ENHANCING THE BORDER AREA SECURITY BY USING HAZE REMOVAL AND OBJECT CLASSIFICATION TECHNIQUES

K.Shanmugam[1], Dr.B. Vanathi[2]
[1]Assistant Professor, [2]Professor & Head
Computer Science and Engineering, Valliammai Engineering College, Chennai, India

Abstract

The border area security is one of the significant area of study. It is imperative that unapproved individuals ought not enter inside the confined ranges. The proposed work gives a surveillance camera in all the confined zones. The moving objects discovery from the video of a surveillance camera is used in detecting the object and provide further classification and so on. The recognition of the amount of persons present in the video succession is a noteworthy study and the determination of the individual count is a noteworthy issue. In this paper, persons seen in the video are calculated using Reversible Jump Marcov Chain Monte Carlo (RJMCMC) algorithm. The RJMCMC algorithm gives the effective method for checking the persons at various impediments. The persons in the scene are obtained by deciding the area and size of the object utilizing an irregular imprint. This algorithm identifies the individual number in multidimensional perspective. Further the natural elements that influence the video sequence, for example, clamor and dimness can be evacuated for giving enhanced perceivability of the objects in the image of the video sequence. The clamor in the edge is evacuated by utilizing trilateral filter that smooth's the picture without impacting the edges of the pictures and the dimness is uprooted by color attenuation prior algorithm. The color attenuation prior algorithm dehaze the picture by ascertaining the depth information of the murky picture and the atmospheric scattering model which gives the transmission and scene radiance recovery by considering the depth map. Presently the object in the picture is characterized utilizing the texture based classification algorithm keeping in mind the end goal to discover whether the article is a human, creature or plant, and so forth. The texture based classification algorithm gives a less computational time when contrasted with the color based classification algorithm, by utilizing the exact training information without influencing the end result in terms of accuracy. At last the experimental result demonstrates the effectiveness of the proposed framework.

Keywords: Object Detection; Count Of Person; Haze Removal; Noise Removal; Object Classification.

I. INTRODUCTION

The moving object detection is one of the vital components in the video processing framework that uses image processing techniques. The security in the border area is an essential field that should be tended to in each angle. The border area is observed by the surveillance camera. The video sequence got from the camera is processed for giving the authentication of the persons who are entering inside the border area. For this reason the video sequence is analyzed by the image processing techniques. This paper utilizes the object detection, haze removal and object classification approach for validating the persons. The procedure of examining the video groupings for identifying numerous moving objects is a interesting process. The process of analyzing the human count is very difficult[1].

The object detection gives the best approach to recognize the foreground objects by assessing or removing the background in the image. Object detection is the methodology of finding events of objects in the image, for instance, animal, bicycles, and structures in

pictures or human. Object detection techniques typically use extricated elements and learning techniques to see events of an object classification. It is routinely used in numerous areas. It is extremely hard to understand the human movement and distinguishing them by taking into account of their appearance since individuals show up in various postures [2]-[4]. Once if the moving objects are recognized from the image, then it is easy to further process the image.

In this paper, the object detection is done to tally the quantity of persons present in the observed range or the territory under surveillance. In the process of getting the individual number, it is essential to learn about the location and different appearance of the person. After finding the count of the peson the haze removal procedure is started to uproot the fog present in the picture [5]-[7]. The picture taken in the outside with poor natural condition will have a cloudiness inside it. Such degraded images will give low perceivability of the objects present in the picture and this makes the computer vision algorithm to be invalid [8].

At last, the object classification is experienced to give the classification of the objects found in the picture, for example, human, creature, trees, and so on. The object classification utilizes certain parameters of the object that is to be grouped. The parameters will be the information for the classification and the yield will be the object sort (human, plant, and so on.). The object classification is done to discover the object precisely from the picture. The aftereffect of the object classification is utilized to give the learning about who is entering inside the fringe range and the security of the nation is viably given.

The remaining portion of this paper arranged as follows: In section II, the audit of the related works is done. In section III, the existing system is provided with its drawbacks. In section IV, the overview of the proposed system with the architecture is clarified. In section V, the experimental results are depicted. At long last the conclusion is in section VI.

II. RELATED WORK

In this section, the issue of providing the quantity of persons present in the border area from the observation camera is analyzed. Along this, the issues in the dehazing algorithms and object classification algorithms is also analyzed.

