International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878, Volume-8 Issue-4, November 2019

A Novel Technique for Moving Object Detection & Tracking with Optical Flow

C.Karthika Pragadeeswari, G.Yamuna

Abstract *– A novel technique for tracking for tracking of objects in moving state is proposed to done by optical flow analysis which provide accurate results. In this Optical flow analysis, the velocity vectors of the pixels are obtained. As a result, velocity field is analyzed for the frame sequences which are considered and described for short duration of the video. This method doesn't need to refer the previous frames which reduces the processing time and can be applicable for real time events. This novel algorithm produces better results with repeatability, uniqueness and reliability, compared to previous techniques. This method can be able to perform faster computation and comparison. This can be achieved by performing image convolutions for integral images followed by technical operations in the descriptors and detectors. Finally these methods can be simplified to the needed requirements. This leads to a package of better quality detection followed by description and recognition steps. The paper encircles a brief explanation of the algorithm and the results of simulation are also described in detail.*

Keywords *– Optical Flow, Frame Conversion, Noise, Velocity Field.*

I. INTRODUCTION

Moving Object detection and tracking has the objective to track the object in motion in the input video. In computer vision based algorithms this method of tracking is the first fundamental step. It is widely used as an important block for in surveillance and in so many applications. Lastly, in previous years, tremendous growth in video research and technologies has taken place, especially in the area of detection and tracking. Many novel techniques were introduced, some of the best detection and tracking techniques were identified and the review of literature is given in the ensuring paragraph.

Xia Dong et al. in (2009) gives the view at classifying the object of interest including shadow along with background using color model of any particular type RGB. This paper considers chromaticity ratio model and brightness ratio model. This joined with proportion model for edge to segregate the misclassified item and shadow. This technique is having a positive perspective as item and shadow are anything but difficult to segregate and furthermore done at quick enough for usage progressively examination. This strategy is having negative viewpoint as same shading data are less hard to gathering like darker shadow zones of the moving objective which has a similar power level to that of foundation data which neglects to isolate from each another[1].

JinMin et al. (2012) offer the summary on identification of the moving target. The target moves over the quick illumination changes. These variations exploits Mathematician model using mixtures for detecting moving objects. For the diagnosis of color, the color property and brightness model based on ratio is used for the elimination of false pixels on foreground. Having positive facet doesn't need the coaching sequence and programmed modification of the parameter anyway having a negative aspect therefore corrupts in muddled surroundings that has cumulous day off, or in laic locales. The Proposed procedure is likewise attempted with brightening adjustment [2].

JiuYueHao et al. (2012) offers the synopsis on methodology for traffic polices work misuse Bayesian combination strategy any place in thickness estimation dependent on the piece is utilized for foundation demonstrating and Gaussian definition is administrated for the closer view model. Having Positive Facet needs less machine time and functions admirably with the quickly and gradually regularly evolving foundation, nonetheless, having negative aspect as Object's element a twin of that of foundation are abrogated [3].

Liu Gangl et al. (2013) offers the rundown on the expanded the three - outline differential strategy joined with shrewd edge location to accomplish total data related with a moving objective having positive feature. Ghosting impact is disposed of and Algorithm beats the unfilled wonder and edge cancellation issues of typical three-outline differential method anyway having negative aspect on the grounds that the outcome isn't perfect inside the surroundings with light-weight and evident shadow added to the outcomes debase for dynamic background[4].

Lucia Maddalena et al. (2014),offers the outline on the moving objective is identified by Neural foundation model that is precisely made by a self-sorting out procedure having positive feature which functions admirably with dynamic foundations and not exclusively precisely control with steady varieties in Illumination, and shadows manufactured by articles which are moving anyway furthermore durable against recognitions on lie anyway having negative aspect as exactness can't be acquired just if there should arise an occurrence of sharp enlightenment varieties and reflection[5].

Manuscript published on November 30, 2019.
* Correspondence Author
*** C.Karthika Pragadeeswari***, Assistant Professor, Department of ECE, Alagappa Chettiar Government college of Engineering and Technology, Karaikudi 630003 India. Email: bk.karthika1969@gmail.com
G.Yamuna, Professor and Head, Department of ECE, Annamalai University, Annamalainagar, 608002 India. Email: yamuna.sky@gmail.com

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an open access article under the CC-BY-NC-ND license http://creativecommons.org/licenses/by-nc-nd/4.0/

Prem Kumar Bhaskar et al. (2014), offers the synopsis on Vehicle acknowledgment and following abuse Gaussian model dependent on blend and the mass discovery having positive features vehicle retribution was done precisely furthermore a solid for low and medium traffic anyway having negative
aspect as just if there should be an occurrence of congestion and the high traffic stream situation execution breakdown and not prudent to get the best execution essential amount of parameter adjustment is required [6].

