



Real-Time Detection and Recognition of Road Traffic Signs

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Abstract:

This paper focuses primarily on traffic sign detection and identity systems placed on roads and roads. This system aims to deal with real-time traffic signal identification, that is, the type of traffic sign in any area of any input image during fast processing. Our identification module relies on the proposed extraction and classification of traffic signals built on the color probability model of the HAAR feature, which is the compilation and color histogram (HOG) of oriented gradients. The RGB will apply to the hog technique before the original image becomes gray. Then the support vector machine (SVM) is derived from the result and is compared to the database. At the same time, the fuzzy c cluster (FCM) technology received the same output from the above results, and can later be compared to the database images .By identifying the traffic signal using the shape of the paper's earlier execution. However, the design-based traffic signal recognition failed to detect the traffic sign in different weather conditions. By using this method, the accuracy of identifying signals may be improved. Dynamic update of new signals can also be done. The task of this task is to locate and locate the traffic sign without any defect..

Introduction:

Indian road conditions need development of an automatic driver system. Human lives are getting uncertain day by day. Since traffic Concentration is increasing day by day worldwide, roads are occupied by overloaded vehicles. Driver cannot easily predict the sudden pot holes or bumps or sudden turns where the road signs are not very prominent. Although image processing plays a vital role in the road signs recognition, mainly in color analysis, but the paper points to many problems concerning the constancy of the received information of colors, distinctions of these colors with respect to the daylight circumstances, and absence of a color model that can led to a good solution. This means that there is a lot of work to be complete in the field, and a lot of improvement can be achieved. Soft computing techniques were wide used in the detection and therefore the recognition of the road signal. The bulk of the authors used neural networks as a recognizer, and as classifier. Some other methods such as template matching or classical classifiers were also used. New techniques should be involved to increase the forcefulness, and to get faster systems for real- time applications . Road and traffic sign recognition is one in every of the essential fields within the modern transport system.

They define a visible language that may be taken by the drivers. The goal was to try various computer vision methods for the detection of objects in outdoor scenes. Since that time

various research groups and companies are interested and conducted research in the field, and enormous amount of work has been completed. Road image examinations are very important aspect for automated driver support system. Real- time qualitative road data examination is the cornerstone for any modern transport system. So far, most of the utilization of image process techniques for qualitative examination remains at its early stage and examination is finished manually. In this paper to implement the traffic sign detection and recognition different image processing algorithms are used. Most of the cases, they're not attentive to the traffic signs. In many cases, accidents happen during bad weather or in occlusion. Drivers could not identify the road Signs due to bad weathers. Shadows, in the dark time and cloudy weather square measure some advanced that Drivers face. Different type of issues are happening when the traffic sign recognition processing.

That means same signs are matching. Illumination effect on traffic sign at the time of traffic sign recognition. Moreover, signs are inflexibly positioned relative to the environment, often set up in clear sight to the driver. Traffic sign detection usually color based algorithm are used. And sometimes shape based algorithm also used to detect the traffic sign detection. Traffic sign detection using the shape based depending on the set of predefined templates. In particular image region is captured by the shape based algorithm. Color based traffic sign detection is using the basic colors. In image processing Red color, green color and blue color are the basic color in the analysis of image.

HSI is the most commonly used color space since it gives different pieces of information in every component. It describes a general framework for the detection and classification of traffic signs from image sequences using color information. The color based segmentation gives the good result of segmentation. The traffic sign codes are different forms that are mainly prohibition sign. It shows that public work or any construction on the roads. The prohibition sign are symbolically represented as the circle. In that circle back round having white or blue color are having and borders are coated with red color. The second one is the warning sign. The warning sign is the right angular triangle. The warning sign equilateral triangle back round having the white and border having the red color. The yellow color back round sign is warning signs and prohibition signs it placed at the public work progression. Informative signs have a similar color.