A. Count of the Object

People counting and segmentation of the image can be implemented by different techniques, like motion or texture analysis [9,10]. The machine learning techniques will provide the classification of the observed features into human or background [2]. In [13], Kong et al proposed the Feature-based relapse technique that is utilized to include the quantity of persons the observed range. By assessing the elements, the tally of the persons is resolved that uses the neural system which is the capacity of relapse.

In [14], JongSeok et al proposed the movement data and adaboost calculation for location of various walkers. The person on foot identification should be possible for the picture that is acquired from the camera set in both versatile and stationary framework. The variety between two unique pictures will be utilized to decide the area of hobby and after that the walkers are identified utilizing the classifier taking into account the sub window inside of the locale of hobby. The identification exactness is low by utilizing the aforementioned strategies and the precise number of the individual is not gave adequately under a few conditions.

B. Dehazing Process

The fog or mist is removed in this process from the image. In [15], [16], the polarization based strategy is utilized to expel the cloudiness from different pictures that has different degrees of polarization. In [17], Kaiming et al proposed the dull channel former calculation to expel the fog from the picture. It considers the non-sky fixes that contain a low power in any event any of the shading channel. This channel is known as dull channel and by utilizing this, the estimation of the transmission is done and the scene brilliance is recouped. Notwithstanding the fog evacuation handle the undesirable clamor that influences the picture visual quality can be additionally uprooted by utilizing any commotion evacuation systems. In [18], Xia et al proposed the expulsion of cloudiness from a solitary picture by considering sensor obscure and clamor. This strategy depends on dark channel prior calculation which also evacuates the commotion in the picture. The productivity of the murkiness evacuation done by the

aforementioned calculations are not all that great for a few parameters furthermore the calculations might get invalid for various ecological conditions.

C. Object Classification

The object classification is the process of finding the category of the object (animal, human). In [19], Juan Li, et al proposed the feature based classification algorithm that uses the particular features of the item such as skin shading, tallness, weight, width, et cetera, of the article is removed. The foundation of the picture is uprooted by utilizing the GMM strategy so that just the frontal area object features is just removed. The feature based system is valuable when the shape data is not given. In [20], Hitesh A Patel, et al proposed the shape based article classification strategy to acquire the item data. The shape of the items, for example, creature, human, and so forth is given as the data.

III. EXISTING SYSTEM

In existing system the person detection is done by motion information and adaboost algorithm is used. The image frames may contain either static or moving images and its region of interest should be calculated. In case of static image, the adaboost algorithm will find the region of interest of the object. In case of moving image, the motion information is used to find the object and that can be done by using the difference in the two consecutive images provided by the frame differencing method. The difference recorded from the two images is used to find the binary image and from the binary image the region of interest is calculated [21].

After finding the region of interest the pedestrians are obtained from the histogram of oriented gradient features which classifies the object using sub window method [21]. This method fails to provide the exact count of the persons. The haze present in the image is removed by using the dark channel prior algorithm that provides the depth map of the hazy image as the by-product. The major goal of a haze removal algorithm is to recover the transmission medium (t), scene radiance (J), atmospheric light (A) from intensity (I) [17]. The images with non-sky patches will have a very low intensity in at least one color channel. The intensity of the corresponding color channel of the image is calculated and is used to find the t, J, A components of the image. By using the above terms the haze is removed from the image. This algorithm fails when the scene object is very similar to air light. Also the noise in the image is not considered in this process. The object in the image is classified using shape based classification method which uses the shape of the object as the input parameter [20].

Title and author	Algorithm	Advantage	Disadvantage
"Learning Optimal Seeds For Diffusion-Based Salient Object Detection", Song Lu, Vijay Mahadevan, Nuno Vasconcelos	Diffusion based salient object detection	➢ Efficiently used in the detection of an object. ➢ The stare-of-art of the result is maintained.	➢ High computational time.
Detection of the Mobile Object with Camouflage Color under Dynamic Background Based on Optical Flow" Jianqin Yin Yanbin Han Wendi Hou Jinping Li.	Optical flow	➢ Efficiently used in detecting the object that has camouflaged color.	➢ Easily affected by noise.

"Tracking objects using shape context matching", Zhao Liu, Hui Shen, Guiyu Feng, Dewen Hua.	Contour based detection	➢ Efficiently used for detecting the moving object that has occlusion problem.	➢ Cannot be used in crowed area. ➢ Only shape of the object is detected.
"An automatic algorithm for object recognition and detection based on ASIFT keypoints", Reza Oji.	Affine scale invariant transformation	➢ Most accurate detection algorithm.	➢ Shape of the object cannot be detected.

