ALERT SYSTEM FOR VEHICLES TO AVOID COLLISION DURING MURKY CONDITIONS

A PROJECT REPORT

Submitted by

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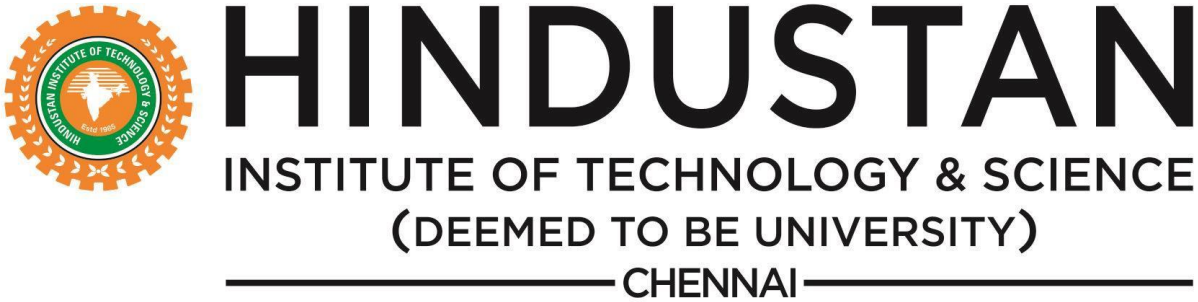
In partial fulfillment for the award of the degree of

BACHELOR OF COMPUTER APLICATIONS



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BONAFIDE CERTIFICATE

Certified that this project report "**ALERT SYSTEM FOR VEHICLES TO AVOID COLLISION DURING MURKY CONDITIONS"** is the bonafide work of who **SUDHAN A (19351029), VARUN M (19351007), and SAHAYA JAMSON S (19351033)** carried out the project work under my supervision during the academic year **2019 - 2022.**

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ABSTRACT

Images taken in poor weather conditions have high amount of fog in it. It degrades the visibility and clarity of the image. In this project, a technique to enhance the image and to detect the fog and other objects present in it is proposed. The enhancement technique used here is Dark Channel Prior, Bilateral and Guided Filter. The enhanced image is segmented and the objects are detected using Saliency Map. Following which statistical feature is used to classify the detected objects such as humans, vehicles and Animals. Finally the method for finding the distance of the object in real-world units from the camera mounted vehicle is also proposed. As per the measure of distance, the proposed method can alert the drivers for prevent the accident. An overall accuracy of almost 90.5% is achieved regarding enhancement and detection using the proposed method.

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CHAPTER 1

INTRODUCTION

1.1 DOMAIN INTRODUCTION

1.1.1 Image Processing

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually, Image Processing system includes treating images as two-dimensional signals while applying already set signal processing methods to them.
It is among rapidly growing technologies today, with its applications in various aspects of a business. Image Processing forms core research area within engineering and computer science disciplines too.

1.1.2 Image processing basically includes the following three steps

- Importing the image with optical scanner or by digital photography.
- Analyzing and manipulating the image which includes data compression and Image enhancement and spotting patterns that are not to human eyes like satellite photographs.
- Output is the last stage in which result can be altered image or report that is based on image analysis.

1.1.3 Purpose of Image processing

The purpose of image processing is divided into 5 groups.

They are:

- Visualization - Observe the objects that are not visible.
- Image sharpening and restoration - To create a better image
- Image retrieval - Seek for the image of interest.
- Measurement of pattern – Measures various objects in an image.
- Image Recognition – Distinguish the objects in an image.

Types of Image Processing

The two types of methods used for Image Processing are Analog and Digital Image Processing. Analog or visual techniques of image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. The image processing is not just confined to area that has to be studied but on knowledge of analyst. Association is another important tool in image processing through visual techniques. So analysts apply a combination of personal knowledge and collateral data to image processing.

Digital Processing techniques help in manipulation of the digital images by using computers. As raw data from imaging sensors from satellite platform contains deficiencies. To get over such flaws and to get originality of information, it has to undergo various phases of processing. The three general phases that all types of data have to undergo while using digital technique are Pre- processing, enhancement and display, information extraction.

