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Scene Classification Based on Feature Extraction

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Abstract: The scene classification plays a vital role in many areas such as video indexing, video compression, video access and others which is the context of the object detection, recognisation and classification. This paper deals with the basic image analysis techniques like RGB, HSV and color histogram. The frame classification can be categorized in to a different classes like, indoor, outdoor, beach, party, roads, river, sky, play ground, etc here we are classifying the frames by considering the TV news video into anchor and reporter frames.

Keywords: Scene Classification, RGB, HSV, Color Histogram.

I. INTRODUCTION

A scene is a basic unit of a story that takes place at a specific location and the time in any one of these changes there will b a new scene. Here we focuses more on the scene identification and its classification to distinguish among the frames in to a group. Hence one can have the clear detail about the content of the frames. The study of scene classification is based on the application and video which are processed will have a slight change in the information carried by the frame as the time changes. This corresponding group of a frame with or without slight changes are called as shot of a given video.

There are many ways and techniques are available for the scene classification. This paper considers the color and histogram analysis of a frame. More attention is required during the grouping of frames because the information which represented by the frame so as to keep the variation from person to person and time to time.

Emphasizing the fact is that we here an attempt is made to recognize and identify the shot detection in a frames at different scales and not just based on global features or only with local features. It's expected to be a good work for classifying the frames however it requires the following research work who made on attempt in classification using various technique are represented in the following section with prior knowledge about resources available with frames. Julia Vogel and Bernt Schiele [1] Elaborated techniques of classifying image into One of the main activities in our daily life is eight semantic categories.

Torralba A., Oliva A [2] concentrated on lesser properties of frames instead of going for exclusive classifications. We took into the consideration of both the techniques and also referred the similar technique and followed them for some extent. In our work we have employed the combination of two are more techniques to improve the efficiency or at least minimize the complexity involved other techniques. In order to emphasise the importance of the color image analysis for the classification in collaborated with working essentially on gray scale images, scene recognisation means knowing the information about the semantic category and the content of the environment. Basically there are two application of scene recognition has been observed,

1) Object recognisation to decide the class (category) of the scene.
2) Segmentation and processing of objects and try to categorize each scene through its global information estimation.
3) One of the main activity in our life is the ability to distinguish between the things in order to identify them and link them with our prior knowledge this will gives the ability to recognize and interpret the environment around us.

Considering the fundamental problem of computer vision i. e enabling computer to see the ways we see the things in the present day we are expecting the machines would have the capability to match with the human vision classification of an object as a table , a ball and scenes etc.

II. TYPES

In this paper RGB(Red, Green and Blue), HSV(Hue, Saturation and Value) Color models with histogram analysis are used for frame classification. These color models includes the thresholds which are helpful for the classification of scenes.

1) RGB Color Space:

The primary components of RGB model are Red, Green and Blue which can be represented on a Cartesian coordinate system as shown in figure 1. In case of the RGB color model there are three primary colors considered are red, green and blue at three are corners and other three are secondary colors and are Cyan, Magenta and Yellow at other three corners followed by black at the origin and white is at the corner farthest from the origin. Point between the black and the white represents the Gray scale level which is represented by dot line, Figure .2 represent the extracted image and RGB color model histogram.

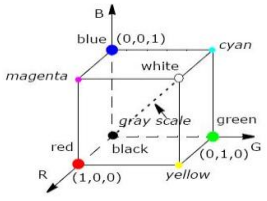

Figure 1: RGB Color Model.

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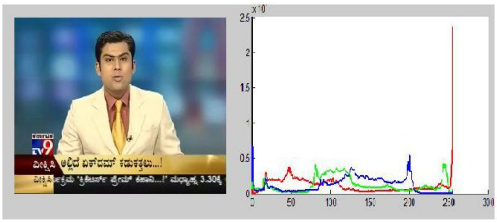

Figure 2: Frame with RGB Color Histogram.

2) HSV Color Model:

The main drawback of the RGB color model is that it doesn't consider the luminance effect in colored frames and this may leads to some wrong information and hence here we are using HSV color model. This provides color information as Hue, Saturation and Value a component which helps in better classification.