Table1:Comparison between different object classification algorithms.

IV. PROPOSED SYSTEM

The proposed framework gives the surveillance camera to screen the fringe range of our nation. The camera will continuously catch the scene (things happening) in the fringe range. The video arrangement is handled to give the approval of the general population those are found in the scene. The fig 1 is the representation of the proposed framework.

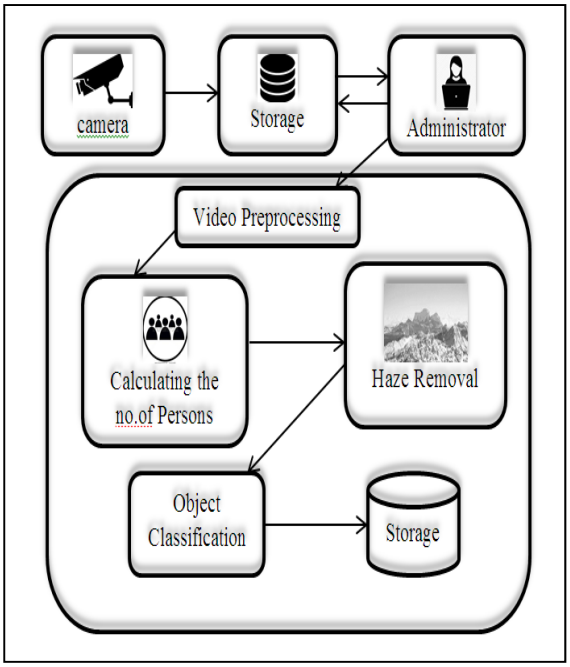

Fig. 1. *Architecture of the proposed System*

A. Preprocessing

In the proposed framework, at first the video sequence is changed over into frames and every edge is subjected to a two pass background subtraction to extricate the real closer view of the object. The two pass background subtraction will permit one procedure in forward pass that runs the frames from first to last. The second process will give the regressive pass that runs the frames from last to first. This will deliver changes in the light at a time frame T. The times that are lesser than T will deliver a frontal area veil utilizing the forward pass and the times more prominent than T will create a forefront cover utilizing the retrogressive pass. The observed foreground area veils are consolidated to get the right precise closer view.

B. Person Count

After eliminating the background, the check of the persons is found by utilizing Reversible Jump Marcov Chain Monte Carlo method. This method depends on Marked Point Process (MPP) which is a stochastic procedure that has an arbitrary number of sets of focuses on a limited area. The MPP gives the limit of the persons utilizing the size and area of the persons. Three different types of proposals are used in this RJMCMC method.They are as follows.

1. *Birth / Death proposal :-* At the time of each new move, a point and mark are added to the current scenario by providing the central location according to the foreground object that makes it a data-driven proposal. The length and breath are the Gaussian distributions. The opposite move of birth is

death. The death proposal selects one rectangle homogeneously at unplanned form from the current rectangles and eliminates it from the configuration. The configuration increases by one for a birth and decreases by one for a death.

2. *Update proposal:-* The update proposal keeps the record of the current scenario unchanged, but generates a new hypothesis by making small adjustments to the objects detected previously. Modification of the mark is done by sampling from the corresponding conditional mark process associated with the current location.

In the above three process, the birth and death process will use the reversible jump concept that will keep on detecting and deleting the persons when they enter and leave the scene area respectively. The update process provides the current configuration of the scene based on the Marcov Chain Monte Carlo method. Thus the RJMCMC method will accurately count the number of person in the monitored area and the count can be done to the persons not only in the image plane (2D) but also in the 3D view hence the counting can be done multidimensional view effectively.

Case i: When t= 0

$f(x)=i$; where $0 \le i \le \alpha$

Case ii: When t= T

$$f(x)=\begin{cases} i+j \text{ ; where } \alpha \le j \le \beta \\ i-j \text{ ; where } j \le i \end{cases}$$

C. *Haze Removal Process*

The proposed system after finding the count of the persons the elimination of noise and haze (fog or mist) in the image is done. This is done by the color attenuation prior and trilateral filtering method. The trilateral filter is utilized to evacuate the noise in the picture and this is finished by smoothening the picture. The picture is smoothened without considering the edges of the article in the picture. The trilateral filter smooth's the picture by consolidating the non-linear adjacent estimations of the picture which smooth's the edges of the picture towards a sharp piecewise guess which is linear in structure. Thus the strong noise reduction is done in the image.