1.1.4 Working diagram of Image Processing:

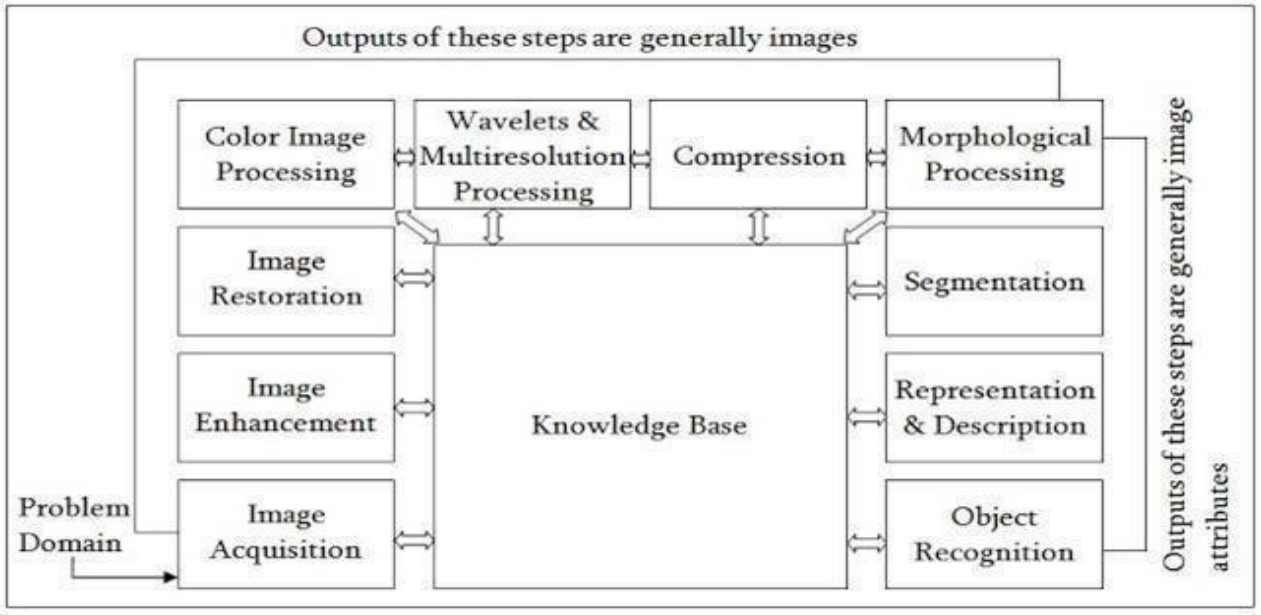


Figure 1.1IMAGE PROCESSING DIAGRAM

Characteristics of Image Processing:

Before going to processing an image, it is converted into a digital form. Digitization includes sampling of image and quantization of sampled values. After converting the image into bit information, processing is performed. This processing technique may be, Image enhancement, Image restoration, and Image compression.

Image enhancement:

It refers to accentuation, or sharpening, of image features such as boundaries, or contrast to make a graphic display more useful for display & analysis. This process does not increase the inherent information content in data. It includes gray level & contrast manipulation, noise reduction, edge crispening and sharpening, filtering, interpolation and magnification, pseudo coloring, and so on.

Image restoration:

It is concerned with filtering the observed image to minimize the effect of degradations. Effectiveness of image restoration depends on the extent and accuracy differs from image enhancement in that the latter is concerned with more extraction or accentuation of image features.

Image compression:

It is concerned with minimizing the number of bits required to represent an image. Application of compression are in broadcast TV, remote sensing via satellite, military communication via aircraft, radar, teleconferencing, facsimile transmission, for educational & business documents, medical images that arise in computer tomography, magnetic resonance imaging and digital radiology, motion, pictures, satellite images, weather maps, geological surveys and so on.

- Text compression – CCITT GROUP3 & GROUP4
- Still image compression – JPEG
- Video image compression – MPEG

1.1.5 Advantages of Image Processing:

- The processing of images is faster and more cost-effective. One needs less time for processing, as well as less film and other photographing equipment.
- It is more ecological to process images. No processing or fixing chemicals are needed to take and process digital images. However, printing inks are essential when printing digital images.
- When shooting a digital image, one can immediately see if the image is good or not.
- Copying a digital image is easy, and the quality of the image stays good unless it is compressed. For instance, saving an image as jpg format compresses the image. By resaving the image as jpg format, the compressed image will be recompressed, and the quality of the image will get worse with every saving.
- Fixing and retouching of images has become easier. In new Photoshop 7, it is possible to smoother face wrinkles with a new Healing Brush Tool in a couple of seconds.
  The expensive reproduction (compared with rastering the image with a repro camera) is faster and cheaper.
- By changing image format and resolution the image can be used number of made

1.2 PROJECT INTRODUCTION

Nowadays public areas are monitored by several cameras in order to increase public order and safety. For most applications, trained and experienced human operators can do this monitoring very well. However, watching multiple camera images at the same time is not only too expensive but also practically impossible. Moreover, surveillance video data is currently used only “after the fact” as a forensic tool, thus losing its primary benefit as an active, real-time medium. The goal of visualsurveillance is not only to put cameras in the place of human eyes, but also to accomplish the entire surveillance task as automatically as possible. Thus intelligent visual surveillance (IVS) becomes an active research topic in computer vision.

Detection of foreground objects of interest from a surveillance video sequence is a key step for an intelligent visual surveillance system. In the literature there are various algorithms proposed for object detection. All of these approaches assume that the input images have clear visibility, thus they can achieve satisfying results under clear weather conditions. Unfortunately, this is not always true, such as when videos are taken under bad weather conditions, such as on a foggy day. The image suffers degradation and severe contrast loss. These low-quality images are a nuisance for conventional object detection algorithms.

Similarly, Murk is a thick cloud of tiny water droplets suspended in the atmosphere which obscures visibility. Diverse weather situations such as murk, smoke, rain or snow will cause multifaceted visual effects of spatial or temporal domains in images or video. Such artifacts may appreciably humiliate theperformances of outdoor vision systems relying on image/video feature extraction or visual attention modelling such as event detection, object detection, tracking and recognition, scene analysis and classification, image indexing and retrieval. They generally fail to correctly detect objects due to low scene visibility. In order to get clear surveillance frames, enhancing visibility is an inevitable task. In recent years, as an active research topic in computer vision, considerable work has been done on haze removal techniques.