In the last decade, road sign detection has attracted nice attention, as road sign recognition system needs automatic road sign detection as a primary step, particularly for pictures with untidy background. First, there's an oversized element of no rigidity and textural variations among road sign. This system will play a really vital role for the detection purpose of specific domains like island, schools, traffic sign, universities, hospitals, offices etc. In the authors apply Kalman filters to trace the signs till their size is massive enough to confirm sturdy recognition results. The system consists of 3 basic parts: sensory , sensory activity and abstract analyzers. The information obtained is employed by a spatiotemporal Attention neural network within the sensory activity instrument.

LITERATURE REVIEW

There are many experiments in the literary deal with the road signal recognition (RSR) issue. In this section, we will look into some of these policies. Mobile mapping is a standard technology to compile cartographic information from a mobile vehicle. Writer paper is a novel method designed to create recognition in the mobile mapping process, which has a pattern to restore symbolic distortion on weak classification cascade results and implement identification techniques. The high difference of signal performance is the recognition and recognition of road signs, and many studies have been delayed by the computer study problem. There are two main procedures in this field, color based and gray scale based signal recognition. Reducing the color-based approach allows false positives are the result of the recognition process, but grayscale techniques focus on the geometry of the model to determine it. Color-based studies are based on partitioning in the color space. The Ghakha study focuses specifically on nervous networks, which are used for image filtering and symbolic recognition, and other approaches are based on genetic algorithms.

Studies on gray scale images are geometric reasoning and most of them serve on huff transforms, and are generally used as complementary technology to eliminate false positive results of the color classification method.

Vienna Convention on Road Signs is standardizing traffic signs across different countries. About fifty two countries have signed this written agreement which incorporates thirty one countries From Europe . The convention has loosely classified the road signs into seven classes selected with letters A–H. These initial TSR systems that acknowledge speed limits were developed in cooperation by Mobil eye and Continental Ag. They initial appeared in late 2008 on the redesigned BMW 7-Series, and the following year on the Mercedes-Benz S Class.

It was introduced in 2008 in the Opel badge, later followed by the opal Astra and also the Saab 9-5. This technology is additionally out there on the 2011 Volkswagen Phaeton and since 2012 in Volvo S80, V70, XC70, XC60, S60, V60 and V40 (model year 2013-), a technology called Road Sign info. They are powerless to recognize demarcation line signs, that in most European countries.

The Automotive Coalition for Traffic Safety and also the National road Traffic Safety Administration have demanded a Driver Alcohol Detection System for Safety (DADSS) program to place alcohol detection devices altogether cars. Driver sleepiness detection could be an automotive safety technology that helps stop accidents caused by the driver obtaining drowsy. Various studies have suggested that around 20% of all road accidents are fatigue related, up to 50% on certain roads. Bosch: "Driver sleepiness detection takes input from the steering angle detector, front mounted lane assist camera, vehicle speed and switch signal stalk.

Mercedes-Benz: Attention Assist In 2009, Mercedes-Benz undraped a system referred to as Attention Assist that monitors the driver's fatigue level and temporary state supported his/her driving inputs. It problems a visible and perceptible alarm to alert the driving force if he or she is just too drowsy to continue driving.