The haze is removed by using color attenuation prior algorithm which effectively eliminates the fog or other environmental factors that affects the visibility of the object in the image. The hazy image is formed by the atmospheric light and scene radiance which is known as atmospheric scattering model. To remove the haze caused by the atmospheric scattering model is very complex due to less information is provided in the scene. To remove the haze, the brightness and the saturation pixel is considered in this method. In a non-hazy or haze free region of the image, there is a high saturation in the pixel and it has moderate brightness. The difference between the saturation and brightness of the pixel is approximately zero. The hazy image will consider the three properties that is the brightness, saturation and the difference between the both. The dehazing will be done by using the HSV color model. By creating the linear model the edge of the image is preserved and this is known as edge preserving property. After finding the depth information, the scene radiance can be recovered. The depth information provides the amount of haze present in the image. By calculating the depth information the scene radiance is recovered and thus the image is dehazed. The fig 2 provides the representation of the hazy image to non-hazy image.

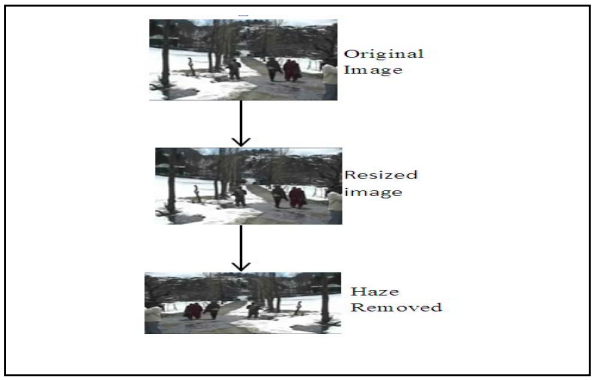

Fig. 2. *Haze removal Process*

1) Algorithm Steps:

1. Select a particular image frame from the sequence of images.
2. Remove the noise using the trilateral filtering method by smoothening the non linear combination of the image pixel.
3. Perform step 2 untill the noise is removed i.e. all the sharp pixels are

smoothened. Else goto step 4 for haze removal process.

4. Find the amount of haze present in the image by calculating using algorithm..

D. *Object Classification*

The proposed system once removing the haze within the image, the objects (person, trees, gun,etc.) found within the image is classed into its applicable sort.

The object is classified using the texture information extracted from the image. For this technique the tendency to choose the local binary pattern (LBP) texture operator that has recently shown glorious performance in several applications and has many properties that favor its usage in background modeling. Maybe the foremost vital properties of the LBP operator are its tolerance against illumination changes and its computational simplicity. In order to create the LBP even a lot of appropriate to real-world scenes, we have a tendency to propose a modification to the operator and use this changed LBP throughout this paper. Not like in most alternative approaches, the options in background modeling square measure computed over a bigger space than one component. This approach provides us with several benefits and enhancements compared to the progressive.

LBP has many properties that favor its usage in background modeling. as a result of the invariableness of the LBP options with relation to monotonic gray-scale changes, our technique will tolerate the considerable gray-scale variations common in natural pictures and no standardisation of input images is required. not like several different approaches, the planned options area unit in no time to cypher, which is a very important property from the sensible implementation purpose of read. LBP may be a statistic method, which implies that no assumptions concerning the underlying distributions area unit required. moreover, the operator doesn't need several parameters to be set and has high

discriminative power. The radius Rregion defines the region for histogram calculation. atiny low price makes the information encoded within the bar chart additional native. If the form info of moving objects is of interest, smaller region size ought to be used. selecting AN LBP operator with an oversized price of P makes the bar chart long and so computing the proximity becomes slow. employing a tiny variety of neighbors makes the bar chart shorter however additionally suggests that losing additional info. what is more, the memory consumption of the strategy depends on the selection of P. Since correlation between pixels decreases with distance, a lot of of the textural info will be obtained from native neighborhoods. so the radius R of the LBP operator is sometimes unbroken tiny. The proximity threshold TP for bar chart comparison is straightforward to seek out by experimenting with completely different values. Values between 0.6 and 0.7 gave smart results for all of our check sequences. The fig 3 shows the extraction of the LBP of the original image.

