Image processing is an application of signal processing where input is picture and the output is either a picture or a couple of characteristics related to the image. It handles with the processing of a 2D image by the assistance from a computer. The tiniest part of an image is a pixel, also known as picture element. The processing of an image is completed pixel by pixel. There are two methods of improving image quality such as image restoration and image enhancement. Image enhancement improves the visibility of taking care of or part of an image [1]. It identifies sharpening of image features such as for instance boundaries, or contrast to produce a graphic display. This really is mainly helpful for display & analysis. This technique will not boost the inherent information content in the data. Gray level & contrast manipulation, noise reduction, sharpening, filtering, interpolation and magnification, pseudo coloring, and so on are included in this.

Image enhancement uses qualitative individual approach to make a more visually gratifying image. They cannot count on any physical model for the image formation and simpler than de-convolution methods. The prevailing research indicates that underwater images raise new challenges and impose significant problems as a result of light absorption and scattering ramifications of the light and inherent structure less environment. Exploring, understanding and investigating underwater activities of images are gaining importance going back few years. Scientists are keen to explore the mystifying underwater world. However, this area continues to be without image processing analysis techniques and methods that might be used Researchers have tried to employ various different enhancement techniques.

II. IMAGE ENHANCEMENT TECHNIQUES

2.1. Wavelength Compensation and Dehazing

The algorithm for wavelength compensation and image dehazing (WCID) [2] combines techniques of WCID to eliminate distortions due to light scattering and color change. The WCID algorithm can effectively restore image color balance and remove haze. To the most effective of our knowledge, no existing techniques are designed for light scattering and color change distortions suffered by underwater images simultaneously. The experimental results demonstrate superior haze removing and color balancing capabilities of WCID over traditional dehazing and histogram equalization methods. However, the salinity and the total amount of suspended particles in ocean water vary with time, location, and season, making accurate measurement of the rate of light energy loss Nner difficult. Errors in the rate of light energy loss will affect the precision of the water depth and the underwater propagation distance derived. Constant monitoring and long-term tabulation of the rate of light energy loss based on time, location, and season might provide a fair estimate of the actual value. Furthermore, a calibration procedure might be performed first by drivers before an image-capturing session by having a test picture at known water depth and underwater propagation distance to fine-tune the rate of light energy loss. Additionally, the artificial lighting is assumed to be a point source emitting uniform Omni-directional light beams across all wavelength spectrums. This is distinctive from the linear or surface source of light with strong beam directionality and no uniform color characteristic commonly encountered in underwater photography. The precise estimation of the luminance distribution of the light source is also demanding. If the geographic location in taking the underwater footage and the characteristics of the light source employed are known a priori, even better results in haze removal and color balance can be reached.
CLAHE was originally developed for medical imaging and has which can be successful for enhancement of low contrast images such as for instance portal films. The CLAHE algorithm [3] partitions the images into contextual regions and applies the histogram equalization to each one. This evens out the distribution of used grey values and thus makes hidden top features of the image more visible. The total grey spectrum is employed to state the image. Contrast Limited Adaptive Histogram Equalization, (CLAHE) is a better version of AHE, or Adaptive Histogram Equalization. Both overcome the limitations of standard histogram equalization. A number of adaptive contrast limited histogram equalization techniques (CLAHE) are provided. Sharp field edges could be maintained by selective enhancement within the field boundaries. Selective enhancement is accomplished by first detecting the field edge in a portal image and then only processing those parts of the image that lie in the field edge. Noise could be reduced while maintaining the high spatial frequency content of the image through the use of a variety of CLAHE, median filtration and edge sharpening. An alternative of the contrast limited technique called adaptive histogram clip (AHC) can be applied. AHC automatically adjusts clipping level and moderates over enhancement of background parts of portal images. CLAHE on RGB Colour Model: The RGB colour model is definitely an additive colour model. Here red, green and blue light are added together in a variety of ways to replicate a wide variety of colours. The worth of R, G, and B components could be the amount of the respective sensitivity functions and the incoming light. In RGB color space, CLAHE is applied on most of the three components individually and the consequence of full-color RGB may be obtained by combining them. CLAHE on HSV colour model: HSV is really a cylindrical-coordinate representation of points within an RGB color model. In color space it describes colors when it comes to the Hue (H), Saturation (S), and Value (V). Regardless of the worth staying at either min or max intensity level, hue and saturation levels won't differ. CLAHE can just only be applied on V and S components.