CHAPTER 2

LITERATURE SURVEY

Nafi Ur Rashid, et al [1] have proposed detection and classifications pf vehicles are the most challenging tasks of a video-based intelligent system. Traditional detection and classification methods are based on subtraction of estimated still backgrounds from a video to find out the moving objects. In general, these methods are computationally highly expensive, and in many cases show poor detection and classification performance, especially when difference between pixel intensities of vehicles and backgrounds are small. In this paper we present a novel detection and classification method that employs an analysis of time-spatial image (TSI) obtained from a virtual line on the frames of a video may be reduced. First, the TSI is segmented to count the number of vehicles those cross the virtual line. Then, a feature-based classification scheme is purposed to classify these vehicles. The classification scheme utilizes the shape of the segmented regions of the TSI as well as that of appropriate frames of a video to extract the certain features of the moving objects.

Liang Wang, et al [2] have explained that a moving object detection and extraction algorithm for serial video images is studied in this paper, and also is simulated on computer. Using the background difference method obtain the object. First, established a background model based on Gauss statistical through several serial images, and then differ current image with rebuilt background to extract the moving object, Morphology filter is used to wipe off the yawp. The simulation results indicated that the algorithm is efficient, and receives the better results.

Ningthoujam Johny Singh, et al [3] have said that one of the great interest in science and industry is the ability for a machine to capture 3D information from the real world which can duplicate the ability of human vision. The disparity between the left and the right images is calculated, using the disparity map and the stereo parameter 3-Dimensional(3D) scene is construct. The distance of the object is calculated by determining the centroid o the bounding box and calculating the Euclidean distance between the centroid of the bounding

box and the camera. Results show the output of the object being placed at the distance between 10 to 3 meters. The average error in the distance calculation is 2.08.

Rawan Younis, et al [4] have explained that how image dehazing improves visual quality. Two aspects are tackled by an existing image fog removal technique is accelerated by replacing a time consuming image filter with a faster filter while maintaining negligible image degrading. A quick and practical algorithm to detect a car in a fog-free image is proposed and applied to a database of about 100 car images. Improved technique is done by Proposed Adaptive Filter. This system is fairly robust an although all images were obtained from existing source, the proposed algorithm is expected to perform equally well with any side-view image of a car in the presence of heavy fog and under real conditions.

Neha, et al [5] have said that single haze removal techniques on outdoor images for visibility enhancement in foggy weather conditions. Haze removal techniques based on dark channel prior model have used different filters for estimating the transmission. We have studied effect of using different filters along with the fundamental mean and gaussian filters in the visibility enhancement. According to our study bilateral filter perform better than the others.

Yutaro Iwamoto, et al [6] have proposed that outdoor images may suffer from haze, and the clearness of the image is greatly lost. The haze removal is an important issue. In his proposed method, he significantly reduce the computational time by improving the method to estimate the dark channel. Our proposed dark channel estimation method uses a down-sampled image and do not need a soft-matting process. Experiments with haze image show that our proposed method is faster and an acceptable quality level compared with the existing in his dark channel's method.

CHAPTER 3

SYSTEM ANALYSIS

3.1 EXISTING SYSTEM :

In existing system, murk/haze removal by using CLAHE and object detection using Curvelet Transform is done. Initially the RGBimage is converted to gray scale image. The gray scale image is then filtered using median filter. The filtered image is enhanced using CLAHE. Finally the enhanced image is segmented by Curvelet Transform.

DISADVANTAGES OF EXISTING SYSTEM:

- Comparatively less amount of Fog/Haze is removed.
- The rate of detection accuracy was less.
- Distance calculation is not implemented to alert the driver.

3.2 PROPOSED SYSTEM:

The proposed model follows dark channel prior, bilateral and guided filter for enhancement and saliency map for object detection. It consists of five steps.

Step 1: Collecting the test images from public database.

Step 2: Image decomposition is proposed in fog image. In image decomposition, image is decomposed into low frequency part and high frequency part (details layers) based on bilateral filter.

Step 3: After that, dark channel prior based fog removal implement in original fog image; details layers (HF part) enhanced using guided filter for restore the dehazed image with initial fog removed image.

Step 4: The enhanced image is segmented and the object are detected based on saliency map. And also detected object or obstacles are classified based on the statistical feature i.e. Human, Vehicle and Animal.

Step 5: To avoid the accident distance is calculated between the detected object and camera mounted vehicle and based on the distance, drivers are alerted to prevent accidents.

ADVANTAGES OF PROPOSED SYSTEM:

- Accuracy of Fog/Haze/Rain removal is high.
- The rate of detection accuracy is high.
- The distance calculation is implemented to prevent the accident.

WORKING OF HAZE REMOVAL:

A novel prior -dark channel prior, for single image haze removal is proposed. The dark channel prior is based on the statistics of haze-free outdoor images. It is found that in most of the local regions which do not cover the sky, it is very often thatsome pixels (called ”dark pixels”) have very low intensity in at least one color (RGB) channel. In the haze image, the intensity of these dark pixels in that channel is mainly contributed by the airlight. Therefore, these dark pixels can directly provide accurate estimation of the haze’s transmission. Combining a haze imaging model and a guided filter method, we can recover a hi-quality haze-free image and produce a good depth map (up to a scale). This approach is physically valid and is able to handle distant objects even in the heavy haze image. This does not rely on significant variance on transmission or surface shading in the input image. The result contains few halo artifacts.