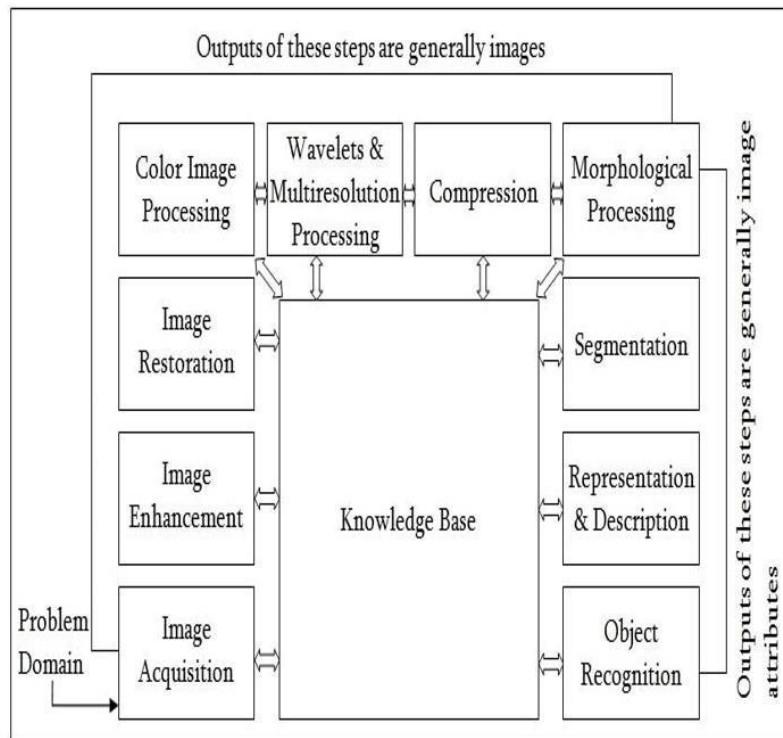
Nissan: According to Paclik, the primary study of automated road sign recognition was reported in Japan in 1984. Since then, number of strategies are developed for road sign detection and identification. For years, researchers are addressing the difficulties of police work and recognizing traffic signs. Recently, some groans even have another camera at the rear and/or the facet of the vehicle recording the signs behind or aboard the vehicle. The cars are fitted with a computer system for effort the videos, or specialized hardware for driving help Applications. Road signs have specific properties that distinguish them from other out of doors objects.

IMAGE PROCESSING AND ITS DESIGN TECHNIQUES

Different techniques are performed on the image or picture is called as the image processing. Image processing is performed different mathematical operation the image .The image processing is one of the signals processing technique. The image processing is taking the input as image and it gives the output as image. This is the image processing method. In this process it plays different operations are performed. That is image taking, enhancement the image, scaling the image, feature extraction also performed when the image processing. Image acquisition is the taking the picture from the environment. In this work the image is takes from the high way of the road, some traffic signs are taken that is speed limit and stop traffic picture, and narrow road.

•Image Acquisition:

Take picture from the film acquisition environment. In this work the movie takes on high highway, speed limit and traffic pick and some traffic signs to stop the narrow road.



3.1. Fundamental Steps of Digital Image Processing:

Fundamental Steps of Digital Image Processing:

•Image Enhancement:

Image enhancement is among the best and most appealing areas of digital image process. Basically, the idea behind enhancement techniques is to bring out detail that's obscured, or just to spotlight sure features of interest in an image. Image enhancement is taken into account in concert of the foremost vital techniques in image analysis. The main aim of image enhancement is to enhance the quality and visual appearance of an image, or to provide a better transformer presentation for Future automated image processing. Many images like medical images, satellite ,aerial images and additionally real world images suffer from poor and dangerous distinction and noise. It is necessary to enhance the distinction and take away the noise to extend image quality. It improves the clarity of images for human viewing, removing blurring and noise, increasing distinction, and revealing details. The enhancement technique differs from one field to a different depending on its Objective. Robustness and imperceptibility factors are the two major criteria which is lacking in spatial domain.

•Image Restoration.

The human visual system will distinguish many thousands of various color shades and intensities, but only around a hundred reminders gray. Three freelance quantities are accustomed describe any specific color. The intensity is set by the particular quantity of sunshine, with a lot of light Correspond to a lot of intense colors. Achromatic light has no color - its only attribute is amount or intensity. The intensity is set by the energy, and is thus a physical amount. Given equally intense blue and green, the blue is perceived the maximum amount darker. Color depends totally on the coefficient of reflection properties of an object than the green.

SOFTWARE TOOLS AND LANGUAGES

The general use of the MATLAB application executes the command window as an interactive mathematical shell or text files containing the MATLAB code.

Variables:

Variables are defined using the delivery operator. MATLAB is a weekly typed programming language, because varieties can be totally altered.