When applying a mix algorithm the main element to acquire good visibility of the ultimate result is represented by the well tailored inputs and weights. Unique of all the existing fusion methods (however, do not require designed to cope with underwater scenes), this fusion technique processes just a single degraded image. The overall notion of image fusion is that the processed result, combines several input images by preserving only probably the most significant top features of them. Thus, results obtained by way of a fusion-based approach fulfill the depiction expectation when each area of the result presents a suitable appearance in one or more of the input images. Inside single-based image approach two inputs of the fusion process are based on the first degraded image. Enhancing solution doesn't search to derive the inputs on the basis of the physical style of the scene, since the present models are very complex to be tackled. Instead, we strive for a quick and simple technique that works generally. The very first derived input is represented by the color corrected version of the image while the second reason is computed as a contrast enhanced version of the underwater image after having a noise reduction operation is performed. This strategy was tested for sure underwater videos and images obtained from different available amateur photographer collections. Consequently, images and videos have now been captured using various cameras and setups. However, an essential observation is that individual’s process only 8-bit data format although many professional cameras have the choice to shoot in the RAW mode that typically stores the unprocessed data of the camera's sensor in 12-bit format. This technique is computationally effective taking approximately 2 seconds in mat lab code for a 800x600 frame but we believe that the optimized implementation could run real-time on common hardware. By way of a general visual inspection it may be observed this technique has the capacity to yield accurate results with enhanced global contrast, color and fine details as the temporal coherence of the videos is well preserved.
III. LITERATURE SURVEY

