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Colour Recognition in Images Using Neural Networks

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ABSTRACT: The wide range of applications of Colour recognition attracts the attention of large number of researchers to unveil various depths in it. Some of the application spaces of colour recognition are road sign identification, location discovering and so on. We devised a new methodology in this paper for recognising the colour in images of RGB colour space with the help of neural networks customized for every colour. Those specialized neural networks are building blocks for the hierarchical structures. Both standard and hierarchical neural networks are tested with various data sets to compare the outcomes of these systems.

KEYWORDS: Multilayer perceptron; Neural networks; Hsv; RGB; Sign detection

I. INTRODUCTION

The purpose of the colour detection is to differentiate the objects depending on their colours in a picture. This detection offers you the possibility of doing any kind of method regarding that object. For instance tracking, labelling in industry, skin colour detection as a pre-process of face detection etc. whereas image analysis in RGB space, an actual colour is decomposed to its basic colour percentages. In this colour area, Red (R), green (G) and Blue (B) colours are basics and every other colours can be obtained from their mixtures. In colour monitors for TV and computers, RGB colour space is employed as a standard.For our system, one amongst the benefits regarding RGB area is, it is convenient for the training a section of N.N. This advantage contributes system at deciding level.

Several colour detection strategies are developed so far. for instance, colour detection for road and traffic signs with taking pictures in a automobile and changing them into HSV colour space [1].Vehicle detection utilizing normalized colour and edge map, this detection is completely different from old strategies as it introduces a replacement colour rework model to seek out vehicle colour [2]. Tagging and pursuit in video with neural network colour detection and spatial filters, employing a developed rule with neural network that is generated from the primary frame of a video sequence to discover the item of a selected colour [3] .our paper describes a new developed technique with the help of neural network in a hierarchical data structure utilizing RGB colour space for colour recognition in every images.

II. RELATED WORK

RGB COLOUR SPACE:

A RGB colour space is outlined by the 3 completely different colours, red, green and blue. It can create any secondary colour by those primary colours. One among the widely used application of the RGB colour model is that the shows of colours on cathode-ray tube, LCD, or plasma display, like a TV or a computer's monitor. Every constituent on the display is described with interface hardware as values of RGB. Their rates is modified in vary of 256 attainable values. Once written, RGB values are ordinarily mere victimisation 3 integers between zero and 255, representing red, green, and blue intensities, therein order. The fundamental theme of RGB colour space is shown as figure 1.

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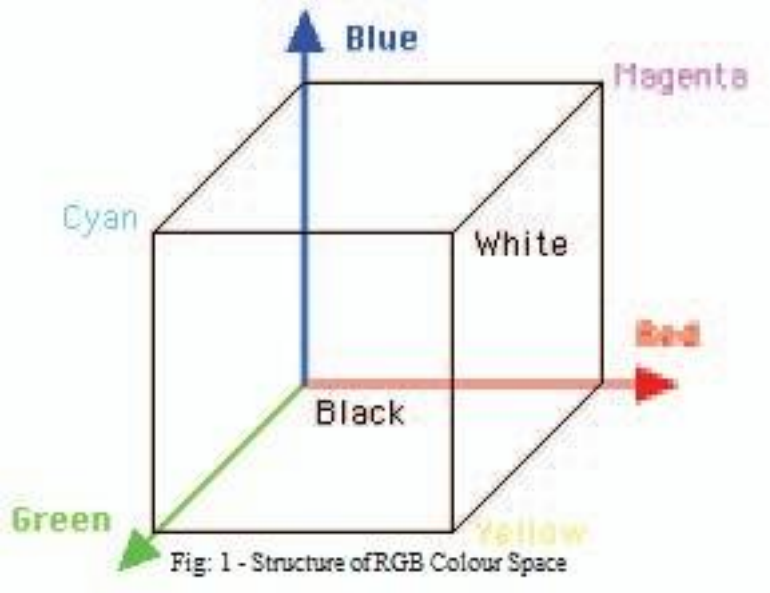

Fig: 1 - Structure of RGB Colour Space

Multiplayer perception:

A multilayer perceptron (MLP) is a feed forward artificial neural network model. An MPL include one input layer, one or more hidden layers and one output layer. These layers have several nodes connected to each other. The input layer neurons collect the information, multiply them by the affiliation weights and send the processed information to following layer and so on.

A neural network has got to be trained before usage with a learning technique known as back propagation. Learning happens within the MLP by changing the affiliation weights with regard to the expected outputs. MLP could be a model which may distinguish the nonlinearly divisible information. That's why MLP encompasses a nonlinear activation function. Output of the activation function is that the output of the network.

MLP can be used for any kind of classification downside, particularly for complicated ones. Speech processing, image processing and applications that require artificial intelligence were few of them.