WORKING OF OBJECT DETECTION:

The simplest method to obtain the salient object region is by thresholding the saliency map to get a binary mask. In order to accurately detect salient objects from saliency maps, image segmentation result is combined with the saliency map.

BLOCK DIAGRAM:

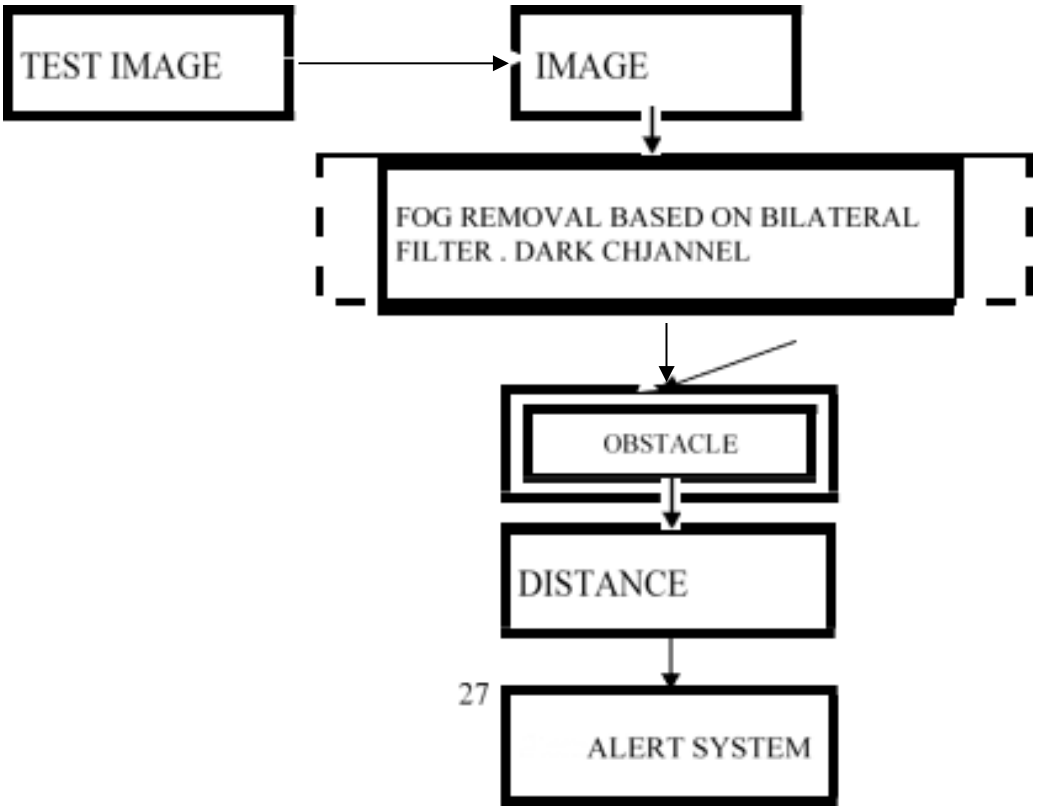


Figure 3.3 Block Diagram

CHAPTER 4

PROJECT DESIGN

4.1 DATA FLOW DIAGRAM:

The Data flow diagram (DFD) is one of the most important modeling tools. It is used to model the system components. These components are the system process, the data used by the process, an external entity that interacts with the system and the information flows in the system.

DFD shows how the information moves through the system and how it is modified by a series of transformations. It is a graphical technique that depictsinformation flow and the transformations that are applied as data moves from input tooutput.

DFD is also known as bubble chart. A DFD may be used to represent a system at any level of abstraction. DFD may be partitioned into levels that represent increasing information flow and functional detail.

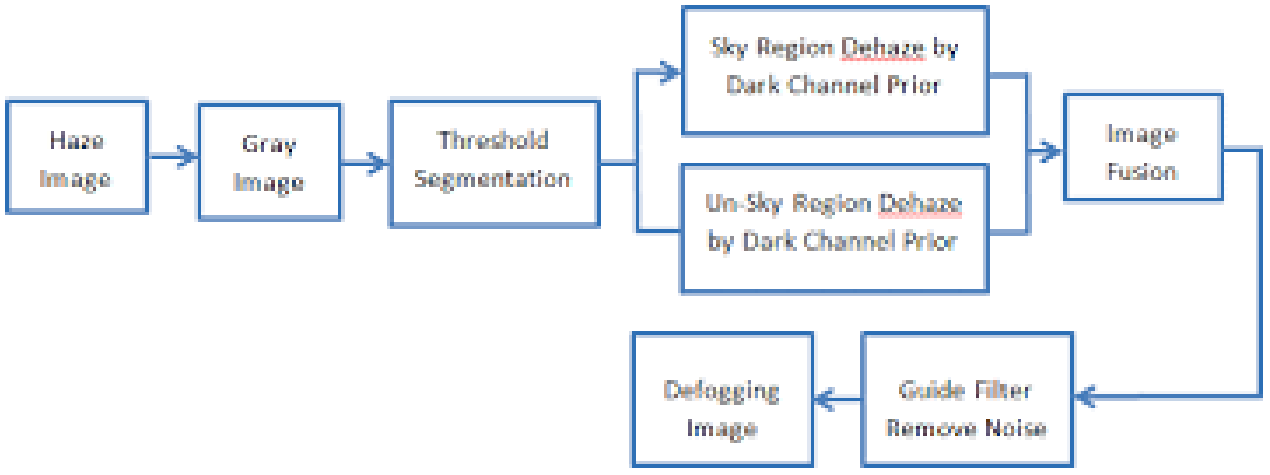


Figure 4.1 DATA FLOW DIAGRAM

4.2 UML DIAGRAM:

UML stands for Unified Modeling Language. UML is a standardized general-purpose modeling language in the field of object-oriented software engineering. The standard is managed, and was created by, the Object Management Group.