For example:

```
>> x = 17 x =17
```

```
>> x = 'hat' x = hat
```

A range with 1, 3, 5, 7, and 9 values defines a variable called sequence (or specifies a new value for the existing variable with a range name), which starts at array 1), increments with each step from the previous value 2 (increment value), And 9 (terminator value) when it (or preventing to exceed).

```
>> array = 1: 3: 9Array
= 147
```

Index is one-based, which is a general meeting for mathematics in mathematics, but not for some programming languages like C, C ++, and Java. Matrix can be defined by separating an item with spaces or a comma, and using a semicolon to end each row. The list of elements should be enclosed with square brackets: []. Parentheses: () to access items and subpages (they also refer to the function argument list).

```
A =>> (2,3)
```

```
Ans =11
```

Indices sets can be expressed through expressions such as "2: 4", which evaluates .For example, subdirectories derived from rows 2 through 4 and 4 to 3 columns are written as follows: >> (2: 4, 3: 4)

```
Ans = 11 8
```

```
7 12
```

```
14 1
```

Using a function eye can create a square recognition matrix of size n, and zeros or matrices of any size can be generated by a series of functions, zeros and respectively. Most MATLAB functions can accept matrices and apply to each element.

For example, each element multiplies in mod (2 * j, n) 2 "j", and then each element can be reduced to "n" in modulo. MATLAB has standard "for" and "while" loops, but (like in other applications such as R), produces a code that can often be executed using Vectored notation.

Structures

MATLAB contains data structures that are configured. With all variables ranges in MATLAB, the correct name is "structure array", where each element of the array has the same field names. In addition, MATLAB supports dynamic field names (see field by field, field manipulation, etc.). Unfortunately, MATLAB does not support JIT MATLAB structures, so the simplest compilation of many variables in one model comes at a price.

Functions

When the MATLAB function is created, the filename must match the first function of the file. Valid function names begin with a spelling, and may contain letters, numbers ,or underscores. The MATLAB programming languages can call the functions written in C or Fortran and sub dines. A wrapper function designed to allow MATLAB to accept and retrieve data types. The dynamically loaded object files created by compiling such functions are called "MEX-Files" (for MATLAB Executable). A two-way interface is growing with Python since 2014. Libraries written in Pearl, Java, and Active X run the MATLAB.

It is difficult to call MATLAB from Java, but it can be done with MATLAB toolbox

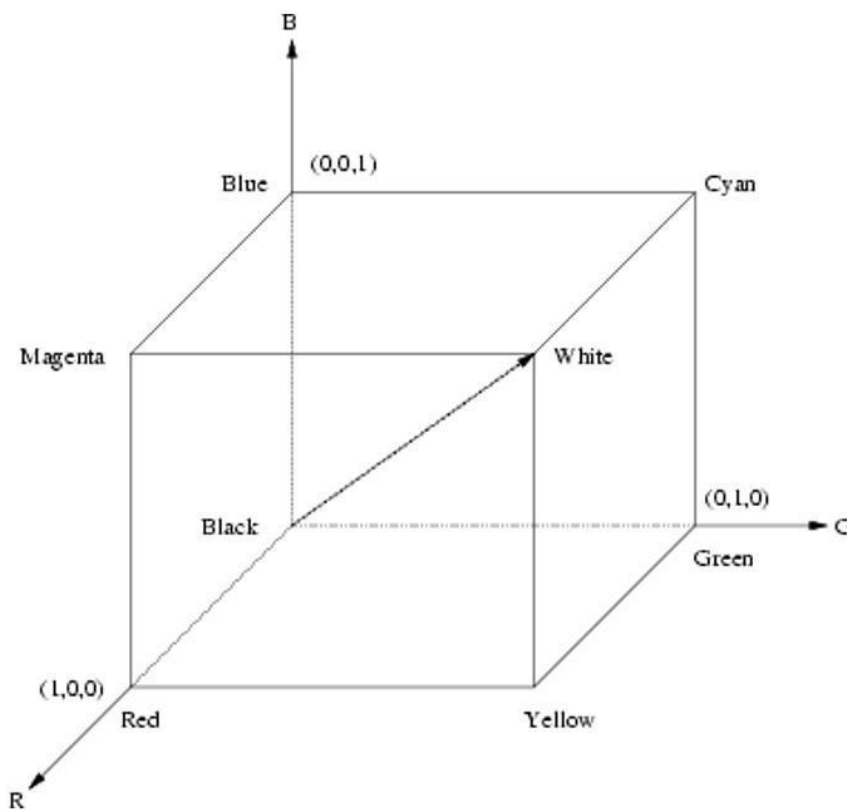
, which is sold separately via Math Works or cannot be confused with the JMI(Java-to- MATLAB

interface), unrelated Java metadata interface, Also called).The official MATLAB API for Java has been added to