- Hue represent Depth of the color
- Saturation represent Purity of the color
- Value represent brightness of the color(intensity)

- Hue components analysis makes the algorithm to provide better immune and thus more robust to light variations. This feature is suited better in case of skin detection(face)
- In case of shadow removing saturation components plays major role hence processing the image in HSV space is better suited for shadow removing,
- As shown in the figure 3 Hue refers to color of Red, Blue & Yellow and has range of 0 to 360^0.
- Saturation means purity of the color and the values varies from 0 to 100 %. The Value refers to the brightness of color and provides the achromatic idea of the color.
- One major problem associated with RGB (Red, Green, and Blue) color space is that, it does not consider the luminance effect on skin color, which may leads to some incorrect information. HSV provides color information as Hue (or color-depth), Saturation (or color purity) and intensity of the Value (or color-brightness) as shown in figure 4. Hue refers to the color of red, blue and yellow and has the range of 0 to 360. When HSV is used for color space, you don't need to know what percentage of blue or green is required to produce a color, simply adjust the hue to get the color which you wish. Saturation means purity of the color and takes the value from 0 to 100%. To change a deep red to pink, adjust the saturation. The value refers the brightness of the color and provides the achromatic idea of the color. Value takes the range from 0 to 100. From this color space, H and S will provide the necessary information about the skin color. The skin color pixel"s H and S components should satisfy the following conditions.

$$0 <= H <= 0.25;$$
$$0.15 <= S <= 0.9$$

Many applications uses the HSV color model. Machine vision uses HSV color space in identifying the color of different objects. Image processing applications such as histogram operations, intensity transformations and convolutions operate only on an intensity image. These operations are performed with much ease on an image in the HSV color space. Figure 4 represent the extracted components (HSV) of RGB colour image.

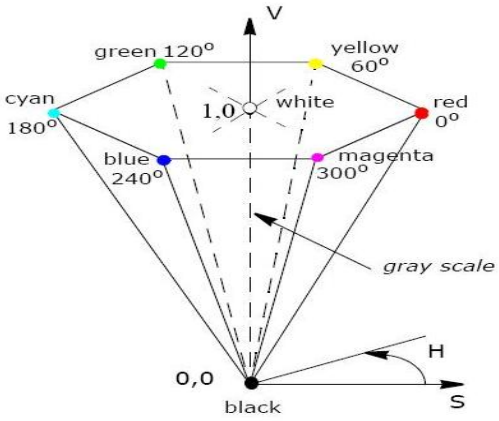

Figure 3: HSV Color Model.

Figure 4: HSV Components.

3) Histogram:

The ability to distinguish between the things in order to identify them and to link them with Knowledge, this will create the ability to recognize and interpret the environment around us.

The simplest method of characterizing a frame of a region is to calculate the average of the gray scale illumination for this region [3] as shown in the figure 5. Another widely used feature is the color histogram. Using a color histogram to define a shot has many advantages: it is quite discriminating, easy to compute, and mostly insensitive to translational, rotational, and zooming camera motion [3]. Figure 5 represent the Gray scale image along with its Histograms.

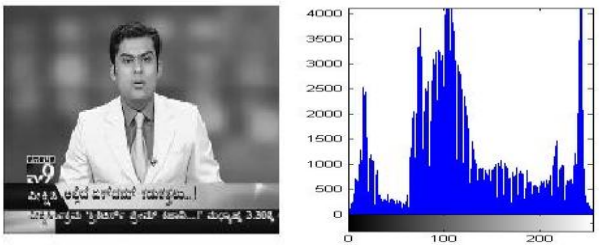

Figure 5: Histogram Model.

III. SHOT DETECTION

Recently, researchers are particularly interested in the area of video processing and indexing, but the most challenging task faced by these researches in this stream is to detect each shot within the video in order to build stories. Color histogram is one of the techniques that have been adapted to detect shots.

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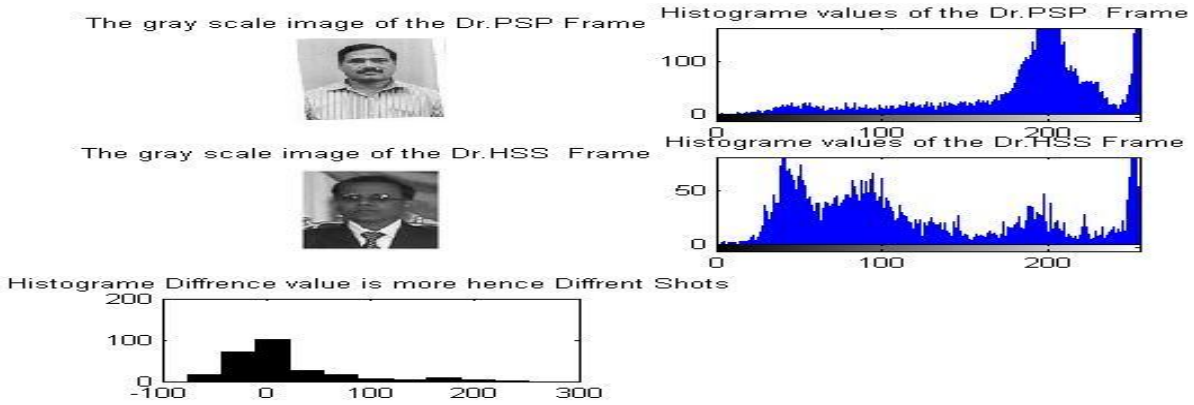

Figure 6: Different Shot.