The goal is for UML to become a common language for creating models of object oriented computer software. In its current form UML is comprised of two major components: a Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML.

The Unified Modeling Language is a standard language for specifying, Visualization, Constructing and documenting the artifacts of software system, as well as for business modeling and other non-software systems.

The UML represents a collection of best engineering practices that have proven successful in the modeling of large and complex systems.

The UML is a very important part of developing objects oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects.

The Primary goals in the design of the UML are as follows:

- Provide users a ready-to-use, expressive visual modeling Language so that they can develop and exchange meaningful models.
- Provide extendibility and specialization mechanisms to extend the core concepts.
- Be independent of particular programming languages and development process.
- Provide a formal basis for understanding the modeling language.
- Encourage the growth of OO tools market.
- Support higher level development concepts such as collaborations, frameworks, pa
- and components.
- Integrate best practices.

4.2.1 USE CASE DIAGRAM:

A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted.

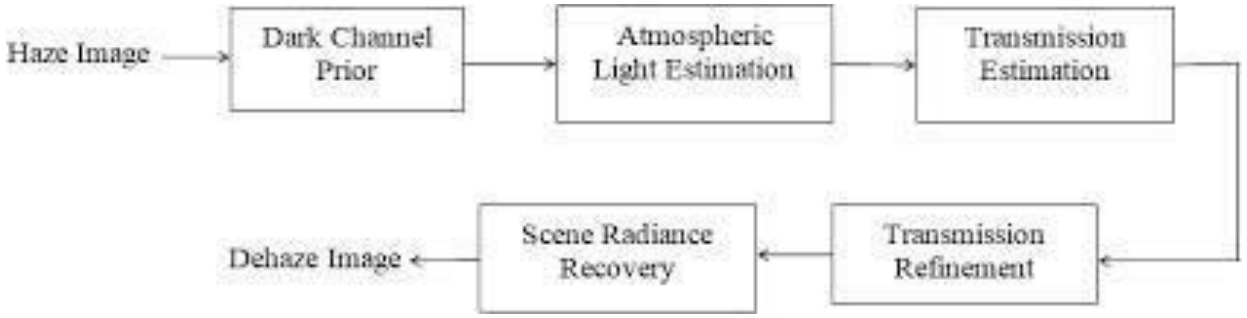
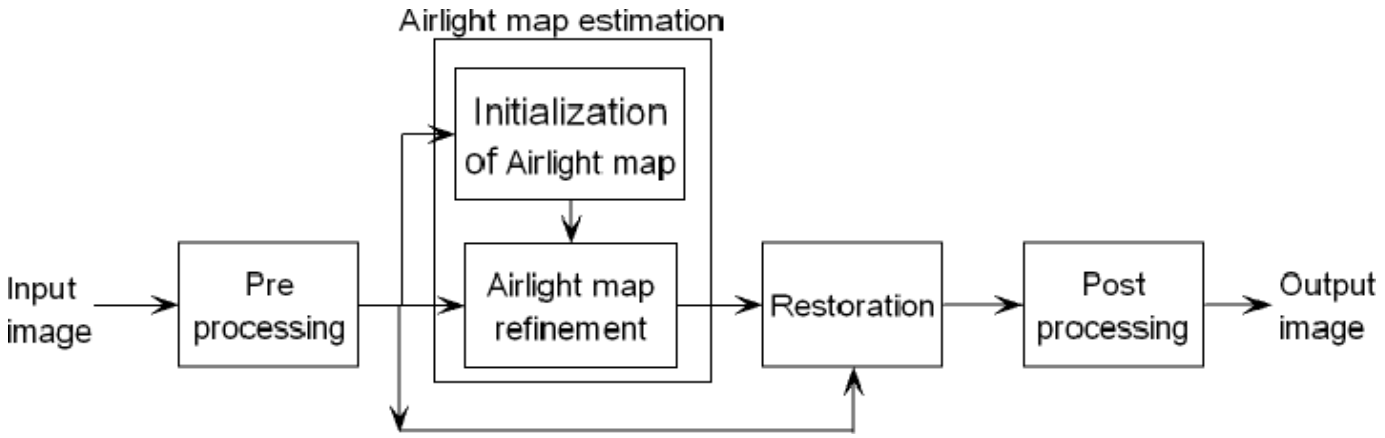


Figure 4.2 USE CASE DIAGRAM

4.2.2 CLASS DIAGRAM:

In software engineering, a class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among the classes. It explains which class contains information.



4.2.3 SEQUENCE DIAGRAM:

A sequence diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams.