2016. The Mu PAD-based symbolic month available from Math Works, as alternatives to the Textbox, can link MATLAB with Maple or Mathematics. There are also libraries to import and export Math ML.

The RGB Model:

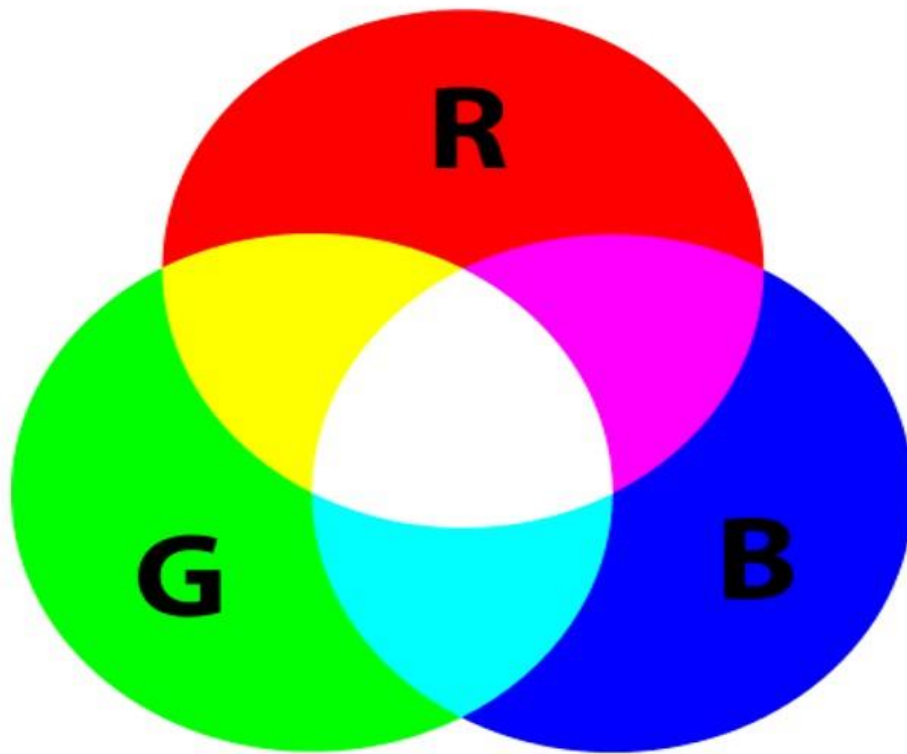
In the RGB model, an image consists of 3 freelance image planes, one in every of the first colors: red, green and blue. Specifying a selected color is by specifying the number of every of the first parts gift. The RGB color model for specifying colors employing a coordinate system those colors made up of equal amounts of every primary lies on the road connation the black and white vertices.



