Correction of Color Images Distorted by Meteorological Factors

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Abstract - **The comparative analysis of RGB and HSI color models concerning correction of images distorted by meteorological factors is given.**

Keywords – **Contrast correction, RGB, HSI, visibility.**

I. Introduction

Bad weather conditions, such as fog and mist, may result in significant visibility impairment. To minimize the risk of emergency, which may occur in bad weather in different industries, including transport, is a problem of actual interest.

This paper contains results obtained by development of previous work [1], which was dedicated to black-and-white images correction. The aim of current research is to apply obtained previously results to color images.

The purpose of establishing weather degraded image correction is not to recover weather-distortion-free image, but to improve the distinctiveness of the objects depicted on the image. According to that, there was no task to minimize the difference between processed and weather-distortion-free images.

II. The Main Part

The proposed method of weather degraded image correction could be classified as contrast correction method and is based on known adaptive histogram equalization, discussed in detail in [2]. Before adaptive histogram equalization applied processed image is separated on several regions by number of quantization levels of image reducing.

Obtained in such way regions are treated in different manner [1].

Contrast correction techniques analyzed in [1] could be applied to the color images. The most common color model in use nowadays is the RGB color model, which suggests using of red, green and blue colors. Digital RGB image is three arrays of data, each presenting an above mentioned color. Also, the HSI (Hue, Saturation, Intensity) color model is widely used. According to this color model a color and intensity components of image are separated. That fact could be useful for a number of applications. Both the RGB and the HSI color models concerning correction of images distorted by meteorological factors are analyzed.

The analysis of RGB images showed that each color array histograms are different. Thereby, application of correction method presented in [1] is complicated by the need of choosing different correction parameters for each color array.

The HSI color model is chosen as preferable considering a set of advantages comparing with RGB.

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In the first place, the I component of HSI image is an intensity image, and all intensity image correction techniques presented in [1] could be easily applied to it. In the second place, it's possible to process only intensity and saturation arrays and hue array of image could be retained. This fact could increase the speed of color image processing comparing with RGB, where all three components of image should be treated.

While letting hue component be retained, the saturation component of image is proposed to be treated. Both the histogram modification and simple amplification of that array of image were tested.

Results of presented method application to real world and synthetic images [3], described by RGB and HSI color models, are given in the report. Along with the presented method a number of existing methods such as histogram equalization and contrast limited adaptive histogram equalization were also tested on the same images. The comparative qualitative and quantitative evaluations of processed images were established.

III. Conclusion

Considering the results of qualitative and quantitative evaluations of processed images, we may conclude that in comparison with RGB, usage of HSI color model could simplify the application of method, presented in [1], to color images.

The main advantage of HSI color model concerning correction of images distorted by meteorological factors is that color and intensity components of image are separated and could be treated independently. Also, processing of the intensity and saturation components of image while letting hue component be retained we may achieve a significant color image processing speed increase.

References

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