A Comprehensive Study of Imaging and Machine Learning Techniques for Diagnosis the Disease

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Abstract. Cerebral Palsy (CP) is described as a neurological disorder due to the abnormalities that develop during brain development in kids. This paper represented the past work on Iris detection and machine learning classification techniques. The experimental result shows the best accuracy obtained for detection of iris and eye corner by our algorithm for the real world conditions with state of art methodology.

Keywords: Digital Image Processing Methododlogy, Classification Methodology, Machine Learning Analysis, Analysing the Improvement CP Children.

1 Introduction

This computational approach automatically categories the abnormalities and identifies the percentage of improvement for CP kids and also determined the effectiveness of visual therapy [1]. By image processing techniques, the iris center coordinate values and central axis of the eye values are extracted. From these values the deviation position of the CP kid is newly obtained by measuring center of iris and accurate central axis of eye [2]. From the experimental results, it was interfered that rehabilitation has improved brain neuron activity which in turn improved the eye performance [3]. Currently, improvement in CP kids undergoing rehabilitation is assessed by VEP test [4].

2 Literature Review - Work Related to analysed the Visual conditions of CP kids

The Percentage obtained by CP kids Visual Problems are analyzed statistically illustrated in Fig. 1.
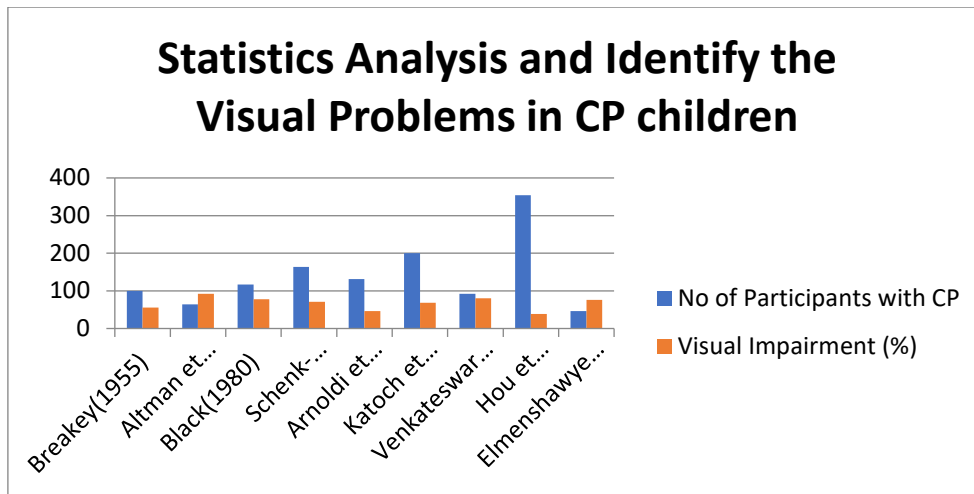
Fig. 1. Statistical Analysis of Visual Conditions in CP Kids

Table 1 represents the Literature Review for assessing the oculomotor deficits conditions of CP children.

Table 1. Survey for assessing the oculomotor deficits conditions of CP kids

Applications	No of Participants	Examination	Comparison	Outcome
Diagnosis and treatment the brain disorders for Stroke Patients [5]	16 participants(8 stroke patients and 8 Normal)	Oculomotor conditions of patients are examined	Eye fixation, smooth pursuit, and blinking parameter are compared in stroke survivors with healthy individuals	Visual stimuli may serve as potential tool for stroke assessment.

3 Literature Survey - Work Related to Investigate the Effectiveness of Vision Therapy techniques for Rehabilitation Process

The analysis of various eye movements in effective way to examine the visual perception. Here EOG techniques used for recording the corneal-retinal potential. The neural network which are used in the analysis of eye movements which are time delay and feed forward neural network, results shows the eleven direction of eye movement signals and used in neural networks [6].

To improve the Vision and Speech for CP Children by using the computer aided system, the survey provides the useful information to clinicians that will aid in the development of treatment plans for visual and speech impairment in this population [7].

4 Literature Survey - Work Related to evaluate the Image Processing algorithms for detecting the eye features like Pupil, Iris, Corner Point and center axis of the eye

The research methodology using eye image the iris portion is recognized for biometric application. Iris is unique for each person. Pupil portion in Eye image detected by canny edge detection and CHT Process. Furthermore, the texture feature of iris is extracted by using the Wavelet transform techniques.

The designed work of robust sclera recognition system with high accuracy for validating the Sclera Region, Here Iris detection process done by applying integro differential operator. This application useful in Vessel Classification. Described the image processing-based artificial neural network for the treatment and diagnosis of heart valve diseases, the extracting the texture feature of medical echocardiography images with gray level concurrence matrix features by using the back-propagation algorithm to classify the heart valve disease more precise and accurately. The results show that the efficiency of this algorithm is good in classification and performance. Table 2 represents the Pupil Detection Process: A Brief Overview, Table 3 represents the Iris Detection Process: A Brief Overview, Table 4 represents the Eye Corner Detection Process: A Brief Overview.

Table 2. Pupil Detection: A Brief Overview

Applications	Methods	Total No of Image	Success Rate%	Outcome
Iris Recognition	Ellipse fitting model	66 eye images that were taken from 22 kids from LPW database.	72.62%	Detected the pupil in near-infrared head-mounted cameras
Eye centre localization	Image gradients algorithms	1521 grey level images taken from BioID database of 23 different subjects with image size (286 × 384)	82.5%	Algorithm used for accurate eye centre localization based on image gradients.