Figure

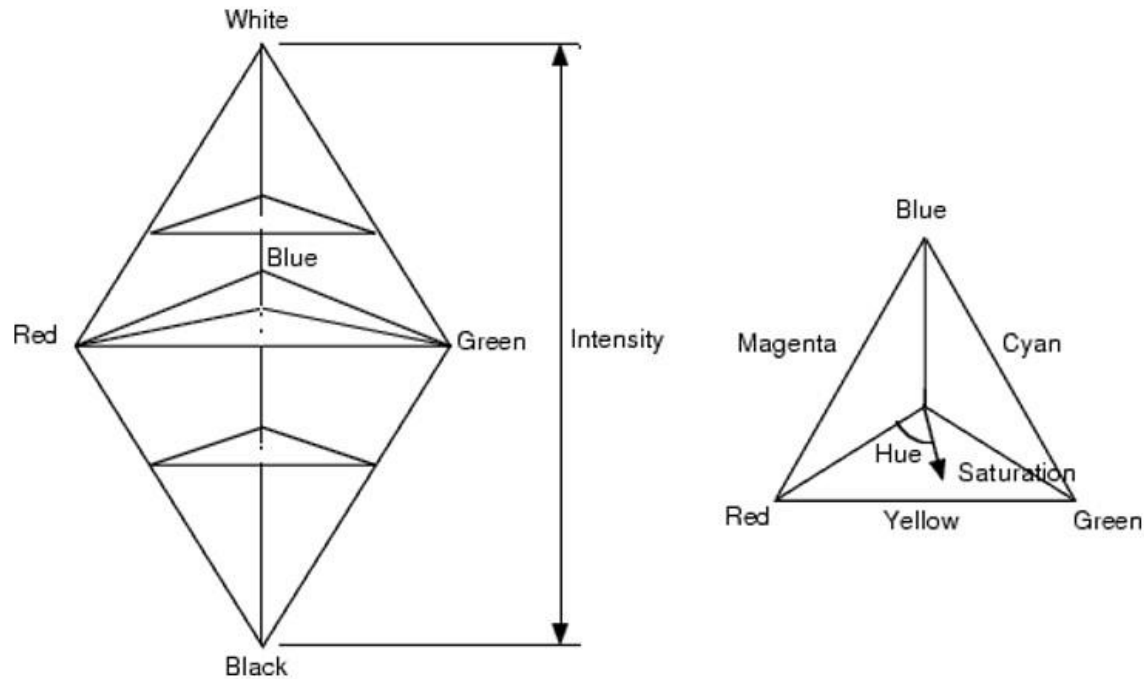
The RGB color cube:

In between the white and black joining vertices have the gray scaled spectrum. This is an additive model, i.e. colors present within the light add to form new colors, and is suitable for the blending of colored light for example. The image on the left of figure six shows the additive intermixture of red, green and blue primaries to make the three secondary colors yellow (red + green), cyan (blue + green) and magenta (red + blue), and white (red + green + blue). Computer and mobile phone displays, video projectors, multi color LED displays and large screens such as Jumbo Ron. To form a color with RGB, 3 light beams (one red, one inexperienced and one blue) should be superimposed. Zero intensity for every element offers the darkest color (no light, thought of the black), and full intensity of every offers a white; the quality of this white depends on the character of the first light sources, but if they're properly balanced, the result's a neutral white matching the system's white point. A secondary color is created by the ad of two primary colors of equal intensity: cyan is green+blue, magenta is red+blue, and yellow is red+green. Every secondary color is the complement of 1 primary color; once a primary and its complementary secondary color area unit supplementary together, the result's white: cyan complements red, magenta enhances green, and yellow complements blue.



A representation of additive color mixing.

The CMY (cyan-magenta-yellow) model is a subtractive model acceptable to absorption of colors, as an example due to pigments in paints. Whereas the RGB model asks what's added to black to induce a specific color, the CMY model asks what's ablated from white. In this case, the primaries are cyan, magenta and yellow, with red, inexperienced and blue as secondary. When a surface coated with cyan pigment is illuminated by white light, no red light is mirrored, and equally form agent and green, and yellow and blue. The CMY (cyan-magenta-yellow) model is a subtractive model acceptable to absorption of colors, as an example due to pigments in paints. Whereas the RGB model asks what's added to black to induce a specific color, the CMY model asks what's ablated from white. In this case, the primaries are cyan, magenta and yellow, with red, inexperienced and blue as secondary. When a surface coated with cyan pigment is illuminated by white light, no red light is mirrored, and equally for magenta and green, and yellow and blue.



additive commixture of red, green and blue.

As mentioned on top of, color is also nominative by the 3 quantities hue, saturation and intensity. This is the HIS model, and also the entire area of colors which will be per this manner is shown in below figure.