Zhihu Wang et al. (2014), offers the synopsis on the utilization of fleeting data for age of movement striking nature that is then trailed by the most entropy and fluffy developing procedure to recognize the moving objective having positive feature. No past information of the foundation subtraction is required and strong to fragile the foundation movements and camera butterflies. No client cooperation for parameter adjustment is required and actually quickly manages the irritations of the foundation anyway having negative aspect as shadow whenever chose close to the moving item which results in misclassified object itself [7].

Jinhai Xiang et al. (2014), offers the rundown dependent on the work on neighborhood power proportion model. It is utilized for the disposal of shadow. This technique pursues the Gaussian blend model to identify the items moving. This technique is having positive aspect since profitable moving objective recognizable proof while not shadow and ever enlightenment condition anyway having negative feature as execution drops significantly just on the off chance that any place, foundation is same as frontal area and closer view is practically identical to shadow and can't oblige with consecutive brightening changes like light-weight on/off [8].

Thus from the above literature, the video detection process and tracking process use two major detection techniques. (a) Background subtraction, Casing by casing handling to such an extent that each casing is identify alongside past transient information. Though it is quick, the outcomes are poor. (b) Optical Flow, the present edge doesn't rely upon recently handled edges and the total development of the article in subject can be distinguished effectively. Consequently the outcomes are great and proficient in reality unpredictability.

The following paper is designed as Section 2 explains the proposed methodology, block diagram and the algorithm used. Section 3 provides implementation of improved optical flow analysis. Section 4explains the simulated output results.

II. Proposed Methodology

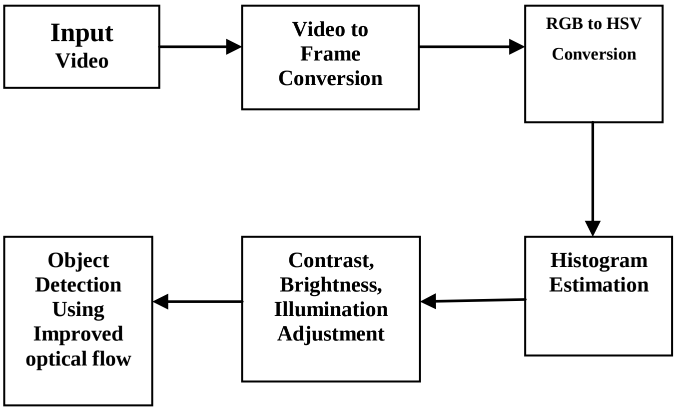


Fig. 1 Block Diagram of Improved Optical Flow

A. Video Acquisition

A Frame converser system is used for Video acquisition. This process is done to convert an analog signal of video input into digital video signal. The analog video input can be getting from a video camera, television tuner or DVD player. Then, this digital output can be stored on a local memory or external circuitry which can be sending in future. This process is termed as video capture. This acquisition process contains the three main processes. They are the reflection of energy from the targeted object, next an Optical system is applied to produce energy and thirdly, a sensor is used to measures the energy amount.

Frame up-conversion rate increase the temporal rate of sampling in video progression. The result is a clearer picture especially during a slow motion video. For analysis, process the video initially the frames characteristics have to be studied. Then, the video properties have to be analyzed. For this, the video has to undergo frame conversion process with the help of MATLAB. Then, the valid information can be extracted from the video. Next, this extracted data is used to process video data efficiently. Also, it reduces the load transfer of the network.

Normally the number of frames in one second will be different for the different cameras especially,18 frames in one second in the early pictures of motion films, 24 frames in one second in movies and camera, the 300+ in high speed cameras and 2500+ in very high speed cameras.

B. Preprocessing

The RGB color model is sensitive to color changes, but this method is insusceptible to changes of the intensity characteristic; therefore, it is difficult to correct the tracking of an object if a video have occurred a large impact from changes of the lighting element and the external environment. The V value in HSV color model which indicates the brightness parameter has to be tracked to overcome the above challenge. Also, this tracking of video has to be done in accordance to the RGB-to-HSV conversion. In this, the image processing histogram consists the pixel values present in the analysis of the image. In this algorithm, histogram detects the changes of the contour and color information between the successive frames in the video; it helps in the analysis of the located object pixel.