Table 3 Iris Detection: A Brief Overview

Applications	Methods	Image Acquisition	Success Rate%	Outcome
Pupil Detection	Hand crafted Model, cascade regression	726 images taken randomly from Boid, GI4E, Talking Face Databases.	The accuracy yields 93.9%(Boid), 99.27%(GI4E), and 95.46% (TalkingFace)	Since this is the novel method, This algorithm is failed to detect the pupils are nearer to the eye corners.

Table 4. Eye Corner Detection: A Brief Overview

Applications	Methods	Total No of Image	Success Rate%	Outcome
Eye Corner Detection	Active Appearance model- used to segment the facial features. Harris corner detector- used for face point tracking method such as interface.	Selected 200 Image with Image size of 800*600 pixels from GI4E database.	99% achieved the success rate.	Best detection rate by using the Harris and Stephens algorithm with accurate and low cost estimating.

5 Discussion

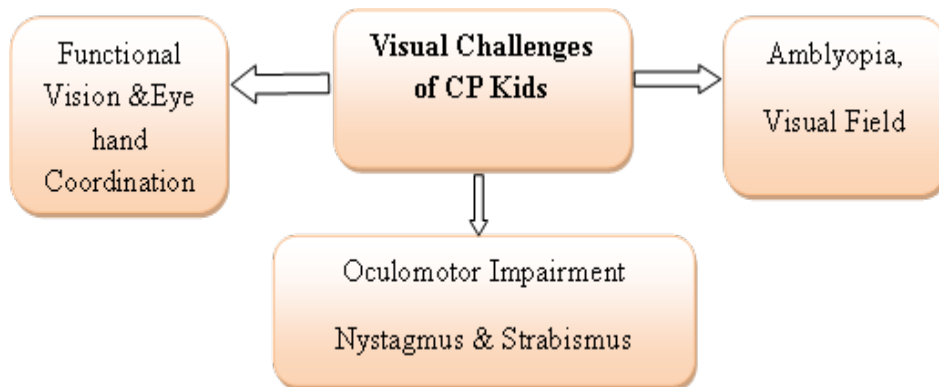The Fig. 2. Illustrate the overall most common problem that are facing by CP kids.

Fig. 2 Visual Conditions in CP kids

6 Results

The Table 5 represents the Performance Results of Iris and corresponding Fig. 3. represents the Performance Graph of Iris with state of art methodology. Similarly, Table 6 represents the Accuracies in % of different classifiers against extracted features and corresponding Fig. 4. illustrate the Classifier Performance.

Table 5. Performance Results of Iris

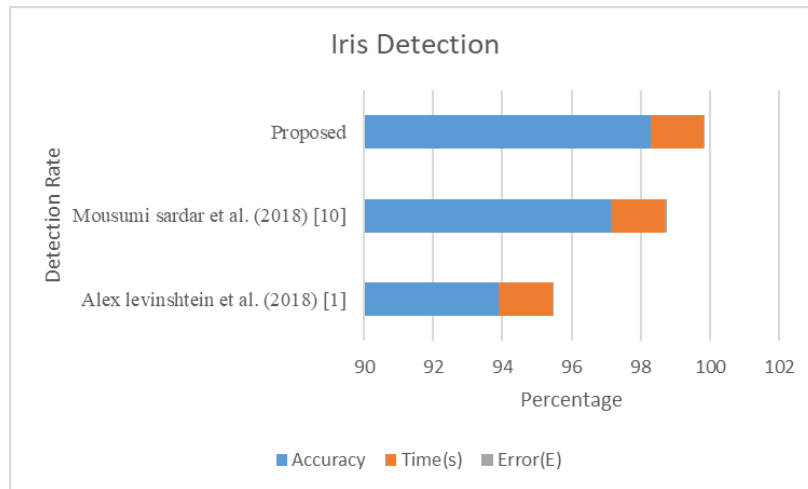| Application Area	Accuracy	Time(s)	Error(E)
Iris Detection	93.9	1.56	0.025
Pupil Detection	97.12	1.56	0.08
Proposed	98.3	1.52	0.017

Fig. 3. Performance Graph of Iris with state of art methodology

Table 6. Accuracies in % of different classifiers against extracted features

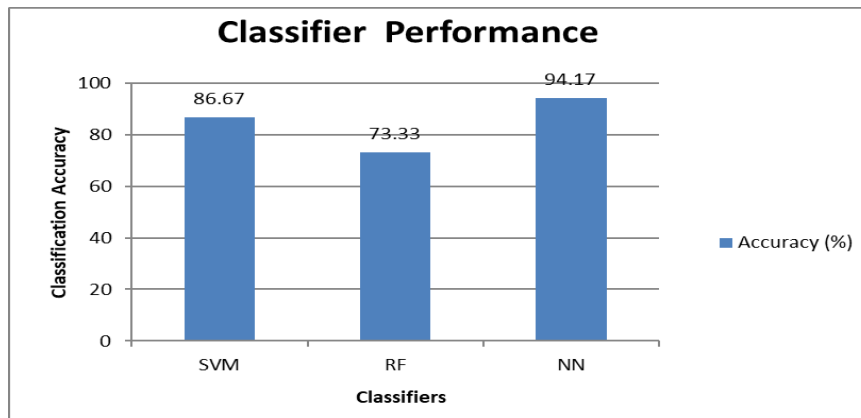| SVM	RF	NN
86.67%	73.33%	94.17%

Fig. 4. Classifier Performance

7 Conclusion

The paper attained the best improvement analysis of CP kids of strabismus condition. This results obtained by various algorithms and attained by MATLAB by image processing and classifiers techniques. This approach for vision improvement of CP patients in rehabilitation centers by the eye features.

Conflict of Interest– None

References

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