Certificate

DELHI TECHNOLOGICAL UNIVERSITY, (Formerly Delhi College of Engineering) BAWANA ROAD, DELHI – 110042

Department of Electronics & Communication Engineering

This is to certify that the Dissertation entitled **"Single Image Fog Removal using Improved Dark Channel Prior and Contrast Limited Adaptive Histogram Equalization"** submitted by Mr.Sidharth Gautam, Roll. No. 2K12/SPD/19, in partial fulfillment for the award of degree of Master of Technology in Signal Processing & Digital Design at Delhi Technological University, Delhi, is a bonafide record of student's own work carried out by him under my supervision and guidance in the academic session 2013-14. The matter embodied in dissertation has not been submitted for the award of any other degree or certificate in this or any other university or institute.

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Candidate Declaration

I hereby declare that the work presented entitled "**Single Image Fog Removal using Improved Dark Channel Prior and Contrast Limited Adaptive Histogram Equalization**" as Dissertation in requirement of partial fulfillment for the award of the degree of Master of Technology in Signal Processing and Digital Design and submitted to Delhi Technological University, Delhi is an authenticate record of my own work carried out under the supervision of **Dr. Rajiv Kapoor**, Professor & Head Department of Electronics & Communication Engineering .

The matter presented in this thesis has not been submitted by me for the award of any other degree of this university or any other university.

Date: **Sidharth Gautam**

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Abstract

One of the major problems in image processing is the visibility restoration of images corrupted by atmospheric degradation such as fog, rain and snow. In outdoor environment when images are captured from optical devices, light after reflecting from an object is scattered in the atmosphere before it reaches the camera. This is due to the presence of atmospheric impurities in the air in pollutants and atmospheric degradations such as fog, rain and snow. These atmospheric impurities result in two fundamental phenomena called 'direct attenuation' and 'airlight' which create a problem of color ambiguity. 'Direct attenuation' reduce the contrast by attenuating the reflected light of distant object reaching the camera and 'airlight' add the whiteness in the scene. As a result, images taken under such conditions, appeared hazy with poor contrast and they lose their visual vividness and color fidility. Although this effect may be desirable from an artistic standpoint. But for outdor-vision application used for object recognition, tracking, navigation and surveillance, one may need to restore an image throgh a process generally referred as fog removal.

Accordingly, the task of this thesis is to present a simple but effective method to remove fog from a single digital image. Proposed method operates at a high speed than current methods and can minimize halo-artifact. This new method uses "**Guided filter"** for refining of transmission map obtained by **"Median dark channel prior"** and **"Contrast-limited-adaptive-histogram-equalization"** as a post-processing operator to improve the overall contrast of image.

Table of Contents

List of Figures

List of Tables