Retrieval Number: D7389118419/2019©BEIESP
DOI:10.35940/ijrte.D7389.118419
Journal Website: www.ijrte.org

Published By:
Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)
© Copyright: All rights reserved.

The x-axis that indicates the pixel histogram with the values of brightness, contrast, and color is composed of a constant-size bin; alternatively, the y-axis represents the frequency that is contained in the respective bin, whereby the number of pixels is represented. In the histogram back-projection method, in which a proportion of the image histogram value is used to obtain the tracked-histogram value in the target that is to be tracked. To perform a back-projection, the attainment of the three-channel HSV histogram should first occur so that the object can able to be tracked. Next, the image-histogram values are compared to perform the image histogram and thereby performs tracking.

C. Detection

In Improved adaptation of optical stream calculation Optic stream strategies utilize the stream vectors of the items moving after some time to identify moving districts in a picture.

In this technique, for each pixel the speed and bearing obviously must be determined in the edge. This technique is productive, yet it expends time. From the Background type movement model, the foundation stage can be determined. This keeps up solidness of the picture and it is anything but difficult to register optical stream. A portion of the articles which are free to one another can likewise be identified by this methodology. This should be possible either as leftover stream or by the stream as picture slope whose course can't be anticipated out of sight plane movement. This technique can ready to recognize moving article given in the information video groupings despite the fact that the video from a moving camera and a moving foundation. In any case, this technique has complex calculations and hard to use in genuine occasions without specific equipment.

This method helps to acquire the complete knowledge related with the object movement. Hence it is used to obtain the target moving from the unmoving background. For example, when the object of interest is moving on a straight line across a stationary scene, the flow field of optical energy forms a radial pattern. This patterns centre gives the zero motion. This centre point of zero motion is also known as focus of expansion. Next the object which is moving will introduce image velocities. This velocity pattern is not the as same as the flow field pattern. This inconsistency is used to identify the presence of moving target of interest. So there exist Discontinuities in optical field flow that can help in segmenting images into different boundary regions and each of that region corresponds to different moving target.

III. DETAIL DESCRIPTION OF PROPOSED ALGORITHM

Initially the video input file has to be got. To find the delay of frame difference varies the two dimensional components of each frame. To compute optical flow measure and follow the brightness derivatives. Find mean for each frame. Then to remove noises find median value. After noise removal apply morphological close and erosion operator to locate the moving features. Next, find optical flow from the features and calculate the velocity threshold. Based on that moving objects will be bounded by blobs and boxes. The structure of the procedure is follows:

Step 1:

Feed V←Video file and derive2-D components representing optical flow with varied delay of frame difference.

For function having linear properties,

$$A_i x + A_j y + A_k = 0$$

where $A_i, A_j and A_k$ are the space and time derivatives

$x$represents the x component of optical flow and $y$represents the y components of flow vectors.

(x,y,∇ t) where ,∇ t is delay of differences of frame.

Step 2:

μ ← mean for frame

which find the mean for given frame

Step 3:

Vmed←median ()

Then remove noise by median filtering technique.

Step 4:

For each frame, do morphological close and erosion operations

Step 5:

For each $frame_i$ given set of frames in (input)

Step 6:

Gauge optical stream. The optical vectors of stream are put away as intricate numbers. Process their extent squared which will later be utilized for thresholding.

$$E = \iint \left(A_i x + A_j y + A_k\right)^2 d_i d_j + \alpha \iint \left\{\left(\frac{\partial x}{\partial i}\right)^2 + \right.$$

$\partial x \partial j2+\partial y \partial i2+\partial y \partial j2didj$ This equation $\frac{\partial x}{\partial i} and \frac{\partial x}{\partial j}$ are the spatial derivatives of the velocity component *x*, and α scales the smoothness term of global estimation. E is estimation of optical flow.