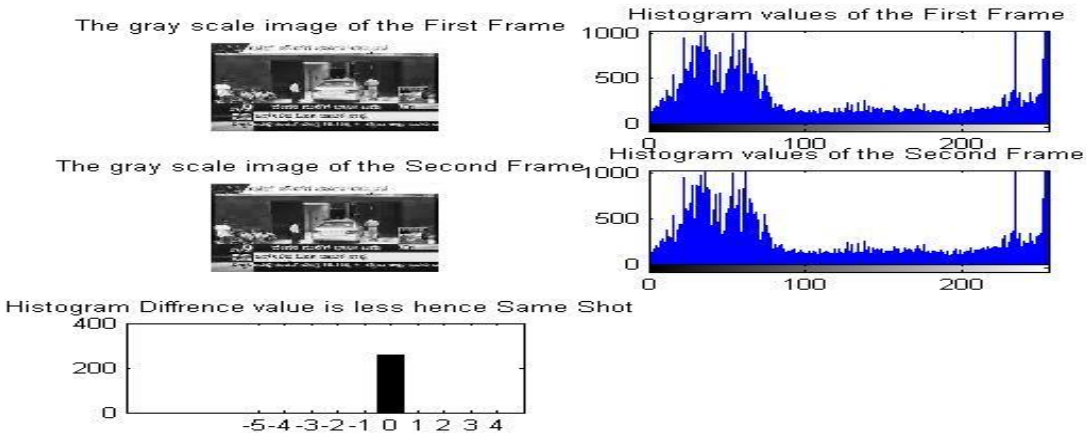

Figure 7: Same Shot.

The main purpose of this paper is to introduce and review techniques that have been proposed and use them to detect anchor shot within a news video. Along with these, it also presents one of the adapted techniques in order to detect anchor shot within the news video using color histogram features. The RGB histogram mean value is implemented and tested as the main method used to detect anchor shots in news video.

Scene change detection is to find the beginning and ending of each shot in a given video, which is also known as shot boundary detection or transition detection. The basis of any shot boundary detection method in a video sequence consists of detecting visual discontinuities in time domain. During this detection process, it is required to extract visual features that measure the degree of similarity between frames in a given shot. This measure, denoted as *g(n+k)*, is related to the difference or discontinuity between frame and n+k where k>l. there exists the different methods for computing the values of *g(n+k)* in a video sequence, being one of the simplest the absolute difference between frames.

$$g(n, n+k) = \sum_{x,y} |I_n(x, y) - I_{n+k}(x, y)|$$

Where I(x,y) is the image intensity level of the image at x and y position. Usually, methods based on absolute difference compares this value with a given threshold in order to determine the occurrence of a significant change in the image sequence. However, the measure of discontinuity g(n,n+k) computed in this way is very sensitive to luminance changes or object and camera motion, leading to a high ratio of false alarms. An alternative to compare image values in a pixel level is to compare statistics of global color. Histograms capture the color distribution of an image. In some cases, luminance histogram is a sufficient measure to reach our aim. As we have mentioned before, the shot detection effectiveness depends on the suitable election of the similarity measure between consecutive frames. Figure 6 and 7 gives the information about the scene classification based on feature extraction as a different shot and same shot in Gray scale image along with its Histograms.

IV. CONCLUSIONS

The most challenging task encountered by researches in the recent past is that news video indexing and classifying area to detect each shot in the video to build stories. There are many techniques used to detect anchor shot in news videos to build databases.

Color histogram features have been used widely related with shot detection. The simplest way of applying the color histogram technique is to calculate the mean value of the RGB histogram for the frames and group similar

frames to detect a shot. MATLAB has become the most popular programming environment for the video and image processing and hence here we have used the techniques like RGB, HSV and Color Histogram for the scene change detection and classification. The result obtained from the studies revealed that HSV method provides better classification than that of the RGB.

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