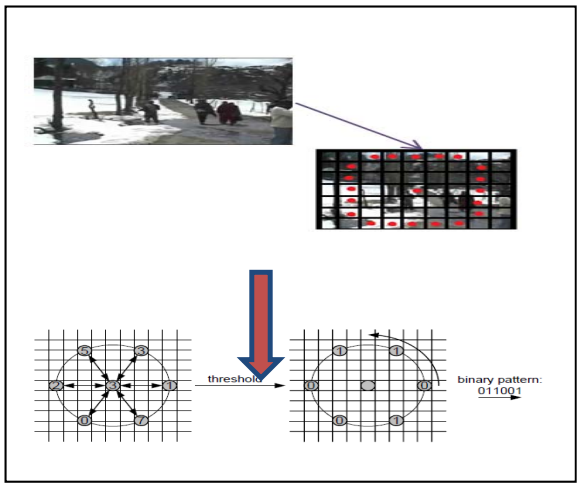

Fig. 3. *LBP Extraction*

V. EXPERIMENTAL RESULT

The following is the experimental result of various algorithms used in this paper. The following graph shows the variation between the colour attenuation previous algorithmic rule (CAP), dark channel previous algorithmic rule (DCP) and therefore the color attenuation previous algorithmic rule at the side of the noise removal method (CAPNR) with relation to time and therefore the share of haze removed. From the experimental result, it's clear that the color attenuation previous algorithmic rule at the side of the noise removal method severs because the best with less procedure time.

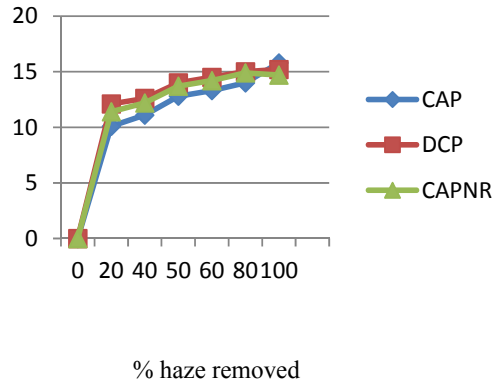

Fig. 4. Performance Evaluation of Various Haze Removal Algorithms

The following graph shows the variation within the computational time between the color based classification (CBC)and texture based classification (TBC) algorithms.

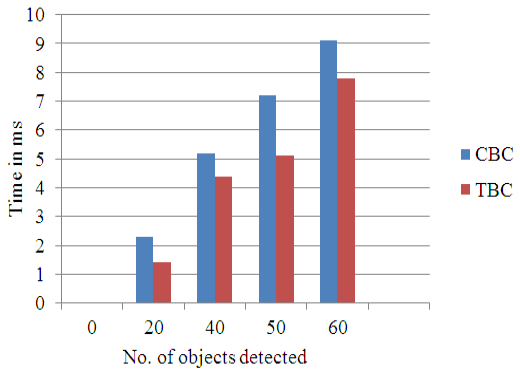

Fig. 5. Time Evaluation of Various Classification Algorithms

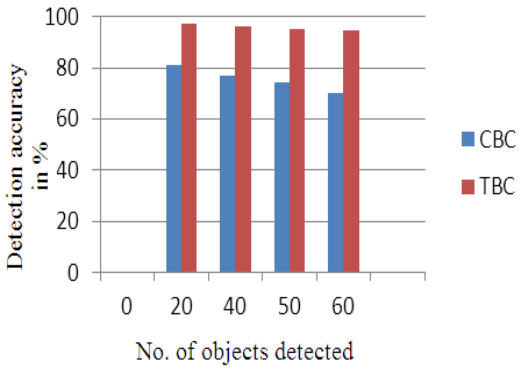

Fig. 6. Accuracy Evaluation of Various Classification Algorithms.

The above graph shows the variation within the detection accuracy between the color based classification (CBC)and texture based classification (TBC) algorithms. It is observed that the texture based classification algorithm possesses high detection accuracy than the color based classification algorithm.

VI. Conclusion

Thus the proposed system effectively finds the quantity of objects or persons present within the video sequence using the Reversible Jump Marcov Chain Monte Carlo (RJMCMC) algorithm. The RJMCMC algorithm provides the economical manner of tally the persons at completely different occlusions and in multidimensional view. additionally the environmental factors that have an effect on the video sequence like noise and haze is removed from providing the improved visibility of the video frames. The result of the haze removal method is incredibly effective and therefore the original color of the image is maintained. The color attenuation previous algorithmic program is compared with dark channel previous algorithmic program and therefore the projected color attenuation previous algorithmic program is evidenced to be only. Additionally the item classification that uses the feel primarily based classification algorithmic program provides larger accuracy in classifying the objects. It's finished less process time and is evidenced by scrutiny with color primarily based classification algorithmic program. Therefore the effectiveness of the projected system is achieved greatly. Any the projected system is extended in future by sleuthing the camauflaged object.