Step 7:

Find the velocity threshold from the matrix of complex velocities.

$$x_{i,j}^{m+1} = x_{i,j}^{-m} - \frac{A_i\left(A_i x_{i,j}^{-m} + A_j y_{i,j}^{-m} + A_k\right)}{\alpha^2 + A_i^2 + A_j^2}$$

$$y_{i,j}^{m+1} = y_{i,j}^{-m} - \frac{A_j\left(A_i x_{i,j}^{-m} + A_j y_{i,j}^{-m} + A_k\right)}{\alpha^2 + A_i^2 + A_j^2}$$

In this equation, $[x_{i,j}^m, y_{i,j}^m]$ is the measure for the pixel at (*x*, *y*) indicates velocity, and $[x_{i,j}^{-m}, y_{i,j}^{-m}]$ is the neighbourhoodaverage of $[x_{i,j}^m, y_{i,j}^m]$. For *m=0*, the initial velocity is 0.

Step 8:

For $frame_i \leq \sigma$

where σ ← Threshold.

End for 'for' loop

Step 9:

Thin_$frame_i$ =morph_thin ($frame_i$)

This is to fill the holes in the blobs.

Step 10:

Compute area →function_area ($frame_i$)

Estimate the area and boxof boundary for the blobs.

$$Area = (x_{max} - x_{min}) * (y_{max} - y_{min})$$

Step 11:

Draw boxes of boundary around the objects which are tracked.

Published By:
Blue Eyes Intelligence Engineering
and Sciences Publication (BEIESP)
© Copyright: All rights reserved.

Step 12:
Calculate the motion vectors and draw it.

$$d_x = x' - x = f_x(a,x,y), d_y = y' - y = f_y(b,x,y)$$

Where x,y- location in previous image, x',y'- location in current image a,b -motion vector coefficient and d_x, d_y-displacement

Step 13:
Display tracked frame results.

Hence tracking of objects from a given video dataset has become efficient we are able to track more number of objects using improved optical flow algorithm.

IV. RESULTS

This part portrays the consequences of the defined calculation. The proposed improved optical flow algorithm is tested on the different dataset. Also Table.1. depicts the histogram values and the precision ratios at 0.5 levels, which shows the goodness of the algorithm. The precision values are above 0.6 which indicates the perfect tracking. The simulated results consist of input frames, RGB to HSV Conversion, traditional optical flow, histogram of Hue, saturation and value image, object detection using improved optical flow, BPR(Boundary Precision Recall)Graph and VPR(Volume Precision Recall**)** Graph. The simulated result of the proposed algorithm for different dataset is shown below:

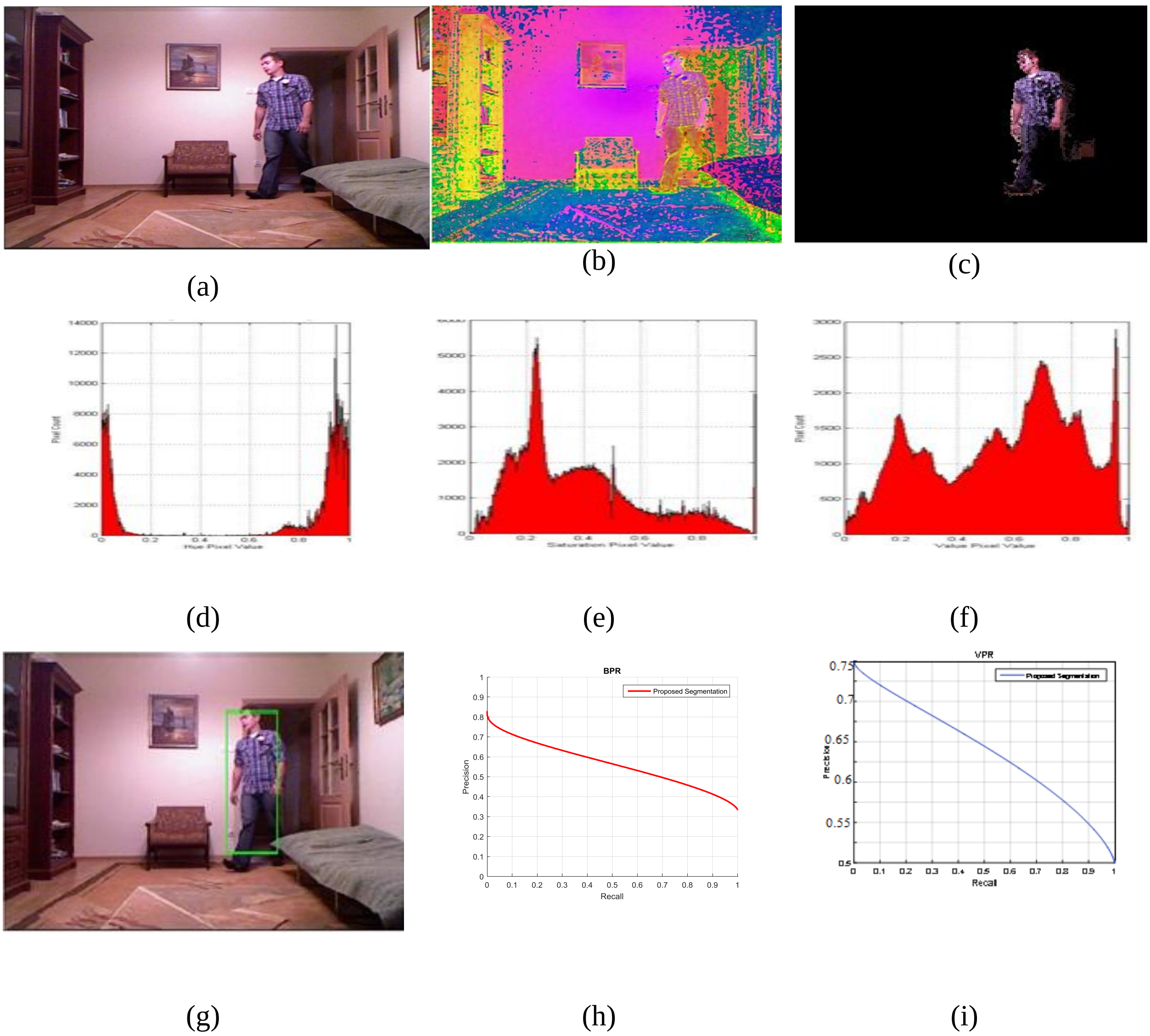


Fig.2 Simulated Results of Man walking inside the Room

a) Frame Conversion (b) RGB to HSV Conversion Fig(c) Object Detection Using Optical Flow Fig(d) histogram of hue Fig(e) histogram of saturation Fig(f) histogram of value Fig(g) object detection using improved optical flow Fig(h) BPR Graph Fig(i) VPR Graph

Retrieval Number: D7389118419/2019©BEIESP
DOI:10.35940/ijrte.D7389.118419
Journal Website: www.ijrte.org

Published By:
Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)
© Copyright: All rights reserved.