Color Image Processing:

Color image process plays the important role in the image detection and recognition. This may embrace color modeling and process in a very digital domain etc. The human sensory system will distinguish many thousands of various color shades and intensities, but only around a hundred reminders gray. Therefore, in an image, an excellent deal of additional data could also be contained within the color, and this additional data will then be went to alter image analysis. Three freelance quantities are wont to describe any specific color. Visible colors occur between concerning 400nm (violet) and 700nm (red) on the spectrum.

Wavelets and Multi resolution Processing:

Wavelets are the muse for representing images in varied degrees of resolution. As a machine tool, multi resolution will be applied to a range of issues in signal and image process. This treatise addresses the issues of segmentation and edge detection in images with specific stress on satellite pictures that show options of a fine nature, like the Atlantic Gulf Stream. The treatise conjointly describes a transportable tool kit , for standard and multi resolution image processing, that was developed to check the as sorted algorithms represented during this analysis.

Image Compression:

Compression deals with techniques for reducing the storage needed to save lots of an image or the information measure to transmit it. Digital pictures become fashionable for transferring visual data. There are several benefits to mistreatment these images over ancient camera film pictures .The digital cameras turn out instant pictures, which might be viewed without the delay of expecting film process. But these pictures are massive in size. The compression techniques helps to scale back the price of storage and economical transmission of digital Pictures.

In the initial one invertible 2nd remodels like separate transform constant, separate moving ridge constant etc are used. We can apply these techniques to image either by applying to a collection of pixels or to the full pictures. In the initial one invertible 2nd remodels like separate transform constant, separate moving ridge constant etc are used. We can apply these techniques to image either by applying to a collection of pixels or to the full pictures. The loss compression that produces unobservable variations could also be referred to as visually lossless. In lossless compression technique the original image is perfectly recovered. This is called as the noise less compression. They will not introduce any noises to the image and that they are mistreatment statistics or decomposition techniques to scale back the redundancy. As mentioned earlier they're most popular for medical imaging, technical drawing etc. The following are a number of the methods that are USA impotence for lossless compression. The Run length secret writing methodology could be a straightforward lossless compression methodology. This is most helpful on information that contains repetitive data. In this process same symbols are replaced. These similar symbols are called as the runs.

The constant space secret writing is technique is increased kind of run length secret writing technique. There is some important advantage of victimization this technique over alternative lossless ways. This technique is increased kind of run length secret writing technique. There is some important advantage of victimization this technique over alternative lossless ways. Here the image is divided in two blocks then the segments area unit classified as blocks that only contains black or white pixels or blocks with mixed intensity. Another variant of constant space writing is to use an unvarying approach within which the binary image is rotten into in turn smaller and smaller block. A gradable tree is constructed from these blocks. The nodes of this tree area unit then coded. For pressure white text a less complicated approach is employed. This is called white block skipping. In these blocks containing solid white area unites area unit coded to zero and every one alternative areas are coded to one.

The lossy compression that produces imperceptible variations is also referred to as visually lossless. The following strategies square measure employed in lossy compression one. Chroma sub sampling a pair of transform coding three. It works by taking advantage of the human visual system's lower acuity for color differences than for luminousness. It is especially employed in video cryptography, jpeg cryptography etc. Chrome sub sampling may be a methodology that stores color information at lower resolution than intensity data. This method introduces 2 sorts of errors. Transform writing it's a type of compression for natural information like photographic pictures. It will result a coffee quality output of original image. It is a core technique suggested by jpeg. Many types of transforms are tried for picture writing, together with as an example Fourier, Karhonen -Loeve, Walsh-Hadamard, lapped orthogonal, discrete cosine (DCT), and recently, wavelets. Fractal Compression it's one amongst the loss compression technique employed in digital pictures. As the name indicates it primarily supported the fractals. This approach is sweet for natural pictures and textures. It works on the actual fact that elements of a picture usually gibe different elements of identical image. This method converts these elements into mathematical information. This information square measure referred to as "fractal codes".

