IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology
Vol. 8, Issue 2, February 2021

DOI: 10.17148/IARJSET.2021.8230

A Web Application for Estimation of Human Health Status Using Eye Images

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Abstract: Anaemia, Jaundice and Cataract are the major health issue in most of the developing countries. This affects all age groups of people. Anaemia is a deficiency that indicates the less number of RBC (Red Blood Cells) or irregular shape of RBC (less than 13.5gm/100ml for men and less than 12.0gm/100ml for women) Jaundice is an excess bilirubin (more than 50µmol /L) content is formed, when Haemoglobin is broken down as part of the normal process of recycling old or damaged Red Blood Cells. Cataract is due to ageing, eye injury, eye disease, after using certain medications, including steroids. Introduced a paradigm of completely non-invasive, on demand diagnostic that may replace common blood based laboratory tests. With this technology, a user downloads an application onto their laptop takes a photo of his/her eyes, and instantaneously receives accurate results which is displayed directly onto their screen.

Keywords: Non-invasive method, Machine Learning, Image Processing, SVM algorithm.

I. INTRODUCTION

"Healthy nation is a Wealthy nation", Health places a major role for the development of countries. Healthy nation can be a wealthy nation. Over 95% of the world population has health problems. In the past 23 years, the leading causes of health loss have hardly changed.

1. **ANAEMIA**

Anaemia affects approximately 25% of the population or 1.6 billon people worldwide. Anaemia is a major nutritional deficiency disorder in the country. Anaemia is a condition where the number of Red Blood Cells (RBC) in the body gets too low or the irregular shape of RBC.

TYPES OF ANAEMIA

- Vitamin deficiency anaemia
- Iron deficiency anaemia
- Hemolytic anaemia
- Sickle cell anaemia

SYMPTOMS OF ANAEMIA

- Look pale
- Be very tired
- Feel dizzy or light headed
- Have a fast heart beat

ANAEMIA TREATMENT

- Medicine
- Changes in diet
- Treatment of another underlying disease

2. JAUNDICE

Jaundice is a condition in which the skin, sclera (whites of the eyes) and mucous membranes turn yellow. This yellow color is caused by a high level of bilirubin (50 µmol/L), a yellow-orange bile pigment. Bile is fluid secreted by the liver. Bilirubin is formed from the breakdown of red blood cells. It is also known as icterus.

TYPES OF JAUNDICE

- Pre-Hepatic
- Hepatocellular
- Post-Hepatic

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SYMPTOMS OF JAUNDICE

- Fever
- Chills
- Abdominal pain
- Flu-like symptoms
- Change in skin color
- Dark-colored urine and or clay colored stool

TREATMENT OF JAUNDICE

- Avoid hepatitis infection
- Stay within recommended alcohol limits
- Maintain a healthy weight
- Manage your Cholesterol

3. CATARACT

A cataract is a clouding of the normally clear lens of your eye. For people who have cataracts, seeing through cloudy lenses is a bit like looking through a frosty or fogged-up window. Clouded vision caused by cataracts can make it more difficult to read, drive a car (especially at night) or see the expression on a friend's face. In India more than 1 million cases per year.

TYPES OF CATARACT

- Nuclear cataracts
- Cortical cataracts
- Posterior sub capsular cataracts
- Congenital cataracts

SYMPTOMS OF CATARACT

- Clouded, blurred or dim vision
- Increasing difficulty with vision at night
- Sensitivity to light and glare
- Seeing “halos” around night

TREATMENT OF CATARACT

- Having regular eye examinations
- Quit smoking
- Manage other health problems
- Wear sun glasses
- Reduce alcohol use

II. OBJECTIVES OF THE PROJECT

Instead of going for invasive method, in this project uses non-invasive tool for health care monitoring. By using redness of conjunctiva, anaemia is deducted and by knowing the intensity of sclera yellow region jaundice is detected. Measuring the volume and thickness of cloudy region formed in lens, cataract is detected. Web application is developed to check the status of our health by using conjunctiva, sclera and lens images anaemia, jaundice and cataract are detected respectively.

