed for the detected out-of-session face images since the images are of low quality and have small size.

Feature extraction: After the pre-processing step, the Local Binary Pattern (LBP) operator is used for our face description. LBP is one of the best performing texture descriptors and it has been widely used in various applications. Its important to be highly discriminative and its key advantages, namely, its invariance to

monotonic grayscale changes and computational efficiency, make it suitable for demanding image analysis tasks.

Verification System: It's used to verify the user face and body recognition and compare sample gallery then it gives valid results to make the correct decision. It verifies the valid user or invalid user using the frontal face images captured by an embedded camera.

Object Detection: This module is used to detect if the user may be wearing a mask and have any object (strike, gun, knife) using OpenCV's built-in Haar cascade profile face detector. User wearing a big mask in case using the best rotation angle for maximizing the face detection

Results

Spiral drawing technique's outcomes for a healthy person and a Parkinson's patient:



1 Outcome of a normal person's spiral drawing is evaluated to be healthy



2 Outcome of spiral drawing of a Person with Parkinson disease is detected correctly.

CONCLUSION

Spiral drawing is one of the initial signs of PD and evaluating drawing movements is easy to perform because it does not require any invasive procedures. The main contribution has been the proposal of the spectrum as inputs to a CNN for PD detection. The CNN includes convolution layers (features learning) and fully connected layers (for PD detection). We evaluated the detection capability of different directions during drawing movements obtaining the best results for X and Y directions. Using a public dataset, Parkinson Disease Spiral Drawings Using DigitizedGraphics Tablet dataset, the best results obtained in this work showed an accuracy of 91.5%, a F1-score of 97.7%. Facial detection of PD based on facial expression recognition.

The Facial expression disease detection was validated. The results can help doctors understand the real-time dynamics of the disease and even conduct remote diagnosis.

This Two system represents a non-invasive, reliable method for the detection of Parkinson's disease. Thus, any hand can be considered for the analysis. Also, readings obtained from all the two axes for both the hands are almost the same, thus for implementation of such a system any one axis can be considered. Sufficient data needs to be collected for confirmed diagnosis of Parkinson's disease based on tremor analysis.

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