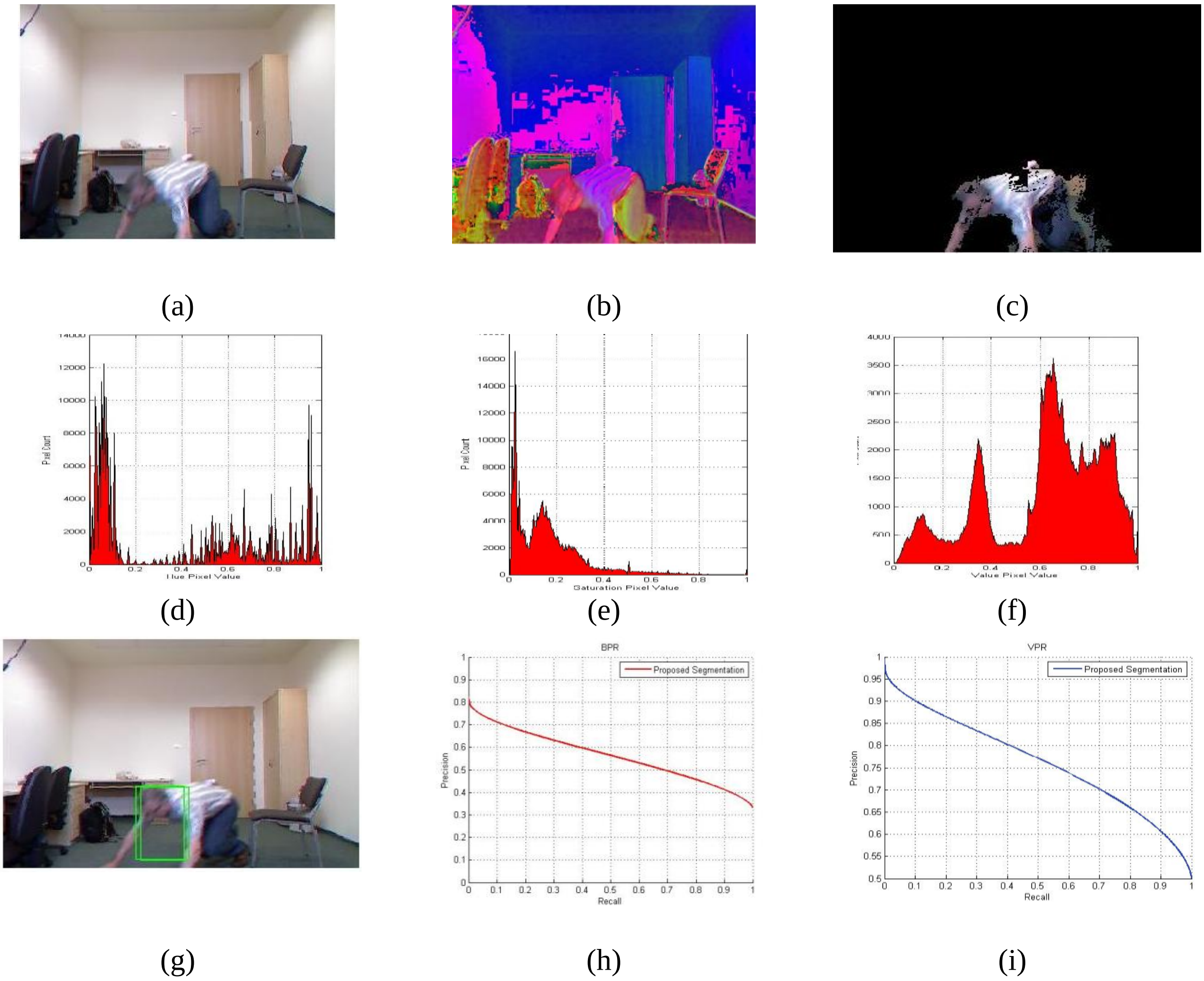
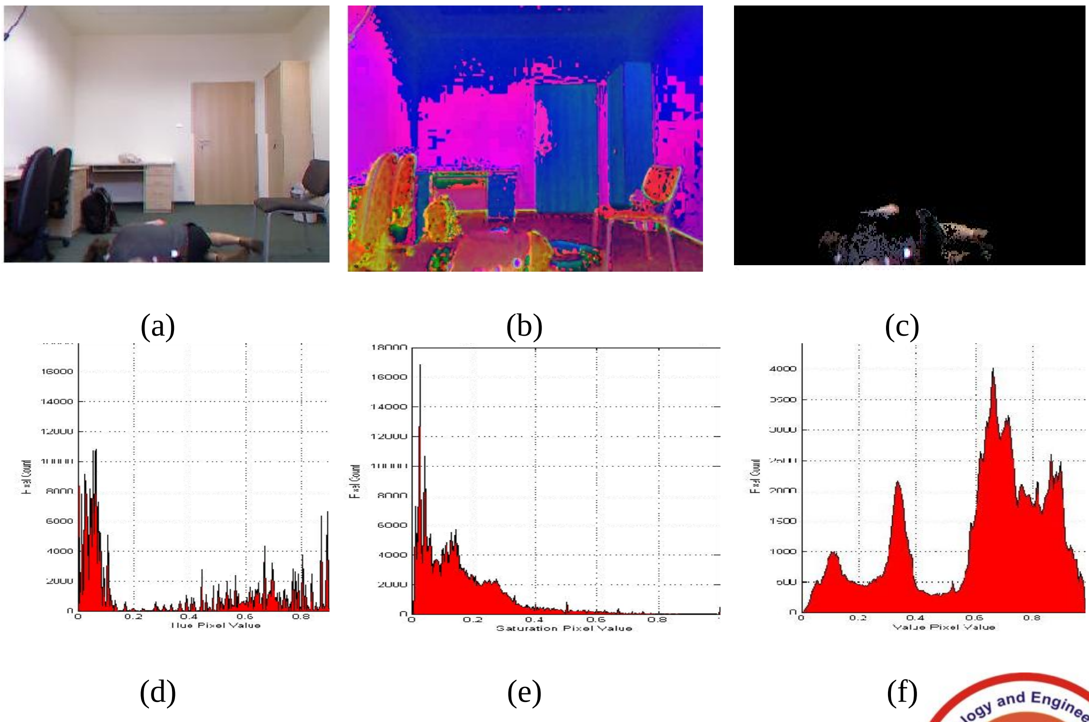
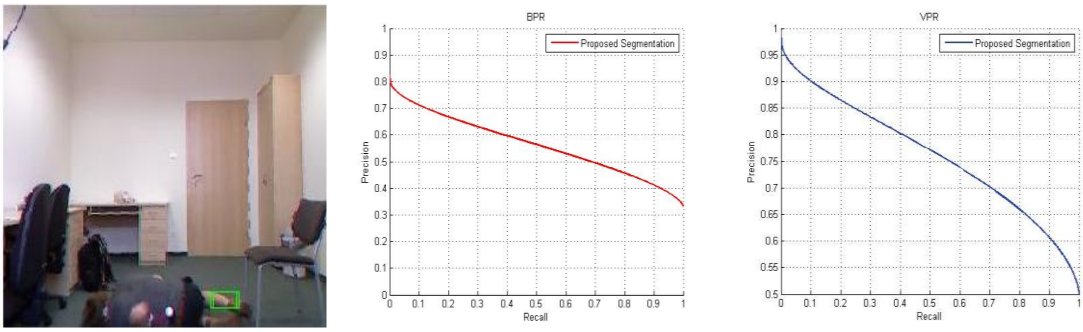


