

Intelligent Transportation System Analysis for Shadow Maimed Traffic Surveillance Visionary

G.Rajkumar¹, R.B.Revathy²

Assistant Professor, Department of Electronics and Communicaton Engineering, SKP Engineering College
Tiruvannamalai, Tamilnadu, India^{1,2}

ABSTRACT: Object detection in the field of computer vision stands to be a crucial and critical task for object and scene recognition, employment of object recognition is vast in field of surveillance and artificial intelligence. An inner–outer outline profile (IOOPL) algorithm is employed to detect the three levels of object boundaries to enhance and achieve accuracy in vehicle segmentation with the help of shadow elevations. This method can be adapted to an experimental model of traffic surveillance video monitoring. In Intelligent Transportation System (ITS) it is very important to recognize the type of a detected object in order to track reliably and estimate traffic parameters correctly .This work addresses the major difficulty faced in the vehicle image segmentation due to the misconception of assuming object shadows as part of object itself. The proposed methodology will be utilized for vehicle detection and segmentation by eliminating its shadow counterpart.

I. INTRODUCTION

Accuracy in Image feature extraction is a mandatory in the field of Computer Vision. The Image feature detection is based on Shape, Pattern and color. Feature extraction of image become complex with homogeneous type of image and it can be extended to the field of Robotics as Artificial intelligence. In Intelligent Transportation System (ITS) it is very important to recognize the type of a detected object in order to track reliably and estimate traffic Parameters correctly. Image boundary extraction and background elimination is implemented with help of gray code conversion.

A. OBJECTIVE:

- To achieve shadow detection in video processing.
- To introduce ITS –Intelligent Transportation System to detect a vehicle.
- Automotive vehicle searching and detection using log query.

B. MOVATIVATION

To detect a vehicle in a complex background environment, the shadow is eliminated first then the vehicle is classified (detected).These things are used to estimate the traffic parameter correctly. For example calculate the traffic rate to build flyovers. In the existing (Object-Oriented Shadow Detection and Removal from Urban High-Resolution Remote Sensing Images) paper required high resolution satellite images are required and it depends on manual searching. In order to avoid this problem the Intelligent Transportation System is introduced to detect a vehicle, which gives automotive vehicle searching and detection using log query.

C. IMAGE FEATURE EXTRACTION

1.3.1 Definition: Image feature extraction is a method of detecting and extracting the Region of Interest(ROI) object in a digital image using edge and boundary detection mechanisms.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2014



Figure1.3 Image Extraction

D. DIFFICULTIES IN FEATURE EXTRACTION

1. Complex Image
2. Multiple Interlinked Objects
3. Non Boundary Objects (shadow)

1.4.1 SIMPLE IMAGE

The extraction of input image is made easily due to the difference of image object and the background object. In this image the Region of Interest is extracted without any error.



Figure1.4.1 Simple Image

1.4.2 COMPLEX IMAGE

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2014

The color is homogeneous in this picture. So we can't extract a correct image, if the ROI is confused with the background image color, the resulted output is merged.



Figure1.4.2 Complex Image

1.4.3 MULTIPLE OBJECT INTERLINKED IMAGE

Due the color indifference of one object to the other is overlapped with one other, so that it is impossible to differentiate from one object to another. Finally The extraction become complex.



Figure 1.4.3 Multiple Object Interlinked Image

1.4.4 NON BOUNDARY OBJECTS (SHADOW)

The shadow of the vehicle made the image boundaries false, the major difficulty faced in the vehicle image segmentation due to the misconception of assuming object shadows as part of object itself. So, that we need to eliminate shadows, in order to eliminate this IOOPL is introduced.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2014

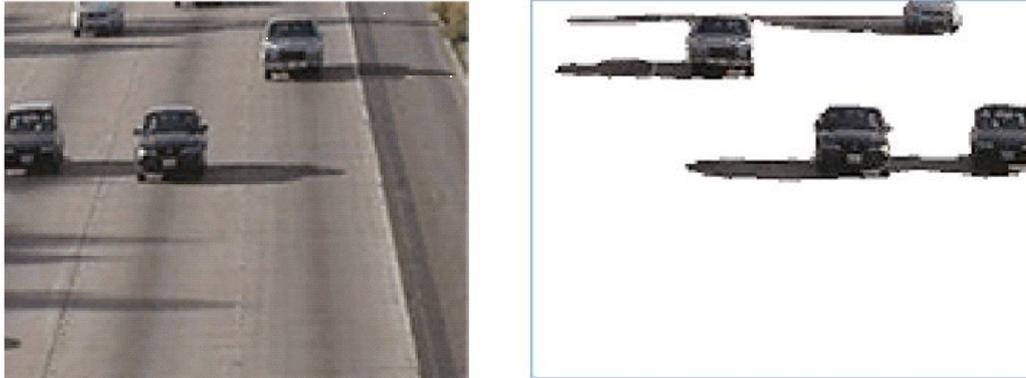


Figure1.4.4 Non Boundary Objects (Shadow)

A. EXISTING SYSTEM

Satellite image shadows are eliminated with the help of IOOPL algorithm. But it needs high resolution satellite images. The shadow is detected in an image domain only. The video domain is not suitable in this existing system. So that the number of noise is present but it is not detected. And it depends on manual searching.

B. PROPOSAL METHOD

Traffic vehicle detection and the video to frame conversion are done with the help of mat code. Moderate quality image can be enhanced using adaptive de-noising filters. Noises are removed by filters. Shadow detection and elimination can be extended to a video domain with the help of IOOPL algorithm. Finally shadow less vehicle is detected. It depends on automotive vehicle searching and detection using log query.