Yisu Zhao et al. (2010) [4] have introduced a novel method by combing Contrast-limited Adaptive Histogram Equalization (CLAHE) and multi-step integral projection to achieve real-time subject-independent automatic facial feature enhancement and detection. They found that sigma filtering in this research is applied because of its validity in noise removal. To extract facial features as accurately and clearly as possible, they applied CLAHE on images for enhancing the facial features. This step is done after the sigma filter in order not to amplify the noise in images. They also used multi-step integral projection to detect the useful facial features regions automatically. They have tested their system on the JAFFE database and achieve a high recognition rate of 95.318% on trained data. Zhen Jia et al. (2010) [5] introduced a new algorithm for improving the visibility of surveillance videos degraded by fog and/or rain and adaptively for enhancing the global and local contrast of a surveillance video. They declared that this algorithm is inspired on the human visual system, and accounts for the perceptual sensitivity to noise, compression artifacts, and the texture of image content. The existing researchers have been combined the classic Contrast Limited Adaptive Histogram Equalization (CLAHE) method with this model to adaptively enhance surveillance videos. They is also implemented a real-time video enhancement system and performed extensive experimental testing over a movie database containing common surveillance videos recorded under fog and rain conditions. Chen Hee Ooi et al. (2010) [6] have described that numerous histogram equalization (HE)-based brightness preserving methods tend to produce unwanted artifacts. Thus, they introduced two methods to overcome the drawbacks in which former method divides the histogram based on the median, and iteratively divides into the lower and upper sub-histograms, to produce a totally four sub-histograms. The separating points in the lower and upper sub-histograms are assigned to a new dynamic range and clipping process is implemented to each sub-histogram. They introduced that later method is the extension of the bi-histogram equalization plateau limit (BHEPL) that segments the histogram of input image based on its mean value and then, clipping process is implemented to each sub-histogram based on their median value. Nyaml khagya Sengee et al. (2010) [7] have found that one widely accepted contrast enhancement method is global histogram equalization (GHE), which achieves comparatively better performance on almost all types of image but sometimes causes excessive visual deterioration. So they introduced a new method which is extension of bi-histogram equalization called Bi-Histogram Equalization with Neighborhood Metric (BHENM) which consists of two stages. They declared that in first stage, large histogram container causes washout artifacts, are split into sub-bins using neighborhood metrics; the exact same intensities of the first image are arranged by neighboring information. In the 2nd stage, histogram of the first image is separated into two sub-histograms on the basis of the mean of the histogram of the first image; the sub-histograms are equalized independently using refined histogram equalization, which produces flatter histograms. They showed in results that BHENM simultaneously preserved the brightness and enhanced the local contrast of the original image. Zohaib Hammed et al. (2011) [8] have found that the performance of an edge detection algorithm can be affected by serious noise & intensity in homogeneities. So they introduced a method aiming at detecting edge of image with varieties of gradient signal degradation which comprised two steps: adaptive histogram equalization and gradient modulation filtering process to improve the signal contrast in a discriminative manner. They revealed that this approach is applicable and effective to detect edges of poor images. Yeong-Kang Lai, Yu-Fan Lai et al. (2011) [9] have found that thin-film transistor liquid crystal display (TFT LCD) is widely used in handheld mobile devices but it consumes 20%–45% of total system power due to different applications. They also found that by controlling the backlight current to reduce the brightness and the contrast of LCDs can reduce the overall power consumption but this may cause significant changes in visual perception. So that they introduced new method to be able to reduce the energy consumption and get rid of the visual changes, the problem becomes. They introduced two new algorithms predicated on content analysis: the newest backlight-dimming algorithm (NBDA) and the newest image enhancement algorithm (NIEA). They observed that these algorithms can simultaneously reduce power consumption by 47% and increase the image enhancement ratio by 6.8% and also the structural-similarity index metric (SSIM) can be used to gauge image quality. Balvant Singh et al.(2011)[10] have described the performance of contrast limited adaptive histogram equalization method is compared with contrast stretching, and histogram equalization method. For comparing the performance, they have applied mean square error and SNR as parameters. They applied this method on various type of underwater image environment for testing. They found that underwater image suffers from low contrast and resolution due to poor visibility conditions, so object identification under water is difficult task. So they presented comparative analysis of various contrast enhancement techniques for such underwater images. John Y. Chiang et al. (2012) [11] have found that Light scattering and color change are two major sources of distortion for underwater photography and no existing underwater processing techniques can handle light scattering and color change distortions suffered by underwater images, and the possible presence of artificial lighting simultaneously. So they introduced that a novel systematic approach to enhance underwater images by a dehazing algorithm, to compensate the attenuation discrepancy along the propagation path, and to take the influence of the possible presence of an artificial light source into consideration. They declared that performance of this algorithm for wavelength compensation and image dehazing (WCID) is evaluated both objectively and subjectively by utilizing ground-truth color patches and video downloaded from the Youtube website. They have shown in results that images with significantly enhanced visibility and superior color fidelity are obtained by the WCID. Gurvir Singh, et al. (2013) [12] have found that in image enhancement various enhancement schemes have been used for enhancing which includes gray scale manipulation, filtering and Histogram Equalization (HE). They declared that existing techniques produce images with do not look as natural as the input ones and HE tends to introduce some annoying artifacts and unnatural enhancement. So to overcome these drawbacks, they introduced that different existing defined brightness preserving techniques are used to check their performance measurement. They have done comparison on the basis of subjective and
objective parameters. And they also found that subjective parameters are visual quality and computation time and objective parameters are Peak signal to noise ratio (PSNR), Contrast and Error. Pulung Nurtianto ANDONO (2013) [13] have introduced that Success of scale-invariant feature transform (SIFT) image registration is bound when attempted on camera footage taken under water and largely as a result of poor image quality inherent to imaging in aquatic environments. To overcome this shortcoming, they have introduced a fresh approach to pre-processing of true-color imagery taken under water on the basis of the Contrast Limited Adaptive Histogram image Equalization (CLAHE) algorithm in that the distribution function of the pixel intensity values of an underwater recorded image is dominated by Rayleigh scattering, and that the noise may be removed as a function hereof. They declared that if applying the CLAHE image enhancement method registration success of SIFT increased by 41% in comparison to reference method (a straightforward contrast stretching enhancement). Seung-Won Jung et al. (2014) [14] have introduced a new global contrast enhancement algorithm using the histograms of color and depth images. they have implemented this technique on the basis of the histogram-modification framework, the color and depth image histograms are first partitioned into subintervals using the Gaussian mixture model and the positions positioning the color histogram are then adjusted such that spatially neighboring pixels with the similar intensity and depth values can be grouped into the same sub-interval. They declared that by estimating the mapping curve of the contrast enhancement for each sub-interval, the global image contrast can be improved without over-enhancing the local image contrast. Shiwam S. Thakare1 et al. (2014)[15] have described comparative analysis of various enhancement techniques for such underwater images. They found that underwater images suffers from low contrast and resolution due to poor visibility conditions, hence an object identification become typical task and the processing of underwater image captured is necessary because the quality of underwater images affect and these images leads some serious problems when compared to images from a clearer environment. They have found that a lot of noise occurs due to low contrast, poor visibility conditions, absorption of natural light, non uniform lighting and little color variations, and blur effect in the underwater images, so they declared that there is need to cure these underwater images by using different filtering techniques. Pooja Sahu et al. (2014)[16] Have introduced the techniques to enhance underwater image enhancement techniques. In addition they discovered that the processing of underwater image captured is essential because the caliber of underwater images affect and these image leads some serious problems like a large amount of noise occurs as a result of low contrast, poor visibility conditions (absorption of natural light), non uniform lighting and little color variations, pepper noise and blur effect in the underwater images when comparing to images from the clearer environment. They've observed that because of these reasons quantity of methods are existing to cure these underwater images using different filtering. They introduced that enhancement of underwater images one is image enhancement using median filter which enhances the image and help estimate the depth map and improve quality by eliminating noise particles with assistance from different techniques, and another is RGB Color Level Stretching have used.