III.LITERATURE REVIEW

AN EFFECTIVE TOOL FOR SCREENING ANAEMIA CORRELATION WITH THE CONJUNCTIVA PALLOR AND HEMOGLOBIN

Anaemia is a major Nutritional deficiency disorder in the country. We propose a non-invasive method, correlation of hemoglobin with conjunctiva pallor colour scores and classification using neural networks. Using the proposed HSI model, the different colour score of the selected region was estimated and correlated with laboratory hemoglobin value. Elman neural network was used for correlating and classifying anemic and non-anemic cases, out of which 91.3 percentages of the predictions were correct and 8.7 percentages were wrong classification.

Published in: 2018 Technology and Health Care
DOI 10.3233/THC-181291 IOS Press, vol.26,pp.23-727

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A STUDY ON NON-CONTACT AND NON-INVASIVE NEONATAL JAUNDICE DETECTION AND BILIRUBIN VALUE PREDICTION

Neonatal jaundice is a yellowish discoloration of skin and eyes that commonly occurs in newborn babies. It is a physiological phenomenon in neonates and it occurs due to the overproduction of bilirubin, reduction of bilirubin treatment function. The investigation methods for examining neonatal jaundice include examination using jaundice meter and blood sampling. In this paper, we propose the non-contact and non-invasive detection method for neonatal jaundice using image processing and computer vision technology.

Published in: 2018 IEEE 7th Global Conference on Consumer Electronics
DOI: https://doi.org/10.1109/GCCE.2018.8574674

AUTOMATIC DETECTION OF EYE CATARACT USING DEEP CONVOLUTION NEURAL NETWORKS

Eye cataract is a condition in which the lens of the eye becomes clouding or less transparent. This paper presents an eye cataract detection system using Deep Convolution Neural Network (DCNNs) comprising two modules: training and testing. The proposed DCNNs architecture is trained, validated and tested with retinal fundus images. Experimental result shows that the proposed system is capable of detecting eye cataract with high accuracy.

Published in: 2020 IEEE region 10 Symposium(TENSYMP)
DOI: https://doi.org/10.1109/TENSYMP50017.2020.9231045

IV. PROPOSED SYSTEM

Non invasive approaches are extremely important for patients who need frequent blood tests and recent improvement in image analysis have enabled promising methodologies developed. Non invasive method gives better result. The existing invasive method requires costly equipment and trained technicians.

We propose a non invasive method for estimation of human health status using eye images. Health status includes detection of anemia, jaundice and cataract with help of web application. Redness of conjunctiva is used to detect anaemia, sclera for jaundice and lens for cataract with the help machine learning and image processing.

Non invasive screening for anaemia, jaundice and cataract could have numerous applications as a point of care test, particularly in resource poor settings. Indeed a dedicated web to automate image analysis and to predict the risk of anaemia, jaundice and cataract could be envisaged. The objective of this proposal is to develop a non invasive method that can be used as a mass screening tool to assess anaemia, jaundice and cataract. This can be implemented with help of machine learning and image processing.

V. FLOW CHART

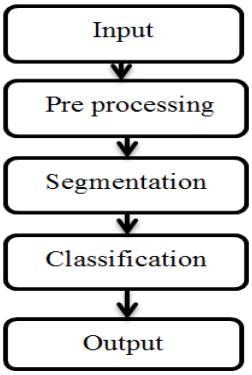

Fig. 1 Flow chart

VI. IMPLEMENTATION OF PROCESS

1. INPUT

Eye image is taken as input from user through web camera in the form of RGB (Red Green Blue). The input image size is 640x480.

2. PRE PROCESSING

The main aim of preprocessing is an improvement of the image data that suppress unwilling distortions or enhances some image features important for further processing, although geometric transformations of images are classified

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among preprocessing methods here since similar techniques are used.
RGB image is converted into gray scale image by using two techniques. First, noise is reduced by histogram equalization and then filter is done by Top Hat algorithm.

3. SEGMENTATION
Inner portion of eye is segmented by S-ROI. Region of Interest is a portion of an image that can filter or operate in some way. The toolbox supports a set of ROI objectives that can use to create ROIs of many shapes such as circle, ellipse, polygons and hand drawn shapes.

4. CLASSIFICATION
Classification of the image is done by the GLCM matrix mean value. Gray Level Co-occurrence Matrices (GLCM) is used for image texture analysis. Given an image composed of pixels each with an intensity the GLCM is a tabulation of how often different combinations of gray levels co-occur in an image or image section.

- Convert the RGB image to gray scale image using cvtColor()
- Remove noise from gray scale image by applying a blurring function GaussianBlur().
- Finally applying the Canny() function to the blurred image to obtain the edges.