ADVANTAGE OF PROPOSAL

1. Noises are very less.
2. Works under in both video and image domain.
3. High accuracy.
4. Low quality images are also detected.
5. Speedy process so that it saves time of manual searching of video.
6. Low resolution image can be enhanced with the help of filters.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2014

2.4 BLOCK DIAGRAM OF PROPOSAL METHOD

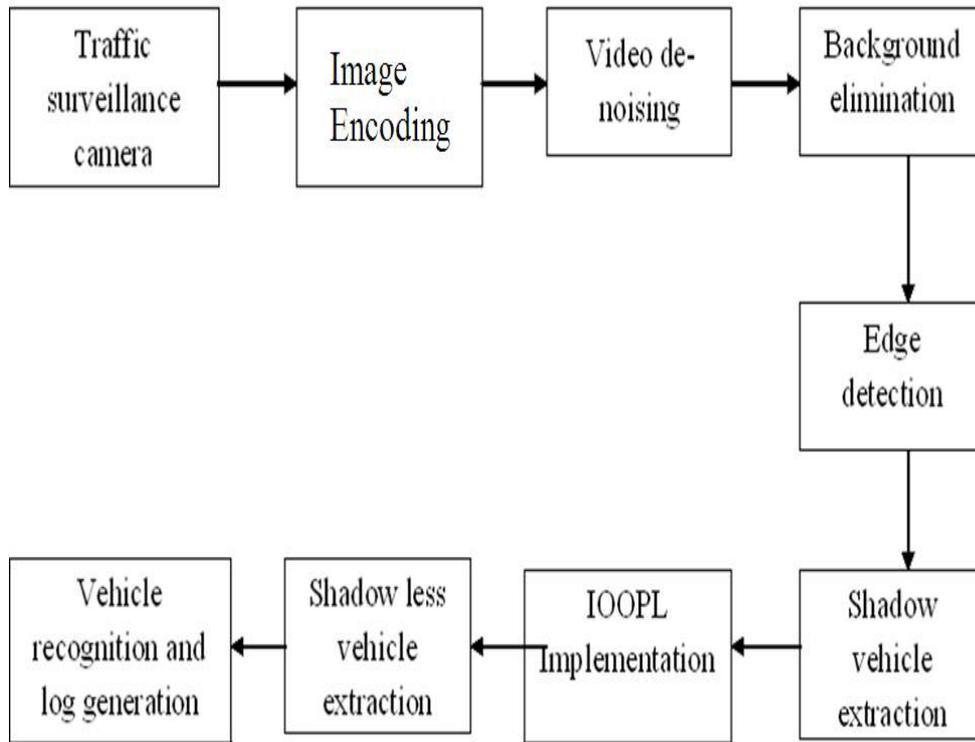


Figure 2.4 Block diagram of proposal system

EXPLANATION OF BLOCK DIAGRAM

Image encoding: By the mat lab in build process (functions) the image is encoded before de-noising.

De-noising: Which is used to eliminate noises present in the image frame, such as thermal noise, short noise etc..., in this paper salt and pepper noise are removed. This is useful in an filtering process.

Background elimination: Apart from the region of interest the background images(objects) are removed by edge and boundary detection method.so that the surrounding objects are eliminated from the image frame.

Edge detection: The Canny edge detection algorithm is known to many as the optimal edge detection method. With the help of canny, image edge is detected after the background elimination process. Finally the shadow vehicles are detected.

IOOPL Implementation: IOOPL matching is a process of obtaining homogeneous sections by conducting similarity matching to the IOOPL section by section. During the process, Gaussian smoothing is performed to simplify the view of IOOP. At the end of this process the shadows are removed, shadow less vehicle is detected.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2014

SHADOW AND EDGE DETECTION IN ITS

Shadows are created because the light source has been blocked by something. There are two types of shadows: the self-shadow and the cast shadow. A self-shadow is the shadow on a subject on the side that is not directly facing the light source. A cast shadow is the shadow of a subject falling on the surface of another subject because the former subject has blocked the light source. A cast shadow consists of two parts: the umbra and the penumbra. The umbra is created because the direct light has been completely blocked, while the penumbra is created by something partly blocking the direct light, as shown in the following Figure.

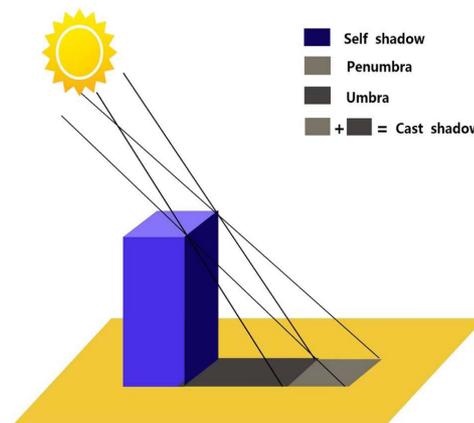


Figure3.1 Sample Shadow Image

3.1.1 Edge Detection in Image processing

Edge detection is the name for a set of mathematical methods which aim at identifying points in a digital image at which the image brightness changes sharply or, more formally, has discontinuities.

The points at which image brightness changes sharply are typically organized into a set of curved line segments termed edges. The same problem of finding discontinuities in 1D signal is known as step detection and the problem of finding signal discontinuities over time is known as change detection. Edge detection is a fundamental tool in image processing, machine vision and computer vision, particularly in the areas of feature detection and feature extraction for scene understanding.

There are many ways to perform edge detection. However, the majority of different methods may be grouped into two categories:

3.1.1.1 Gradient based Edge Detection:

The gradient method detects the edges by looking for the maximum and minimum in the first derivative of the image.