IV. GAPS IN LITERATURE
Image enhancement algorithms become more beneficial for numerous vision applications. It has been originated that the most of the existing research have mistreated numerous subjects. Following are the various research gaps concluded using the literature survey:-

1. The presented methods have neglected the techniques to reduce the noise issue which is presented in the output images of the existing image enhancement algorithms.
2. Not much effort has focused on the L*A*B color space using CLAHE based enhancement.
3. The problem of the uneven illuminate is also neglected by the most of the researchers.

V. CONCLUSION AND FUTURE SCOPE
Image enhancement is really a preprocessing component of many image processing applications. The goal of image enhancement is usually to enhance the interpretability or perception of information in images for human viewers, order to have better input for other automated image processing techniques. There are numerous causes of low quality associated with an image including distortion being created by the imaging systems, insufficient expertise from the operator and the adverse external conditions during the time of image acquisition. Mainly, Image enhancement includes intensity and contrast manipulation, noise reduction, edges sharpening and filtering, etc. Image enhancement algorithms are more useful or a lot of vision applications. It is found that most of the existing researchers have neglected many issues; i.e. no technique is accurate for different kind of circumstances. The existing methods have neglected the use of L*A*B color space to enhance the image in efficient manner. Also the problem of the uneven illuminate is also neglected by the most of the researchers.

To overcome the problems of existing technique in near future, a new L*A*B color space and CLAHE based image enhancement algorithm may be proposed. To overcome the issue of the uneven illuminate issue in the output image of the CLAHE output may be further removed using the use of color channel normalization.

REFERENCES