Fig.3 Simulated Results of Movement of a Man. (a) Frame Conversion (b) RGB to HSV Conversion (c) Object Detection Using Optical Flow (d) histogram of hue (e) Histogram of saturation (f) histogram of value (g) object detection using improved optical flow (h) BPR Graph (i) VPR Graph



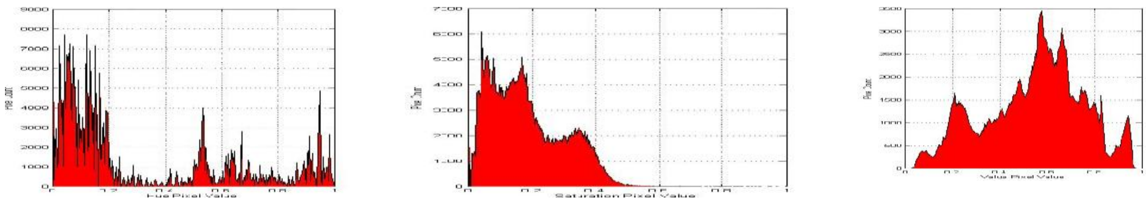
© Copyright: All rights reserved.



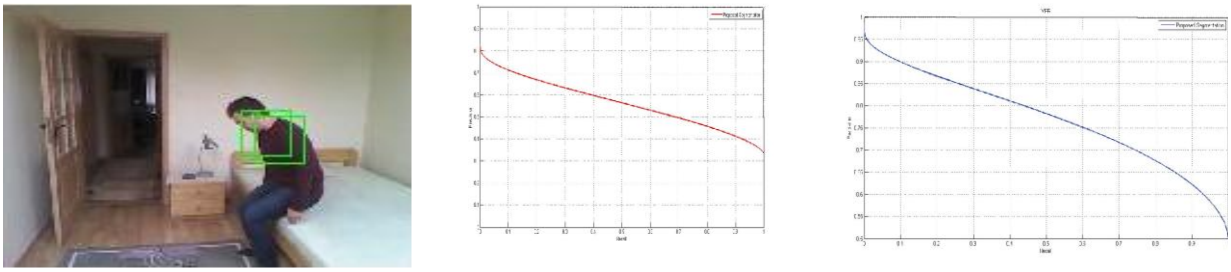
(g) (h) (i)

Fig.4 Simulated Results of Movement of a Man sitting in the bed.
(a) Frame Conversion (b) RGB to HSV Conversion(c) Object Detection Using Optical Flow (d) histogram of hue (e) histogram of saturation (f) histogram of value(g) object detection using improved optical flow (h) BPR Graph (i) VPR Graph

(a) (b) (c)



(d) (e) (f)



(g) (h) (i)

Fig.5. Simulated Results of Movement of a Man Falling a From the Chair
(a) Frame Conversion(b) RGB to HSV Conversion (c) Object Detection Using Optical Flow(d) histogram of hue (e) histogram of saturation (f) histogram of value (g) object detection using improved optical flow (h) BPR Graph (i) VPR Graph

Table.1.Histogram values and Precision Ratio for different Data sets

Sl.No.	Dataset	Hue	Saturation	Value	BPR	VPR
1.	Man walking	0	2000	15000	0.6	0.65
2.	Movement of a Man	1000	500	500	0.6	0.79
3.	Man sitting	4000	0	2000	0.58	0.8
4.	Man Falling	250	200	450	0.6	0.78

© Copyright: All rights reserved.