3.1.1.2 Laplacian based Edge Detection:

The Laplacian method searches for zero crossings in the second derivative of the image to find edges. An edge has the one-dimensional shape of a ramp and calculating the derivative of the image can highlight its location. There are problems of false edge detection, missing true edges, producing thin or thick lines and problems due to noise etc. In this paper we analyzed and did the visual comparison of the most commonly used Gradient and Laplacian based Edge Detection techniques for problems of inaccurate edge detection, missing true edges, producing thin or thick lines and problems due to noise etc.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2014

3.1.2 Color and Position for pixel-wise detection



Figure3.1.2 Color and Position for pixel-wise detection

With the regular structure of the Street Scenes, sky at the top, roads at the bottom, it is no surprise that position information can help in the classification task. Color information is also very helpful, as to be expected. It can be seen that the relative utility of color and position information depends on the object type.

MATLAB image Equivalent pixel value

Command Window															
File Edit Debug Desktop Window Help															
New to MATLAB? Watch this Video, see Demos, or read Getting Started.															
117	128	133	115	118	129	120	119	120	103	104	104	109	105	116	124
141	147	127	119	138	122	130	142	109	112	119	116	126	115	120	128
128	140	128	130	109	135	114	122	125	106	119	124	132	128	103	106
122	121	115	148	120	128	127	124	139	113	132	144	125	130	119	123
124	127	102	111	119	126	105	113	113	109	112	107	102	102	112	106
93	103	101	105	115	135	121	111	116	102	105	100	111	96	97	112
87	104	114	137	127	134	128	122	117	107	123	126	121	125	119	118
114	111	119	110	111	124	109	96	97	98	99	107	116	116	108	98
118	117	98	109	86	129	115	96	96	116	104	113	117	137	99	121
119	110	102	120	91	136	103	105	121	121	132	104	127	119	85	121
124	107	120	143	131	129	101	111	177	149	153	123	146	116	103	107
127	129	114	113	121	124	120	128	118	131	114	148	134	140	141	126
132	123	111	128	106	108	120	115	97	125	102	110	131	154	135	125
119	93	88	77	85	103	99	103	74	101	92	86	102	82	92	93
121	132	117	129	140	117	126	115	132	127	155	131	109	108	101	90
133	126	110	112	104	124	140	114	137	123	134	133	107	97	116	94
112	124	111	91	113	145	132	115	110	138	123	127	109	132	101	99
123	141	111	91	118	116	108	108	114	143	112	116	103	129	125	111
95	109	86	109	115	105	103	121	138	142	122	158	97	115	149	123
80	86	92	95	105	106	151	139	158	98	123	161	115	139	150	116
114	81	96	119	90	124	137	127	101	121	118	152	117	130	99	119
87	111	109	109	104	122	119	131	110	121	102	128	99	115	101	87
110	103	126	122	118	118	150	160	110	123	113	118	120	101	123	108
96	90	114	131	128	125	125	109	108	97	112	98	112	132	134	114
110	93	117	122	128	120	150	108	123	115	125	103	121	130	117	135
134	152	155	142	129	94	106	129	125	115	108	87	116	125	111	112
96	120	120	143	119	98	104	113	110	130	115	86	117	103	103	128
83	107	65	99	110	110	86	98	111	117	116	109	89	120	119	98
89	110	93	117	115	106	123	112	104	82	103	110	104	125	136	119
114	134	107	117	104	123	119	139	111	116	97	114	137	129	130	97
119	97	120	176	125	114	119	112	163	124	120	136	146	128	112	136
100	100	142	155	74	112	96	90	143	112	124	146	126	128	139	96
93	114	121	137	111	114	108	154	103	147	121	124	126	120	106	96
137	113	115	120	111	122	95	86	82	111	97	134	68	89	84	100
111	133	107	122	69	71	135	119	105	106	85	79	99	102	126	106

Figure3.1.2 Image Equivalent pixel value

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2014

A. EDGE DETECTION TECHNIQUES

3.2.1 Sobel Operator:

The operator consists of a pair of 3×3 convolution kernels. One kernel is simply the other rotated by 90°.

-1	0	+1
-2	0	+2
-1	0	+1

G_x

+1	+2	+1
0	0	0
-1	-2	-1

G_y

These kernels are designed to respond maximally to edges running vertically and horizontally relative to the pixel grid, one kernel for each of the two perpendicular orientations. The kernels can be applied separately to the input image, to produce separate measurements of the gradient component in each orientation (call these G_x and G_y).

These can then be combined together to find the absolute magnitude of the gradient at each point and the

orientation of that gradient. The gradient magnitude is given by

$$|G| = \sqrt{G_x^2 + G_y^2}$$

3.2.2 Robert's cross operator:

The Roberts Cross operator performs a simple, quick to compute, 2-D spatial gradient measurement on an image. Pixel values at each point in the output represent the estimated absolute magnitude of the spatial gradient of the input image at that point. The operator consists of a pair of 2×2 convolution kernels as shown in below Figure. One kernel is simply the other rotated by 90°. This is very similar to the Sobel operator

+1	0
0	-1

G_x

0	+1
-1	0

G_y

These kernels are designed to respond maximally to edges running at 45° to the pixel grid, one kernel for each of the two perpendicular orientations. The kernels can be applied separately to the input image, to produce separate measurements of the gradient component in each orientation (call these G_x and G_y). These can then be combined together to find the absolute magnitude of the gradient at each point and the orientation of that gradient. The gradient magnitude is given by:

$$|G| = \sqrt{G_x^2 + G_y^2}$$

3.2.3 Prewitt's operator:

Prewitt operator is similar to the Sobel operator and is used for detecting vertical and horizontal edges in images

-1	0	+1
-1	0	+1
-1	0	+1

G_x

+1	+1	+1
0	0	0
-1	-1	-1

G_y

In this work we are employing canny edge detection to convert the integer image pixels into low area consuming Binary edge pixels.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2014

3.2.4 Canny Edge Detection Algorithm:

The Canny edge detection algorithm is known to many as the optimal edge detector. Canny's intentions were to enhance the many edge detectors already out at the time he started his work. He was very successful in achieving his goal and his ideas and methods can be found in his paper, "A Computational Approach to Edge Detection". In his paper, he followed a list of criteria to improve current methods of edge detection.