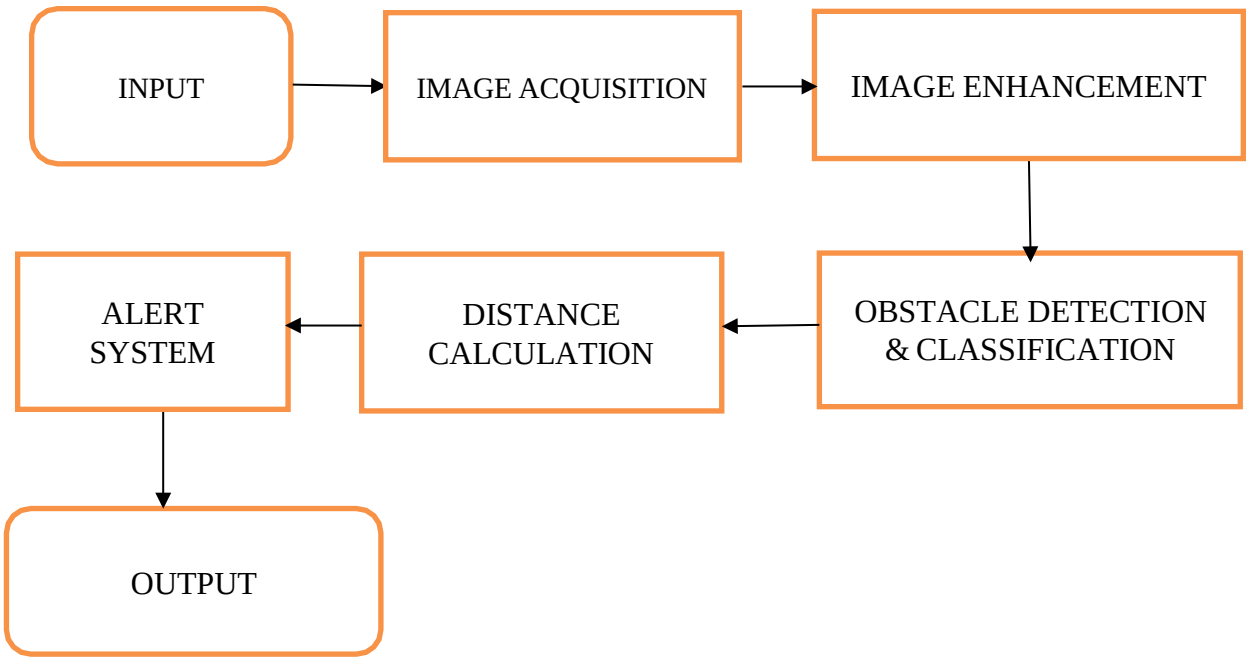


Figure 4.4 SEQUENCE DIAGRAM

4.2.4 ACTIVITY DIAGRAM:

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control. Server keeps on tracking the safety regions of vehicles and generates alerts for all vehicles with overlapping safety zones as soon as it finds any intersection in safety zones of individual vehicles. Collision Detection

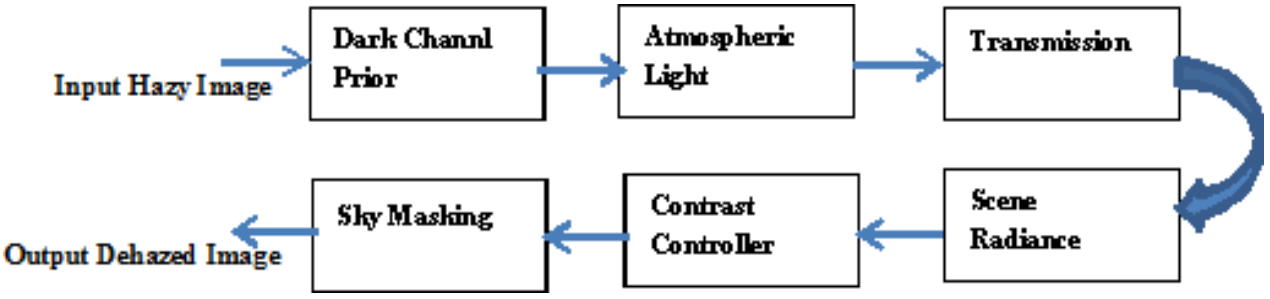


Figure 4.5 ACTIVITY DIAGRAM

4.3 INPUT AND OUTPUT DESIGN

INPUT DESIGN:

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy.

Input Design considered the following things:

- Data should be given as input.
- The data should be arranged or coded.
- The dialog to guide the operating personnel in providing input.
- Methods for preparing input validations and steps to follow when error occur.