V. CONCLUSION

This paper centers on article discovery with improved optical stream. From the exploratory outcomes that the proposed calculation is predominant regarding exactness, unwavering quality and execution time, looked at the different techniques displayed in the writing. The significant disadvantage of the customary stream strategy is its computational trouble. The proposed improved optical stream conquers the above issues and it is demonstrated from the trial result. The calculation can be improved by including different items following computational cost. At the point when a specific item is recognized as a format, at that point begin to look through objects of that specific tone esteem and do shape by shape acknowledgment. In this way, the contributions of the calculation are shade esteems and state of the article. At the point when there are no items in the edge, at that point this algorithm start to look through the entire casing to distinguish the most comparative looking articles and track them. The object following calculation can be applied in an edge, that too now and again having the nearness of clamor, non-linearity and brightening changes to tracks object with proficiency.

REFERENCES

1. Xia Dong, Kedian Wang and GuohuaJia, "Moving Object and Shadow Detection Based on RGB Color Space and Edge Ratio", *IEEE 2nd International Conference, on Image and Signal Processing*, Oct. 2009, pp. 1-5.
2. JinMin Choi, Hyung Jin Chang, Yung Jun Yoo and Jin Young Choi, "Robust moving object Detection against fast illumination change,"*Computer Vision and Image Understanding*, 2012, pp. 179-193.
3. JiuYueHao, Chao Li, Zuwhan Kim, and Zhang Xiong, "Spatio-Temporal Traffic Scene Modeling for Object Motion Detection", *IEEE, Intelligent Transportation Systems*, 2012.
4. Liu Gangl, NingShangkun, You Yugan, Wen Guanglei and ZhengSiguo, "An Improved Moving Objects Detection Algorithm", in *Proceedings of the 2013 IEEE International Conference on Wavelet Analysis and Pattern Recognition*, 14-17 July, 2013, pp. 96-102.
5. Lucia Maddalena, Alfredo Petrosino,"The 3dSOBS+ algorithm for moving object detection",*computer vision and image understanding*, vol.122, 2014, pp. 65-73.
6. Prem Kumar Bhaskar, Suet-Peng Yong, "Image Processing Based Vehicle Detection and Tracking Method", *International conference on computer and information sciences (ICCOINS)* 2014.
7. Zhihu Wang, Kai Liao, JiulongXiong, Qi Zhang, "Moving Object Detection Based on Temporal Information", *IEEE Signal processing letters,* volume: 21, issue: 11, Nov. 2014.
8. Jinhai Xiang, Heng Fan, Hoghong Liao, Jun Xu, Weiping Sun, and Shengsheng Yu, "Moving Object Detection and Shadow Removing under Changing Illumination Condition", *Hindawi publishing corporation, mathematical problem in engineering* 2014, articles ID 827461, 10 pages.

AUTHORS PROFILE

C.Karthika Pragadeeswari received her under graduate in Electronics and Communicaton Engineering from Vinayaga Mission Kirubananda Variar Engineering College, Salem, Tamil Nadu in 2001 and obtained her Masters in Computer Science and Engineering from Annamalai University in 2008 and she is doing her research in Video Surveillance. Currently she is an Assistant professor of Dept. of Electronics and Communication Engineering at Alagappa Chettiar Government college of Engineering and Technology, Karaikudi. Her research interest are Video processing areas in the academic environments. she is a life time member of Indian society of Technical Education.

G. Yamuna, received her B.E. in Electronics and Communication Engineering from National Institute of Technology (NIT), Trichy, Tamil Nadu, India in 1987. She received her M.E. in Power Systems from Annamalai University in 1991. She received her Ph.D. in Electrical Engineering from Annamalai University in 2010. She has published many technical papers in national and international conferences and journals. Currently, she is Professor and Head of Department of Electronics and Communication Engineering, Faculty of Engineering and Technology, Annamalai University, Tamil Nadu, India. She is an associate editor and reviewer for several national and international journals. Her research interests include signal processing, image processing, wireless communication systems, antenna design and information security.

.

© Copyright: All rights reserved.