The first and most obvious is low error rate. The second criterion is that the edge points be well localized. A third criterion is to have only one response to a single edge. This was implemented because the first two were not substantial enough to completely eliminate the possibility of multiple responses to an edge. Based on these criteria, the canny edge detector first smoothest the image to eliminate and noise.

It then finds the image gradient to highlight regions with high spatial derivatives. The algorithm then tracks along these regions and suppresses any pixel that is not at the maximum (no maximum suppression). The gradient array is now further reduced by hysteresis. Hysteresis is used to track along the remaining pixels that have not been suppressed.

Step 1:-The first step is to filter out any noise in the original image before trying to locate and detect any edges. And because the Gaussian filter can be computed using a simple mask, it is used exclusively in the Canny algorithm. Once a suitable mask has been calculated, the Gaussian smoothing can be performed using standard convolution methods. The localization error in the detected edges also increases slightly as the Gaussian width is increased.

Step 2:-After smoothing the image and eliminating the noise, the next step is to find the edge strength by taking the gradient of the image. The Sobel operator performs a 2-D spatial gradient measurement on an image. Then, the approximate absolute gradient magnitude (edge strength) at each point can be found.

The Sobel operator [3] uses a pair of 3x3 convolution masks, one estimating the gradient in the x-direction (columns) and the other estimating the gradient in the y-direction (rows). They are shown below:

-1	0	+1
-2	0	+2
-1	0	+1

G_x

+1	+2	+1
0	0	0
-1	-2	-1

G_y

The magnitude, or edge strength, of the gradient is then approximated using the formula: $|G| = |G_x| + |G_y|$

Step 3:-The direction of the edge is computed using the gradient in the x and y directions. However, an error will be generated when sum X is equal to zero. So in the code there has to be a restriction set whenever this takes place.

Whenever the gradient in the x direction is equal to zero, the edge direction has to be equal to 90degrees or 0 degrees, depending on what the value of the gradient in the y-direction is equal to. If G_y has a value of zero the edge direction will equal 0 degrees. Otherwise the edge direction will equal 90 degrees. The formula for finding the edge direction is just: $\text{Theta} = \text{invtan} (G_y / G_x)$.

Step 4:-Once the edge direction is known, the next step is to relate the edge direction to a direction that can be traced in an image. So if the pixels of a 5x5 image are aligned as follows:

X	X	X	X	X
X	X	X	X	X
X	X	a	X	X
X	X	X	X	X
X	X	X	X	X

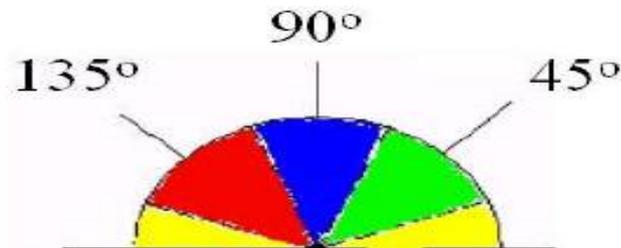
Pixel Array (5x5) Structure

Then, it can be seen by looking at pixel "a", there are only four possible directions when describing the surrounding pixels - 0 degrees (in the horizontal direction), 45 degrees (along the positive diagonal), 90 degrees(in the vertical direction), or 135 degrees (along the negative diagonal). Think of this as taking a semicircle and dividing it into 5 regions.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2014



Therefore, any edge direction falling within the yellow range is set to 0degrees, the green range is set to 45 degrees, the blue range is set to 90 degrees. And finally, any edge direction falling within the red range is set to 135 degrees.

Step 5:-After the edge directions are known, non-maximum suppression now has to be applied. Non-maximum suppression is used to trace along the edge in the edge direction and suppress any pixel value (sets it equal to 0) that is not considered to be an edge. This will give a thin line in the output image.

Step 6:-Finally, hysteresis is used as a means of eliminating streaking. Streaking is the breaking up of an edge contour caused by the operator output fluctuating above and below the threshold. If a single threshold, T1 is applied to an image, and an edge has an average strength equal to T1, then due to noise, there will be instances where the edge dips below the threshold. Equally it will also extend above the threshold making an edge look like a dashed line.

C. VISUAL COMPARISON OF VARIOUS EDGE DETECTION ALGORITHMS

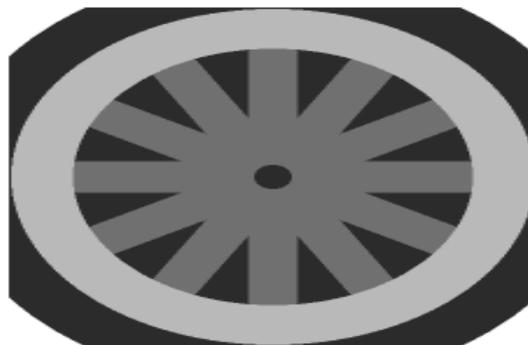


Figure 3.3 Comparison of edge detection

Edge detection of all four types was performed on Figure, Canny yielded the best results. This was expected as canny edge detection accounts for regions in an image. Canny yields thin lines for its edge by using non-maximal suppression. Canny also utilizes hysteresis with thresholding.

