DESIGN OF EFFICIENT FLICKER FREE VIDEO DEFOGGING METHOD FOR REAL TIME APPLICATIONS

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Abstract:

Many image pre-processing algorithms, such as de-noising, illumination adjustment, and haze removal approaches, have been integrated for enhancing the visibility in imaging systems. In real-time monitoring systems, implementing a low-complexity and sufficiently-quick solution for pre-processing algorithms is necessary. Hence, hardware implementation involving very-large-scale integration (VLSI) design can be considered a better solution, which can be included in end-user camera equipment to achieve real-time requirements. Defogging is an essential pre-processing technique for object detection in computer vision-based systems and has been widely used in outdoor surveillance system applications. Considering real-time applications, the proposed defogging algorithm involves a low-cost hardware oriented design that is based on an atmospheric scattering model and dark channel prior an adjuster is applied to the video for preventing “flicker” which means that the brightness changes dramatically between two neighbor frames in the video. To achieve the requirement of real-time applications for both static and dynamic images, an implementation of seven-stage very-large-scale integration (VLSI) architecture for the proposed algorithm is presented.
1. INTRODUCTION

Currently, the demand for cameras and intelligent surveillance systems, for executing real-time recording and monitoring public and private areas is increasing. Consider, for example, a vehicle dashboard camera. Such a camera records road situations in real-time during driving, and the recorded videos can provide information, regarding the automatic license plate recognition or, crashes-related events. Such information is highly beneficial for the police in investigating and resolving road event and traffic violation. In intelligent transportation systems, cameras keep track of road or street scenes to detect the traffic flow or identify cars for specific applications such as vehicle identity checks. Therefore, video quality plays a critical role in such applications.

However, unfavorable weather conditions or poor atmospheric light results in inadequate visibility in imaging systems and leads to the production of blurred video images, rendering the recorded videos ineffectual. Haze or fog corrupts a scene and degrades captured images by substantially diminishing the contrast and visual quality of the image objects.

In addition, fog or haze damages images by making them excessively blurry, renders the identification of vital information difficult. These effects considerably increase the impracticality of intelligent system applications. To overcome the problems engendered by haze or fog, many researchers have proposed various algorithms for enhancing the visibility of affected images. Such algorithms can be classified into two categories according to the number of reference images: multiple image processing and single-image processing. Multiple image processing needs different weather condition for defogging.

In this algorithm, a weighted technique is employed to refine darker atmospheric light used in for obtaining high contrast image which means that the components of image histogram cover a broad range of the gray scale. In addition, the proposed algorithm executes an edge-preserving transmission estimation process with a low-pass filter to reduce the halo effect on object contours.

Moreover, the adjustment of atmospheric light values was considered to accommodate for the difference between videos and images. Besides, in order to meet real-time processing in video, the parallelization of the processed step in the defog algorithm by exploiting the inter-frame dependency is
employed in the proposed method. The experimental results demonstrate that the proposed algorithm exhibited superior performance to existing algorithms in terms of both quantitative and qualitative evaluations.

2. EXISTING WORK

Many image preprocessing algorithms, such as de-noising, illumination adjustment, and haze removal approaches, have been integrated for enhancing the visibility in imaging systems. In real-time monitoring systems, implementing a low-complexity and sufficiently-quick solution for preprocessing algorithms is necessary.

Haze or fog corrupts a scene and degrades captured images by substantially diminishing the contrast and visual quality of the image objects. In addition, fog or haze damages images by making them excessively blurry, renders the identification of vital information difficult. These effects considerably increase the impracticality of intelligent system applications.

To prevent artifacts from being generated in a recovered scene, a soft matting technique can be applied to optimize the transmission.

Drawbacks

- More delay
- High computational complexity

3. PROPOSED WORK

Biasing histogram and weight base technique is used for more efficient and low-complexity hardware-oriented defogging algorithm that can obtain bright results and satisfy the requirements of real-time applications for static and dynamic images.

The operating procedure of the proposed algorithm can be separated into three main parts: atmospheric light estimation, transmission map estimation, and scene recovery. First, a mixed weighting technique is proposed for determining an appropriate weighting value for
different atmospheric light in bright and dark portions. Second, object contours are detected and an edge-preserving low-pass filter and dark channel are alternately applied to estimate the transmission map. Finally, the image gets recovered.

ADVANTAGES

- Less delay
- Low computational complexity

BLOCK DIAGRAM

SYSTEM ARCHITECTURE
SIMULATION RESULTS:

MATLAB SAMPLE OUTPUT SCREENS:
PROCESS EXPLANATION

Fig[a]: Input HAZY Image

Fig[b]: Restored Image with Higher Atmospheric Light

Fig[c]: Restored Image with Lower Atmospheric Light
5. CONCLUSION

This paper presents a dark-channel-prior based real-time and highly efficient defogging algorithm. This algorithm can produce brighter and more colorful images compared with previous methods, and it can be applied to multiple continuous dynamic image systems. In general, the proposed algorithm exhibits three characteristics: First, it calculates a threshold value in a noncomplex manner, and it then computes a suitable atmospheric light according to this threshold by applying a weighting technique. Second, it applies a dynamic adjustment strategy of A to solve flicker problems in videos. Third, it capitalizes on temporal dependency to increase its processing rate by simultaneously calculating the threshold value, atmospheric light, and the recovered pixels. The experimental results revealed that the proposed algorithm obtained comparable recovered images at a low-complexity processing compared with previous approaches. Moreover, a seven-stage pipeline hardware architecture is proposed to implement our algorithm for achieving real-time processing of full HD resolution (1920 × 1080) videos at closed to 100 fps. The simulation results also showed that the proposed design could operate at a processing rate of 200 M pixels/s (indicating a clock period of 5 ns), which is sufficiently fast to meet real-time processing requirements.

These results confirm that the proposed algorithm is a favorable candidate for low-cost haze removal hardware implementation of real-time application.

REFERENCES