References

[1] T. H. Chen, Tsong-Yi Chen and Zhi-Xian Chen, "A Intelligent People-Flow Counting Method for Passing Through a Gate", *IEEE International Conference on Cybernetics&Intelligent Systems (CIS)*, pp. 573-578.

[2] A. B. Chan, Z.-S.J. Liang and N. Vasconcelos, "Privacy preserving crowd monitoring: Counting people without people models or tracking", *IEEE Conference on Computer Vision and Pattern Recognition*, pp. 1-7.

[3] Huazhong Xu, Pei Lv , Lei Meng “A people counting system based on head-shoulder detection and tracking in surveillance video ", *IEEE Conference on Computer Design and Applications (ICCDA), 2010.*

[4] Yu Peng, Min Xu, Zefeng Ni, Jesse S. Jin, Suhuai Luo, “Accurate Pedestrian Counting System Based on Local Features”.

[5] Erik Matlin, Peyman Milanfar, "Removal of Haze and Noise from a Single Image".

[6] Manpreet Kaur Saggu, Satbir Singh, "A Review on Various Haze Removal Techniques for Image Processing" International Journal of Current Engineering and Technology E-ISSN 2277 – 4106, P-ISSN 2347 – 5161 ©2015 INPRESSCO

[7] Munira A Jiwani, S.N.Dandare, "Single Image Fog Removal Using Depth Estimation Based on Blur Estimation", International Journal of Scientific and Research Publications, Volume 3, Issue 6, June 2013.

[8] Zheqi Lin, Xuansheng Wang, "Dehazing for Image and Video Using Guided Filter", Open Journal of Applied Sciences Supplement:2012 world Congress on Engineering and Technology.

[9] A. Marana, L. Costa, R. Lotufo, and S. Velastin. On the efficacy of texture analysis for crowd monitoring. In Proc. Computer Graphics, Image Processing and Vision, pages 354–361, 1998.

[10] A. Ess, B. Leibe, K. Schindler, and L. van Gool. A mobile vision system for robust multi-person tracking. In CVPR, 2008.

[11] L. Fei-Fei, R. Fergus, and P. Perona. One-shot learning of object categories. PAMI, 28(4):594–611, 2006.

[12] Belén Riveiro, Lucía Díaz-Vilariño, Borja Conde-Carnero, Mario Soilán, Pedro Arias," Automatic Segmentation and Shape-Based Classification of Retro-Reflective Traffic Signs from Mobile LiDAR Data",IEEE Journal Of Selected Topics In Applied Earth Observations And Remote Sensing, Vol. 9, No. 1, January 2016.

[13] D. Kong, D. Gray, and H. Tao. Counting pedestrians in crowds using viewpoint invariant training. In BMVC05,2005.

[14] JongSeok Lim, WookHyun Kim, "Detection of Multiple Pedestrians using Motion Information and Adaboost Algorithm".

[15] Y. Schechner, S. Narasimhan and S. Nayar, "Instant dehazing of images using polarization," In Proc. IEEE Conf. Computer Vision and Pattern Recognition, vol. 1, pp. 1–325, 2001.

[16] S. Shwartz, E. Namer and Y. Schechner, "Blind haze separation," In Proc. IEEE Conf. Computer Vision and Pattern Recognition, vol. 2, pp. 1984–1991, 2006.

[17] Kaiming He, Jian Sun, Xiaoou Tang, "Single Image Haze Removal Using Dark Channel Prior".

[18] Xia Lan, Liangpei Zhang, Huanfeng Shen, Qiangqiang Yuan, Huifang Li, "Single image haze removal considering sensor blur and noise", In EURASIP Journal on Advances in Signal Processing 2013, 2013:86

[19] Juan Li, Chunfu Shao, Wangtu Xu, Hao Yue, "Real Time Tracking of Moving Pedestrians", 2009 International Conference on Measuring Technology and Mechatronics Automation, pp. 811-815.

[20] Hitesh A Patel, Darshak G Thakore,"Moving Object Tracking Using Kalman Filter", International Journal of Computer Science and Mobile Computing,April 2013, pg.326 – 332.

[21] JongSeok Lim, WookHyun Kim, "Detection of Multiple Pedestrians using Motion Information and Adaboost Algorithm".