3.3.1 Results of edge detection

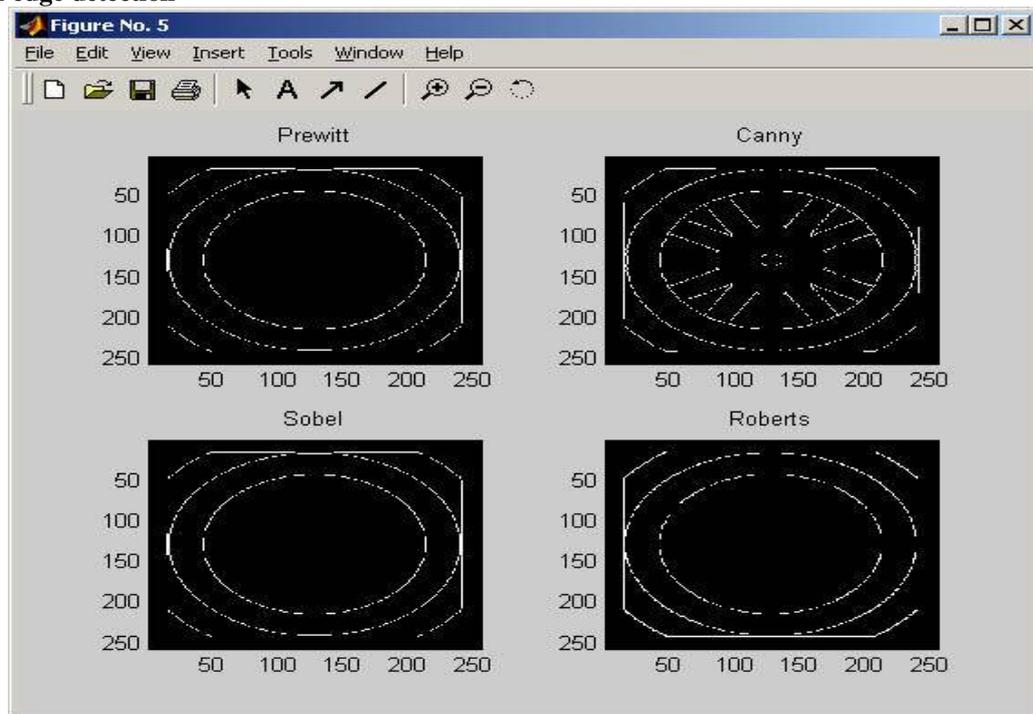


Figure3.3.1 edge detection

Many effective algorithms have been proposed for shadow detection. Existing shadow detection methods can be roughly categorized into two groups: model-based methods and shadow-feature-based methods.

1. The first group uses prior information such as scene, moving targets, and camera altitude to construct shadow models. This group of methods is often used in some specific scene conditions such as aerial image analysis and video monitoring.

2. The second group of methods identifies shadow areas with information such as gray scale, brightness, saturation, and texture.

An improved algorithm exists that combines the two methods. First, the shadow areas are estimated according to the space coordinates of buildings calculated from digital surface models and the altitude and azimuth of the sun. Then, to accurately identify a shadow, the threshold value is obtained from the estimated gray scale value of the shadow areas. However, information such as scene and camera altitude is not usually readily available. Consequently, most shadow detection algorithms are based on shadow features.

For example, the shadow region appears as a low gray scale value in the image, and the threshold is chosen between two peaks in the gray scale histogram of the image data to separate the shadow from the non-shadow region. An illuminant invariance model has been used to detect shadows. This method can obtain a comparatively complete shadow outline from a complex scene and derive the shadow-free image by using certain neutral interface reflecting assumptions. The improved version of canny is IOOPL (Inner Outer Outline Profile).

D. IOOPL ALGORITHM

1. Acquire input image.
2. Apply Gaussian Smoothing ($\sigma=2, n=11$).
3. Divide image into smaller sub sections.
4. Similarity matching will be done for each subsection by employing image correction.
5. If correction result is high than two sub sections belongs to same object then merge.
6. If correlation result is small then other object shadows are present in the sub sections and need to be separate.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2014

3.4.1 EXAMPLE IOOPL IMAGE

R is the vector line of the shadow boundary obtained from shadow detection, R1 is the outer outline in the no shadow area after expanding R outward, R2 is the inner outline in the shadow area after contracting R inward. Even through the object are interlinked in single image, this is differentiated into three R1, R2, R.

3.4.2 IOOPL Matching

IOOPL matching is a process of obtaining homogeneous sections by conducting similarity matching to the IOOPL section by section. During the process, Gaussian smoothing is performed to simplify the view of IOOPL, as shown in the figure. 3.4.1 The Gaussian smoothing template Parameters were $\sigma = 2$ and $n = 11$.

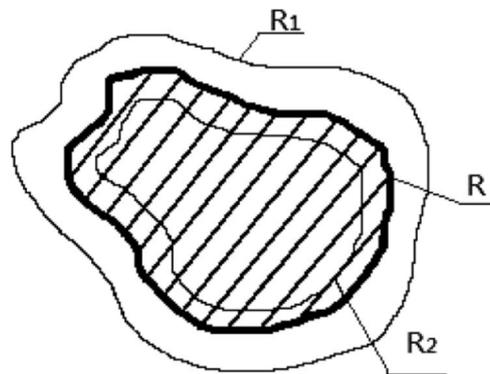


Figure 3.4.1 Example Ioopl Image

To rule out the nonhomogeneous sections, the IOOPL is divided into average sections with the same standard, and then, the similarity of each line pair is calculated section by section with. If the correlation coefficient is large, it means that the shade and light fluctuation features of the IOOPL line pair at this section are consistent. If consistent, then this line pair belongs to the same type of object, with different illuminations, and thus is considered to be matching. If the correlation coefficient is small, then some abnormal parts representing some different types of objects exist in this section; therefore, these parts should be ruled out. The sections that have failed the matching are indicated in red. If more accurate matching is needed, the two sections adjacent to the section with the smallest correlation coefficient can be Segmented for matching again. The similarity of curve A and curve B is expressed by

$$\text{Similarity}(A, B) = \frac{\sum_{i=1}^n (c_i^A - \bar{c}^A) (c_i^B - \bar{c}^B)}{\sqrt{\sum_{i=1}^n (c_i^A - \bar{c}^A)^2 \cdot \sum_{i=1}^n (c_i^B - \bar{c}^B)^2}}$$

E. INTELLIGENT TRANSPORTATION SYSTEM

3.5.1 ITS Definition:

Intelligent transportation systems (ITS): are advanced applications which, without embodying intelligence as such, aim to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks.