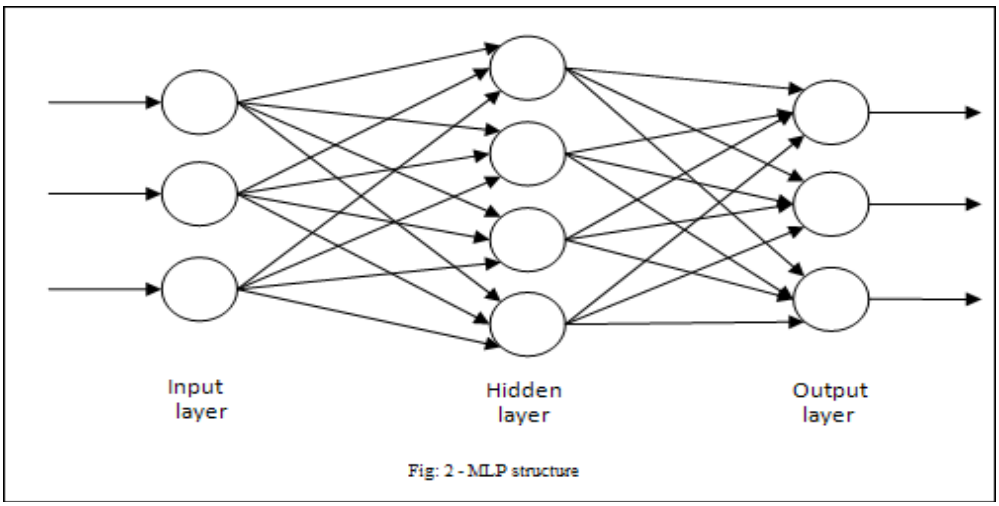

Fig: 2 - MLP structure

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III. PROPOSED ALGORITHM

COLOUR DETECTION USING MLP:

Colour detection is a common drawback which can be setback by using neural networks. Very first thing has got to be done is to form a database that accommodates RGB percentages of colours that is going to be detected in a picture. And also the target for every data must be determined to train the network.

Color Name	Red	Green	Blue	Total
black	0	0	0	0
gray	142	142	142	5
white	255	255	255	9
red	255	0	0	15
orange	255	85	0	25
brown	160	112	80	35
yellow	255	255	0	45
green	81	197	0	55
lime	0	255	0	65
turquoise	0	255	198	75
cyan	0	255	255	85
sky	0	127	255	95
blue	0	0	255	105
purple	127	0	255	115
magenta	255	0	255	125
pink	255	0	127	135

Table:1- RGB Data Sample Set

RGB NORMALIZATION:

$$R = \frac{R}{TOTAL} \times 255$$
$$G = \frac{G}{TOTAL} \times 255$$
$$B = \frac{B}{TOTAL} \times 255$$

Where TOTAL= R+G+B

Normalized RGB values are passedas the inputs and the targets are the expected outcome for a neural network. A network trained with a bigger data set provides high level results. Once the training got over, the network is ready to use. Whereas testing the input are the RGB values of a pixel in a picture(Table:1). The network can produce a result that relies on the results of the training for example, the network could manufacture a result like 254.490.02550.255 - 0.255 for an input of 13 15 213.

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Fig: 3 - Lena

By observing the results it is simple to mention that pixel is blue. After this method is completed for the all pixels in a picture, colours within the image are detected by the N.N.
As an example, colourful pictures were used as inputs for the standard N.N. structure [fig 3]. So as to indicate a result, the pictures were regenerated by the outputs of N.N. [fig 4].

Figure: No	Figure 3 - Lena
No:of:sample colours	10
RGB Values	232-152-100 178-100-72 212-182-170 210-230-230 116-122-195 12-21-78 246-255-255 238-210-203 24-14-15 68-52-69
Size	512×512

Table: 2

Step1 outcome: R; *step2 outcome: G;*
Step3 outcome: b; *step4:* $\frac{R+G+B}{255}\times 100$

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Fig: 4 - standard N.N image

IV. PROPOSED STRUCTURE FOR MLP

In our methodology more than one neural network were used. We have neural networks at the primary layer of the hierarchy because the variety of colour categories. These neural networks are specialised for every colour and that they were vital at deciding level. If one N.N. is expert about red, it will generate only two outputs in relation to its input, saying that the input is red or not. All these outputs we get from of these neural networks were the input of the other N.N. At the second layer of the hierarchy the complete structure is delineated in fig 4.

The simulation results of the expert neural networks are used for the training of the most N.N.
If we have got n colour even have n output and these outputs are the ultimate outcome of the entire system. Pictures shown in fig 3 also are applied as input for this structure and therefore the images were re-generated to indicate the results (fig 5).

Fig: 5- Outcome Of Hieraarchical N.N

Same data sets were used for this structure (Table:2). All of the neural networks were trained with a learning technique known as back propagation. Expert neural networks were trained initially and simulated. Main network was trained with the simulation results.

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V. SIMULATION RESULTS

In order to work out the generated pictures are how nearer to the initial pictures in terms of its RGB the following calculations has been devised. It involves the process of evaluating the differences in the red, green, blue values between the generated image and the initial/original image and finding the normalized outcome of the system for set of base values.

$$x = \langle |R{\sim}R'| + |G{\sim}G'| + |B{\sim}B'| \rangle / Total\ Pixel$$

R: Red values of the original image
R': Red values of the processed image
G: Green values of the original image
G': Green values of the processed image

B: Blue values of the original image
B': Blue values of the processed image

Difference in RGB values of initial image and processed in our test data for both standard neural network system as well as for hierarchical neural networks are as follows:

Sample Outcomes:-
For standard N.N:
X = Figure 3 – Figure 4 = 32.6068

For Hierarchical N.N:
X = Figure 3 – Figure 5 = 28.4214

VI. CONCLUSION AND FUTURE WORK

Colour recognition plays major role in modern world across various fields like forensic, tracking aid system-traffic signs recognition, in automobile firms to repaint the automotive, biometrics tools- skin colour detection. As neural networks forms the base for many factitious systems which involves many approaches, we started our towards the colour recognition using neural networks which is a kind of classification issues, so that we can implement our system for various kind of classification problems. Standard neural network can handle colour recognition effectively but hierarchical neural networks have to be incorporated in order to process higher work load. In future we will try to work out mechanisms to handle complex issues.

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