Morphological Process:

Morphological process deals with tools for extracting image elements that square measure helpful within the illustration and description of form. Morphological process is built with operations on sets of pixels. We will examine some basic set operations and their quality in image process.

Morphological process for grey scale pictures needs a lot of refined mathematical Development. Our sets are going to be collections of points on a picture grid G of size $N \times M$ pixels.

Segmentation:

Segmentation is divided the image into small pixels. A rugged segmentation procedure brings the method a protracted manner toward roaring answer of imaging issues that need objects to be identified on an individual basis.

Digital image process is that the use of pc algorithms to perform image process on digital images. Segmentation is the difficult process in the image process. Image segmentation technique is employed to partition a picture into purposeful elements having similar options and properties. That is representing a picture

into purposeful and simply complex manner. The goal of image segmentation is to divide a picture into several parts/segments having similar options or attributes.

The basic applications of image segmentation are: Content based image retrieval, Medical imaging, Object detection and Recognition Tasks, Automatic control systems and Video police investigation, etc.

The image segmentation approaches will be classified into 2 sorts Supported properties of image. There are many existing techniques that are used for image segmentation. These all techniques will be approached from 2 basic approaches of segmentation. Structural Segmentation Techniques The structural techniques square measure those techniques of image segmentation that depends upon the information of the structure of needed portion of the image i. e. the required region that is to be segmental. The popular techniques used for image segmentation are: thresholding technique, edge detection based mostly techniques, region based mostly techniques, clump based mostly techniques, watershed based mostly techniques, partial equation based and artificial neural network techniques etc. These all techniques are totally different from one another with respect to the strategy utilized by these for segmentation.

Thresholding Method:

The above types of ways divide the image pixels with relevance their intensity .These ways square measure used over pictures having lighter objects than background. The selection of those ways may be manual or automatic i. e. can be supported previous data or information of image options. The edge based mostly segmentation ways square measure supported the speedy modification of intensity price in an image as a result of one intensity value doesn't give smart info concerning edge. Region cacophonous and merging methods: The region cacophonous and merging based mostly segmentation ways uses 2 basic techniques. Splitting stands for iteratively dividing a picture into regions having similar characteristics and merging contributes to combining the adjacent similar regions.

Object Recognition:

Recognition is that the method that assigns a label, such as, "vehicle" to an object supported its descriptors. Computer vision is that the ability of machines to visualize and perceive what's in their surroundings. Most recently, in computer vision plenty of analysis is conducted, particularly in its major sub domains like beholding, motion analysis or scene reconstruction. A beholding system uses coaching datasets containing pictures with celebrated and labeled objects and it extracts differing kinds of knowledge supported the chosen formula. This can be data concerning colors, edges, geometric forms then on. Many applications victimization beholding may be found in lifestyle. Starting with robots in industrial Environments, face or handwriting recognition and up to autonomous systems like fashionable cars that use object recognition for pedestrian detection, hand brake assistant then on.

CONCLUSION:

In this paper presents a traffic sign detection and recognition methods. The building blocks are used in this project is pre processing done by CLAHE and edge detection done by canny edge detection method. Classification is done by SVM and Fuzzy C Mean algorithm. These methods are gives the good result. This thesis is useful for the driver assistance system. To use this technology reduce the road accidents. In this paper gives good result compares with the other result. Canny edge detection and Fuzzy c Mean algorithm are gives the good result. The K means classifier used the error probability is 0.6. In this thesis error probability decreased with compared with the SVM and K Means algorithm. In this thesis FUZZY C Mean algorithm is used it gives the minimum error probability.

In our result, the traffic sign displays all kinds of good sign. It was able to reduce this Risk rate with the help of traffic signals notification application. To understand individual effects SVM and Fuzzy C means the components in determining for different icons with the help of cluster, we're running detectors using Color channels and shape channels get the result from the channel above and send it to two different groups. Finally, we have combined two methods of SVM and Fuzzy Commons; identify many unknown traffic signals

simultaneously in effective manner. In our end that shape is a strong queue more than color and shaded images with SVM prediction. Feature scope of this thesis is to implement the unmannered vehicles.

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