3.5.2 Provides advantages over other methods of traffic measurement:

- Less expensive than sensors or cameras
- More coverage (potentially including all locations and streets)
- Faster to set up and less maintenance

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2014

- Works in all weather conditions, including heavy rain

F. INTELLIGENT TRANSPORT APPLICATIONS

3.6.1 Emergency vehicle notification systems

The in-vehicle eCall is an emergency call generated either manually by the vehicle occupants or automatically via activation of in-vehicle sensors after an accident. When activated, the in-vehicle Call device will establish an emergency call carrying both voice and data directly to the nearest emergency point (normally the nearest E1-1-2 Public-safety answering point, PSAP). The voice call enables the vehicle occupant to communicate with the trained eCall operator. At the same time, a minimum set of data will be sent to the eCall operator receiving the voice call.

3.6.2 Automatic road enforcement

A traffic enforcement camera system, consisting of a camera and a vehicle-monitoring device, is used to detect and identify vehicles disobeying a speed limit or some other road legal requirement and automatically ticket offenders based on the license plate number. Traffic tickets are sent by mail. Applications include:

- Speed cameras that identify vehicles traveling over the legal speed limit. Many such devices use radar to detect a vehicle's speed or electromagnetic loops buried in each lane of the road.
- Red light cameras that detect vehicles that cross a stop line or designated stopping place while a red traffic light is showing.
- Bus lane cameras that identify vehicles traveling in lanes reserved for buses. In some jurisdictions, bus lanes can also be used by taxis or vehicles engaged in carpooling.
- Level crossing cameras that identify vehicles crossing railways at grade illegally.
- Double white line cameras that identify vehicles crossing these lines.
- High-occupancy vehicle lane cameras that identify vehicles violating HOV requirements.
- Turn cameras at intersections where specific turns are prohibited on red. This type of camera is mostly used in cities or heavy populated areas.

3.6.3 Variable speed limits

Recently some jurisdictions have begun experimenting with variable speed limits that change with road congestion and other factors. Typically such speed limits only change to decline during poor conditions, rather than being improved in good ones. One example is on Britain's M25 motorway, which circumnavigates London.



Figure3.6.3 Speed meter

On the most heavily traveled 14-mile (23 km) section (junction 10 to 16) of the M25 variable speed limits combined with automated enforcement have been in force since 1995. Initial results indicated savings in journey times, smoother-flowing traffic, and a fall in the number of accidents, so the implementation was made permanent in 1997. Further trials on the M25 have been thus far proven inconclusive.

3.6.4 Vehicle tracking

Vehicle tracking based on contour extraction is one of the most common methods for tracking vehicles. This type of tracking has been consisted of six steps. Each step has its specific algorithm. As an example, Lane masking method has

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2014

been used to separate vehicles in one direction. This is important because it allows the processing of data over a frame to be done. The formula for Masking Algorithm is as follows

$$N(P) = M(P) \times V(P)$$

Where $M(P)$ is amount of the point in original frame and $N(P)=M(P)*V(P)$ is the new point in output image. Considering the above formula, $V(P)$ is the value for masking point such as P . If pixel has been removed, $V(P)=0$; otherwise, $V(P)=1$. Masking must be applied to each RGB image separately.



Figure 3.6.4 Sample vehicles tracking Output by mask algorithm, (a) Image frame, (b) Gray conversion, (c) Binary conversion

The algorithm eliminates all objects shared in background frame with other frames and just will be left the vehicles has been added to other frames. The algorithm may be influenced by conditions such as swinging trees, move lawn lighting, the clouds, rain, snow and the others. In practical applications, some other factors like season, weather and etc., should be considered. The algorithm has been applied using the following equation:

$$D(x, p) = \{I(x, p) - B(p)\}$$



Figure 3.6.5 Traffic Vehicles Detection without background and shadows objects.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2014

In this equation, $B(P)$ is the average of the RGB values for each point such as in the background of chosen frames. Moreover $IB(P)$ shows the pixel color value for point P in a frame such as X . RGB image has been generated by removing background traffic image such as $I(x, P)$. Then, a vehicle frame must be put in the observation area. This operation can be done by the edge detection algorithm based on computing image derivatives. The first derivative must be calculated in order to detect some modifications in density image frame rate. For determining the maximum rate, Second derivative has been considered.

3.6.5 Vehicle Tracking based on Motion Detection

Active contour based tracking; a dual to the region based approach is tracking based on active contour models. The main idea of this work is to have a representation of the bounding contour of the object and keep it updating dynamically. One of the advantages of having a contour-based representation instead of a region based representation is reducing the computational complexity. However, the inability to segment vehicles that are partially occluded remains. If one could initialize a separate contour for each vehicle, then one could track even in the presence of partial occlusion. Moreover, initialization is the difficult part of the problem! Consider the example: if the vehicles enter the detection region partially occluded, the system will group two vehicles into a single object and it will cause to significant measurement errors.

4.1 Morphological Operation

Point and neighbourhood operations are generally designed to modify the look or appearance of an image for visual considerations; morphological operations have been used to understand the structure or form of an image. There are three primary morphological functions for achieving these objectives: 1) Erosion 2) Dilation and 3) Hit-or-miss.