5. OUTPUT
By using the above mentioned process human health status is checked with help of eye images. The output image will be in the size of 256x256.

VII. TECHNOLOGIES USED

1. MACHINE LEARNING
Machine learning (ML) is the field of study that gives computers the capability to learn without being explicitly programmed.ML algorithm uses historical data as input to predict new output values.

TYPES OF ML

- Supervised learning
- Unsupervised learning
- Semi-supervised learning
- Reinforcement learning

2. IMAGE PROCESSING
Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristic/ features associated with that image.

3. SVM
In Machine Learning Support Vector Machine (SVM) is supervised machine learning algorithm that is used for both classification or regression challenges. However, it is mostly used in classification problems. In the SVM algorithm, we plot each data item as a point in n dimensional space with the values of each feature being the value of a particular coordinate. Then we perform classification by finding hyper-plane that differentiates the two classes very well.

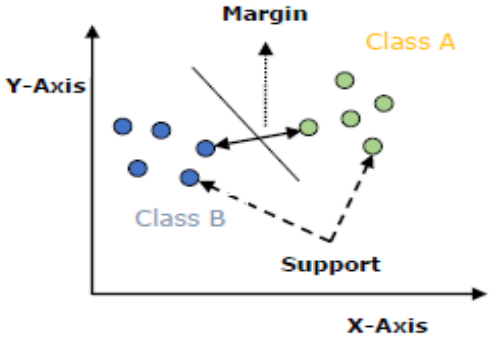

Fig. 2 Graph for SVM

PROS OF SVM
It works really well with a clear margin of separation. It is effective in high dimensional spaces.

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VIII. SOFTWARE REQUIRED

Matlab is a tool required to compile the above mentioned process. MATLAB an abbreviation of "matrix laboratory" is a proprietary multi paradigm programming language and numeric computing environment developed by MathWorks. MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces with programs written in other languages.

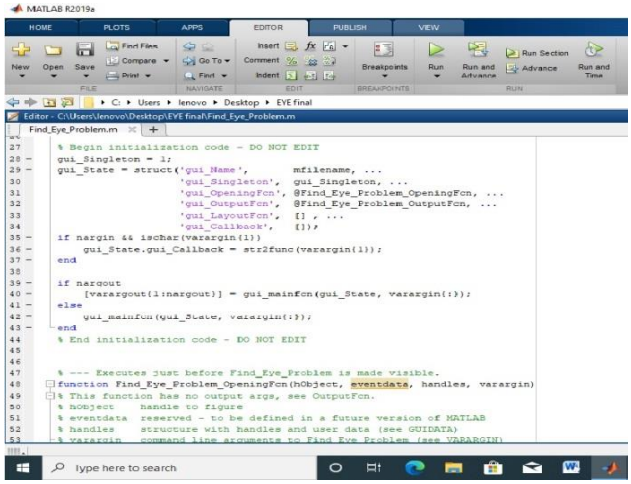

Fig. 3 Software used

IX. RESULT

The users who desire to screen themselves for health status can do so immediately by just downloading an application without being required to be shipped of their homes. When the user wants to test they need to touch up the test button accordingly then camera will open. When they show their eye in front of camera they can predict themselves whether they are affected by anaemia, jaundice and cataract or not.

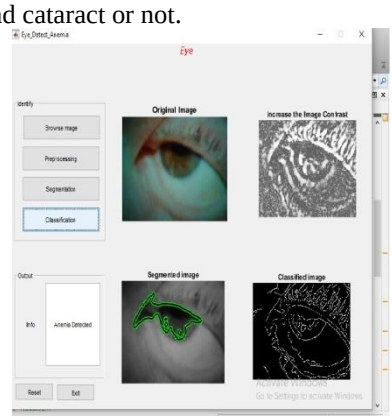

Fig. 4 Anaemia affected

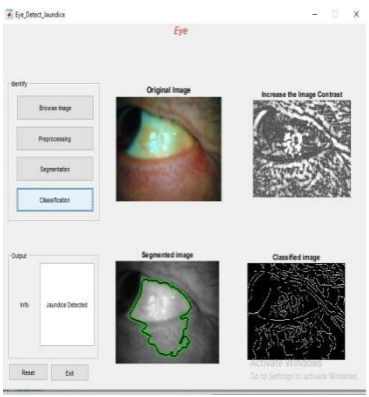

Fig. 5 Jaundice affected

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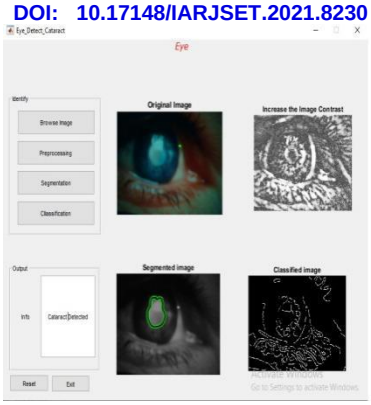