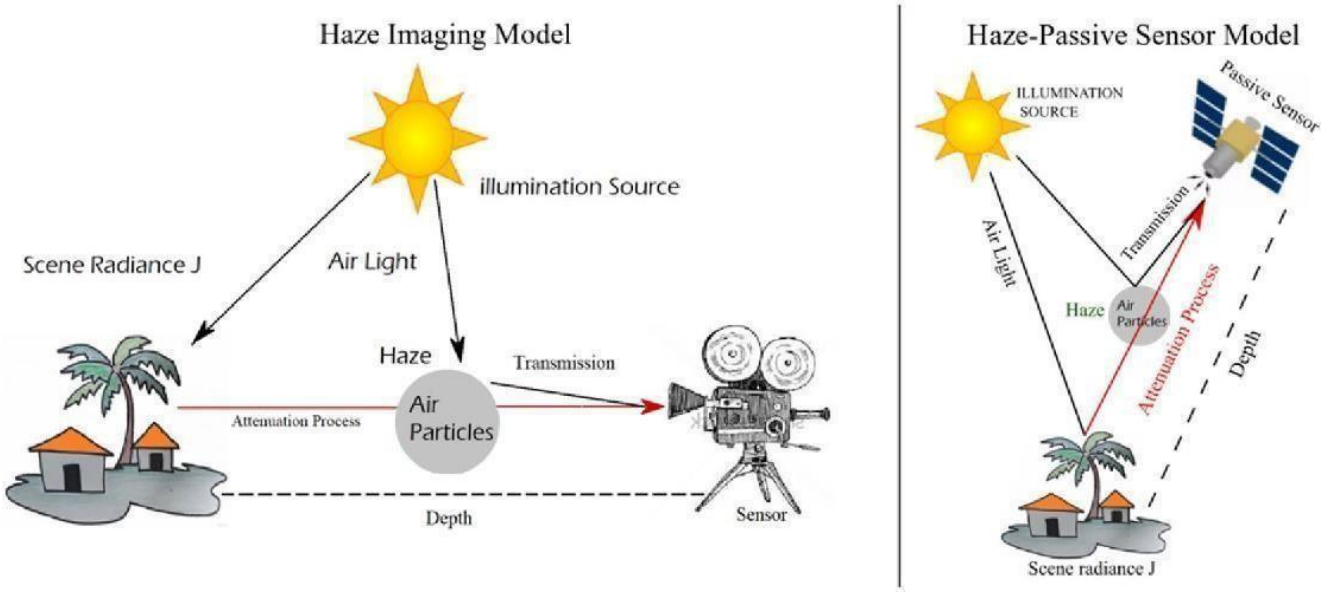


Figure 4.6 HAZE IMAGING MODEL

OBJECTIVES:

1. Input Design is the process of converting a user-oriented description of the input into a computer-based system. This design is important to avoid errors in the data input process and show the correct direction to the management for getting correct information from the computerized system.

2. It is achieved by creating user-friendly screens for the data entry to handle large volume of data. The goal of designing input is to make data entry easier and to be free from errors. The data entry screen is designed in such a way that all the data manipulates can be performed. It also provides record viewing facilities.

3. When the data is entered it will check for its validity. Data can be entered with the help of screens. Appropriate messages are provided as when needed so that the user will not be in maize of instant. Thus the objective of input design is to create an input layout that is easy to follow

4. The received response from server contains a list of nearby vehicles, which is used to mark all nearby devices for a visual display. A received alert from the server is converted into an alarm for the driver of the vehicle and also indicated on visual display in front of driver of vehicle.

OUTPUT DESIGN:

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

1. Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.

2. Select methods for presenting information.

3. Create document, report, or other formats that contain information produced by the system. The output form of an information system should accomplish one or more of the following objectives. Convey information about past activities, current status or projections of the Future.Signal important events, opportunities, problems, or warnings.Trigger an action Confirm an action.

Figure 4.7 OUTPUT DESIGN

CHAPTER 5

SYSTEM REQUIREMENTS

5.1 HARDWARE REQUIREMENTS:

The following are the hardware requirements of this project.

System	:	Pentium IV 2.4 GHz.
Hard Disk	:	400 GB.
Floppy Drive	:	1.44 Mb.
Monitor	:	15 VGA Colour.
Mouse	:	Logitech.
Ram	:	4 GB.

5.2 SOFTWARE REQUIREMENTS:

The following are the software requirements of this project.

Operating system	:	Windows XP/7.Coding
Language	:	MATLAB and PYTHON
Tool	:	MATLAB R2013A and Python 3.8 (Colab)

5.3 MODULES

The following modules are used in this project.

1. Image Acquisition
2. Image Enhancement
3. Obstacle Detection & Classification
4. Distance Calculation

MODULE DESCRIPTION:

1. **Image Acquisition**:

Testing videos are acquired from Gallery.

2. **Image Enhancement**:

In this stage, image is enhanced in terms of fog removal by image decomposition, fog removal and detail part extraction/restoration. The aim of image decomposition is to decompose the image I into its low frequency part LF and its high frequency part HF, namely, I = LF + HF. Image decomposition process done by using our novel method. The method is bilateral filter that is used for decompose of image in image decomposition.

Bilateral filter first extract the base layer that is called as low frequency part image (smoothed image). It's almost less fog free image but usually blurred, while HF contains details of the image. The detail layer or high frequency part image obtained as HF = I – LF. After that guided filter is proposed for enhance the detail partof image. Next, initial fog removal is implemented by using dark channel prior. Dark channel prior is used for extract the transmission map and guided filter is proposed for smooth the transmission map. Finally we restore dehazed image by combining of smoothed transmission map and enhanced detail part.

3. **Obstacle Detection & Classification**:

In this step, obstacles are detected by using hyper graph saliency map.
Thus enhanced image is segmented and then obstacle was detected. Finally statistical feature is evaluated for classify the detected obstacle i.e. human, animal and vehicle.

4. **Distance Calculation**:

After obstacle detection, distance calculation is performed between detected obstacle and testing camera mounted vehicle. Then distance value is converted pixel into meters. Based on the distance of the obstacle from the camera mounted vehicle, three kinds of messages (indication) are given to the driver.