Morphological operations usually have been performed on binary images where the pixel has two values; Value of zero has been considered as black and value of 1 as white. Most of the morphological functions operate on pixel neighbourhoods. The pixel neighbourhood is identified into one of two ways; sometimes interchangeably. The pixel of interest lies at the center of the neighborhood and has been labeled. The surrounding pixels are referred to, or by their compass coordinate and in this paper some morphological operations have been done on binary images.

After subtraction, certainly some additional points on the image in order to subtraction have been left and with morphological operation in these parts remove additional points have been removed. Initially, the objects on the image resulting from subtraction must be removed and then interior and border areas of mark cars in the image resulting from subtraction have been traced.

4.2 Flow chart for traffic analysis

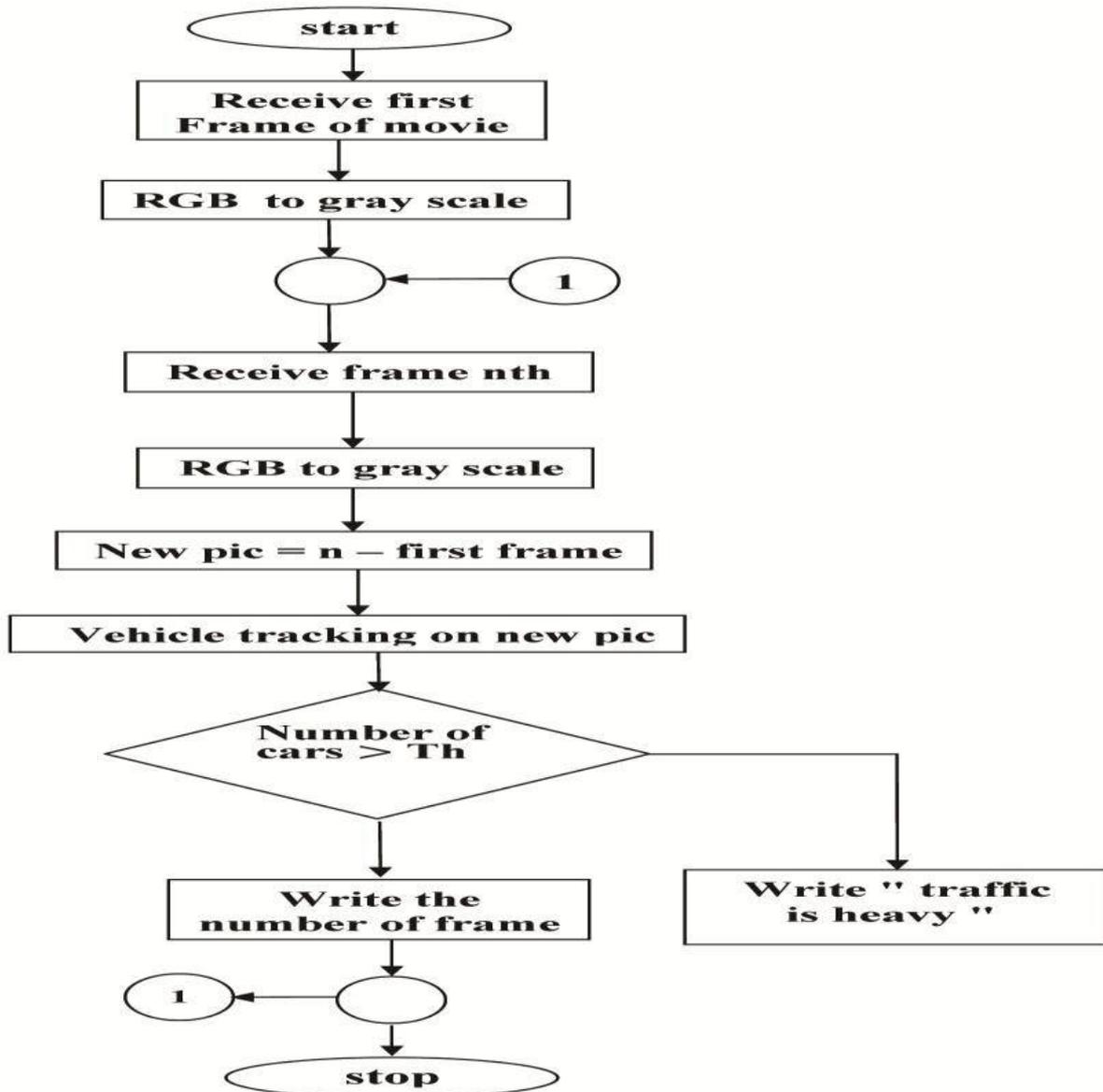


Figure4.2Traffic System Flowchart

4.3 Research goal

As we know the population of city and number of cars is increasing day by day. With increasing urban population and hence the number of cars, need of controlling streets, highways and roads is vital. In this paper, a system that estimates the size of traffic in highways by using image processing has been proposed and as a result a message is shown to inform the number of cars in highway. This project has been implemented by using the Matlab software and it aims to prevent heavy traffic in highways. Moreover, for implementing this project following steps must be considered:

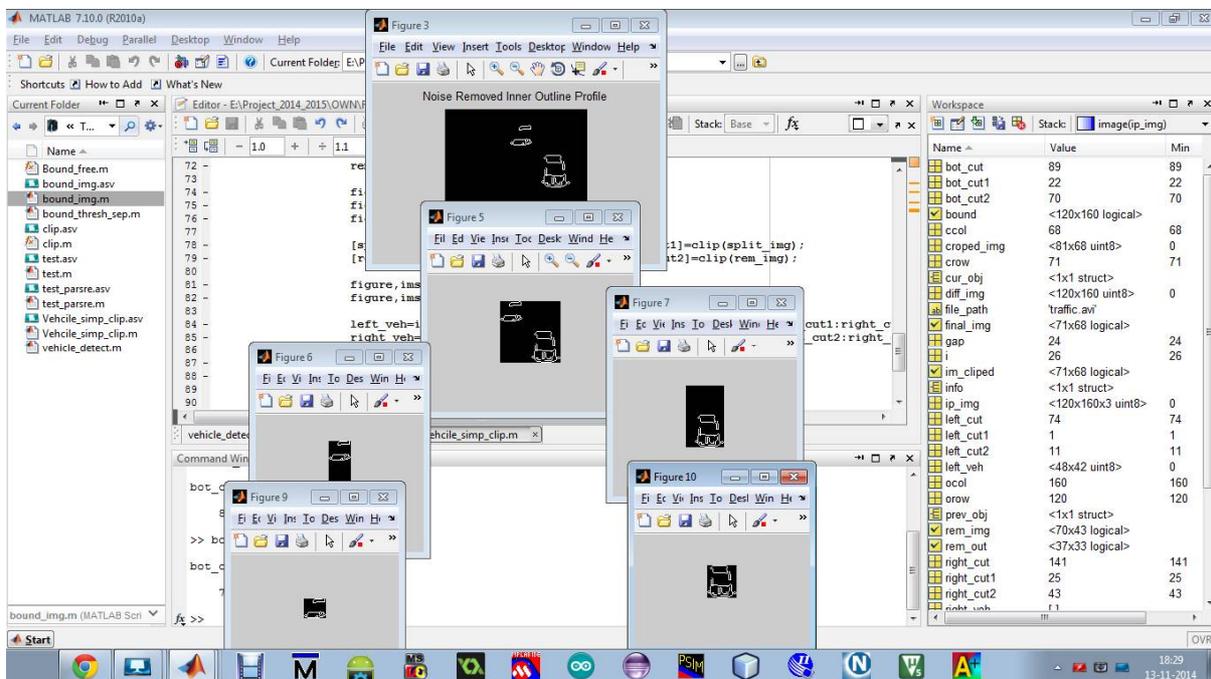
- 1) image acquisition
- 2) RGB to greyscale transformation
- 3) image enhancement
- 4) morphological operations.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2014

At first, film of highway is captured by a camera has been installed in highway. Then, the film comes in the form of consecutive frames and each frame is compared with the first frame. After that, the number of cars in highways is specified. At the end, if the number of cars is more than a threshold, a message is shown to inform the traffic status. By this message we can predict the need to reduce the size of traffic carried. In other words, we use a separating line to determine a sub-window on the image frame. After, we characterize each vehicle by extracting its Hu moments. In off line phase, according to the selected features, we index large types of vehicles and we assign to each vehicle its category based on the knowledge base. In online phase, for each vehicle entering the sub-window, we calculate the vector descriptor and we use a similarity measure for selecting the vehicle type corresponding to high similarity value. Output: vehicle detection with binary conversion



V. CONCLUSION

A successful framework for employing video processing algorithms in the traffic surveillance is analysed and implemented using MATLAB tool. The proposed framework has the advantage of parallel processing multiple vehicles in a single video frame with high precision IOOPL algorithm. The estimated time consumption of the proposed algorithm will vary based on the hardware processor performance and a Pentium I5 processor is the least requirement for the high speed vehicle tracking the implemented vehicle detection and extraction in a traffic video will be extended for vehicle recognition in the fore coming phase of work with the text transcription of the classified vehicle status.

REFERENCES

- 1.Object-Oriented Shadow Detection and Removal From Urban High-Resolution Remote Sensing Images Hongya Zhang, Kaimin Sun, and Wenzhuo Li
- 2.Shadow elimination and vehicles classification approaches in traffic video surveillance context\$ H. Asaidi a,n, A.Aarab b,M.Bellouki
- 3.J.-B.Huang,C.-S.Chen,Movingcastshadowdetectionusingphysics-based features,in:ProceedingsoftheIEEEConferenceonComputer Vision andPatternRecognition,2009,pp.2310–2317.
- 4.T. Kim, T. Javzandulam, and T.-Y. Lee, "Semiautomatic reconstruction of building height and footprints from single satellite images," in *Proc.IGARSS*, Jul. 2007, vol. 2, pp.
- 5.S. Ji and X. Yuan, "A method for shadow detection and change detection of man-made objects," *J. Remote Sens.*, vol. 11, no. 3, pp. 323–329, 2007.
6. P.M. Dare, "Shadow analysis in high-resolution satellite imagery of urban areas," *Photogramm. Eng. Remote Sens.*, vol. 71, no. 2, pp. 169–177,2005.



ISSN(Online) : 2319-8753

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2014

- 7.Y. Li, P. Gong, and T. Sasagawa, "Integrated shadow removal based on photogrammetry and image analysis," *Int. J. Remote Sens.*, vol. 26, no. 18, pp. 3911–3929, 2005.
- 8.A simple on – road object segmentation approach in ITS system IEEE conference 2009—Yongqunan Xia.
- 9.Fast detection of vehicle based on moving region IEEE conference 2007—Zongshunma.
- 10.License Plate Detection method using vertical boundary pairs and geometric relationships IEEE conference 2010—Liangli.
- 11.Hang Shi; Yuexian Zou; Yiyang Wang; Guangyi Shi, "A robust traffic parameter extraction method using texture and entropy," Intelligent Vehicles Symposium, 2009 IEEE , vol., no., pp.237,241, 3-5 June 2009.
- 12.Yuexian Zou; Hang Shi; Yiyang Wang; Guangyi Shi; He Zhao, "A Robust Traffic Parameter Extraction Approach for Surveillance System at Urban Intersection," Image and Signal Processing, 2009.