Fig. 6 Cataract affected

X. CONCLUSION

The benefits of the advanced web technology used in annihilating geographical barriers, saving valuable time, improving the patient's healthcare without needle pricking and providing access to various medical resources. As the web technology and artificial intelligence is revolutionizing the health care industry, this research work proposes a method of non invasive technology for screening anemia, jaundice and cataract or not for clinical decision support tool. The novelty of this proposed work is to identify disease of patients through eye images from a large group without any blood samples enabling significant savings in time and cost for the overall healthcare system.

REFERENCES

[1] Chen ,YM & Miaou, SG 2017, 'Kalam Filtering and Nonlinear Penalty Regression Approach for Non-invasive Anaemia Detection with Palpebral Conjunctiva Images', Journal of Healthcare Engineering, Article ID 9580385,https://doi.org/10.1155/2017/9580385

[2] Dimauro, G, DaniloCaivano, D & Girardi, F,2018, 'A New Method and a Non-Invasive Device to Estimate Anaemia Based on Digital Images of the Conjunctiva' , IEEE Access Human Centered Smart Systems and technologies, Digital Object Identifier 10.1109/ACCESS.2018.2867110,pp.46968-46975

[3] Md. Messal Monem Miah Rafat Jamal Tazim; Fatema Tuj Johora; Md. Ibrahim Al Imran; Sanzida Say,2019, 'Non-Invasive Bilirubin Level Quantification and Jaundice Detection by Sclera Image Processing',
IEEE Global Humanitarian Technology Conference DOI https://doi.org/10.1109/GHTC46095.2019.9033059

[4] Sojiro Kawano, Thi Thi Zin, Yuki Kodama, 2018, 'A Study on Non-contact and Non-invasive Neonatal Jaundice Detection and Bilirubin Value Prediction' IEEE 7th Global Conference on Consumer Electronics DOI: https://doi.org/10.1109/GCCE.2018.8574674

[5] Ishitaa Jindal, Palak. Gupta, Anmolika Goyal, 'Cataract Detection using Digital Image Processing',2019,IEEE Global Conference of Advancement in Technology, DOI: https://doi.org/10.1109/GCAT47503.2019.8978316

[6] Yanyum Dong, Qinyan Zhang, Zhiqiang Qiao, Ji-Jiang Yang, 'Classification of cataract fundus image based on deep learning'2017, IEEE International Conference on Imaging System and Techniques, DOI: https://doi.org/10.1109/IST.2017.8261463

[7] Muthalagu R, Thulasi bai, V. Sheila John & Doreen Gracias, 2018, 'Developmental screening tool: Accuracy and feasibility of non invasive anaemia estimation', Technology and Health Care, DOI 10.3233/THC-181291 IOS Press, vol.26,pp.23-727

[8] Mulathagu R, Thulasi bai, V& Sheila John, 2018, 'A Smart(phone) Solution: An effective tool for Screening Anaemia- Correlation with Conjunctiva pallor and haemoglobin levels', Taga Jouranl, vol.14,ISSN:1748-0345(Online), pp.2011-2621

[9] Zulkarney, A.J.Jurimah, B.Ibrahin, E.M Cheng, 'An overview on jaundice measurement and application in biomedical: The potential of non-invasive method', 2015, International Conference of Biomedical Engineering, DOI: https://doi.org/10.1109/ICoBE.2015.7235896

[10] Md. Rajib Hossian, Sadia Afrone, Nazmul Siddique, Mohammed Moshiul Hoque, 'Automatic Detection of Eye Cataract using Deep Convolution Neural Networks (DCNNs)',2020,IEEE region 10 Symposium(TENSYMP),DOI: https://doi.org/10.1109/TENSYMP50017.2020.9231045