CHAPTER 6

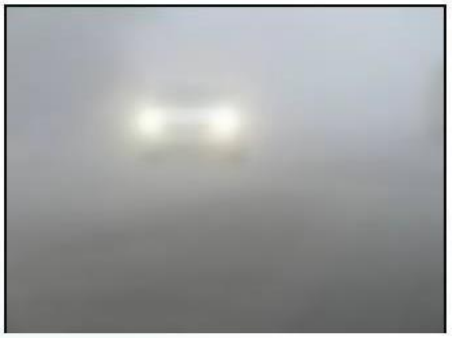
RESULTS AND DISCUSSION

6 FINAL OUTPUT

Original Image

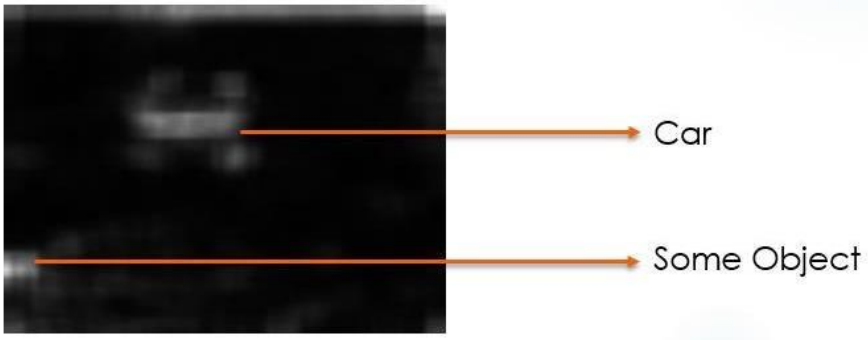
Grayscale Image

Bilateral Filter



Guided Filter

Saliency



SIMULATION:

```
import time
from google.colab import output

car_position = 15
human = 0
print(car_position)

while(car_position > 7):
  time.sleep(1)
  car_position-=1;
  print(car_position)

if car_position <=7:
  print("Be Safe!!")
  output.eval_js('new Audio("https://upload.wikimedia.org/wikipedia/commons/0/05/Beep-09.ogg").play()')
```

```
15
14
13
12
11
10
9
8
7
Be Safe!!
```

CHAPTER 7

CONCLUSION AND FUTURE ENHANCEMENT

7.1 CONCLUSION

The image enhancement has become one of the active areas in the field of image processing. In this paper the fog images are filtered using Bilateral Filter, Dark Channel Prior and Guided Filter. Then objects or obstacles are yet to be extracted from the enhanced fog image based on the Saliency Map. Finally distance is calculated between detected object and camera mounted vehicle. Thus, efficient automatic vehicle detection and a warning system can help drivers in reducing the number of accidents occurring between the one vehicle and the any obstacles on roads and highways.

7.2 FUTURE ENHANCEMENT

As a future step, we have to analyze the behavior for images from other categories too. Furthermore another interesting question is if and how this method would work on night-time scenes.

And as a hardware setup, we have to install our modules in a vehicle and to test it in a real-time scenario and to check out the practical output of our design and to install more cameras to monitor from all sides of the vehicle as the obstacles can reach out and hit our vehicle in any directions.

In the GMPE_ACR [4] model, n Gauss-Markov equations are used to describe the movement of an object in dimensional space. In each dimension, the velocity of a mobile object at time slot t, vt, is modeled by the following Gauss- Markov equation.

APPENDIX

FINAL CODING USING PYTHON

```
import cv2
from google.colab import files

#Reading Files
def read_file(filename):
  image = cv2.imread(filename)
  return image
uploaded = files.upload()
filename = next(iter(uploaded))
image = read_file(filename)

#Grayscale
import cv2
clahe=cv2.createCLAHE()
gray_image=cv2.cvtColor(image,cv2.COLOR_BGR2GRAY)
enhanced_img=clahe.apply(gray_image)
cv2.imwrite("grayscale_car.jpg",enhanced_img)
print("Done")
files.download('grayscale_car.jpg')

#Bilateral Filter
import cv2
# Apply bilateral filter with d = 15,
# sigmaColor = sigmaSpace = 75.
bilateral = cv2.bilateralFilter(image, 15, 75, 75)
cv2.imwrite('car_bilateral.jpg', bilateral)
files.download('car_bilateral.jpg')

#Guided Filter
# importing the modules needed
import cv2
import numpy as np
# Reading the image
# Creating the kernel(2d convolution matrix)
kernel1 = np.ones((5, 5), np.float32)/30

# Applying the filter2D() function
guided_img = cv2.filter2D(src=image, ddepth=-1, kernel=kernel1)
cv2.imwrite("car_guided.jpg",guided_img)
files.download('car_guided.jpg')

#Saliency
saliency = cv2.saliency.StaticSaliencySpectralResidual_create()
```

```
(success, saliencyMap) = saliency.computeSaliency(image)
saliencyMap = (saliencyMap * 255).astype("uint8")
files.download('car_saliency.jpg')

#Simulation
import time
from google.colab import output
car_position = 15
human = 0
print(car_position)
while(car_position > 7):
  time.sleep(1)
car_position-=1;
print(car_position)
if car_position <=7:
  print("Be Safe!!")
  output.eval_js('new Audio("https://upload.wikimedia.org/wikipedia/commons/0/05/Beep-
09.ogg").play()')
```

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