



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Special Issue 1, April 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



9940 572 462



6381 907 438



ijirset@gmail.com



www.ijirset.com

High-Quality Video Denoising Algorithms with Optical Flow Estimation

Mr.M.Venkatesan¹, R.Murali Krishnan², G.Manjunathan³, M.Jayanth⁴, S.Nirmalkumar⁵

Associate Professor, Department of Electronics and Communication Engineering, Adhiyamaan College of Engineering,
Krishnagiri, Tamil Nadu, India ¹

U.G Student, Department of Electronics and Communication Engineering, Adhiyamaan College of Engineering,
Krishnagiri, Tamil Nadu, India ^{2,3,4,5}

ABSTRACT: In digital video, noise is the processing-related dispersion of random color and lighting patterns. By filtering and improving each frame of the video with a motion estimation method utilizing MATLAB, the suggested system decreases both internal and interference noise. Our system's primary goal is to generate noise-free video using a simpler method. The system captures frames from digital video and uses optical flow estimation to de-noise each frame. In order to eliminate structured noise, spatial regularization assures temporal coherence. Gradient smoothing improves the details in frames. Sharpening the edges preserves the edges between items. Impulsive noise between each video frame is de-noised, and the optical flow defines the motion threshold. Motion estimation keeps the texture and pattern consistent between frames. Noiseless digital video will be created by combining denoised frames.

KEYWORDS: - Optical stream estimation, MATLAB

I. INTRODUCTION

From a few different sources, chaos starts. Reflected light enters the convergence point and falls onto the sensor, which is coated in a vast number of photo goals or pixels that transform the light waves' various intensities into contemporary indications. These small variances in current are what make photos right now. As a result of pixels having little light change to report inside the typical picture but being over-escalated by maintained ISO levels, picture noise increases mostly in underexposed film. Beyond introduction, sensors are similarly susceptible to a variety of different problems that cause turmoil in the previous image. The sensor's illumination or another external impedance can potentially create a ruckus. When impedance clamor gradually takes the form of a model overlay on your vision rather than the trembling characteristic of electrical noise, it is often very simple to identify. Electronic clamor can also be caused by commonplace elements like strong radio emissions in the area, which are just as difficult to control as radiation. A specific type of sensor turmoil is gaussian clamor. It essentially appears like sensor heat. The voltage and lighting levels of the sensor are often what cause the glow. Gaussian motion is frequently visible as a steady swaying over an overvolted, underexposed arrangement. This noise will typically be blue in underexposed images on many sensors. Fixed-plan clamor usually results from blemishes inside the amassing system of a specific sensor. It rises when different pixels have different degrees of photosensitivity.

Image gathering denoising is a crucial and unresolved problem that has received less attention than the basic picture case. Change thresholding, neighborhood averaging, fix-based algorithms, and variational procedures are systems for noise clearing in modern images. The most common thresholding techniques are DCT and wavelet thresholding. These approaches alter the primary facts for a predetermined reason and reduce coefficients at a specific farthest point connected to clamorous bits of information. Anisotropic filtering, two-sided filtering, or neighborhood filtering average nearby pixels that are located near a corresponding item, reducing the amount of agitation and guaranteeing the most

International Journal of Innovative Research in Science, Engineering and Technology*An ISO 3297: 2007 Certified Organization**Volume 12, Special Issue 1, April 2023***10th National Conference on Frontiers in Communication and Signal Processing Systems (NCFCSPPS '23)****5th -6th April 2023****Organized by****Department of ECE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India**

important limits. Variational approaches employ a variational framework while maintaining a relative objective.. Optical flow impediment based systems surmise that each pixel has a comparable concealing during the whole heading, or potentially at abutting diagrams.

The dispersion of objects in a scene away from the viewer is known as an optical stream. You can measure the velocities of objects inside the movie by analyzing the optical stream between video traces. When everything is said and done, moving objects that are closer to the camera will exhibit greater development than objects that are farther away and moving at a similar speed. Optical stream estimation is utilized in Computer vision to depict and estimate the development of items throughout a video stream, habitually for development based article revelation and following structures. The description of an optical stream takes into account how individual pixels evolve on the image plane. It is frequently an accurate prediction of real-world physical growth projected onto the picture plane. The majority of optical stream registration methods agree that a pixel's concealment or power remains constant despite moving from one video edge to the next. Optical stream provides a condensed representation of the image's developing regions and current rate of development. Eventually, optical stream computation becomes unreliable in the face of noise and light fluctuations. A key method for tracking the development of picture powers, which is attributable to the development of objects in the scene, is optical stream, or development estimation. Optical stream is a crucial concept that is used in some form in the majority of video planning.

II.RELATED WORK

In Recent Years, Image Processing Has Applied To Process Frames By Denoising It And Converting Into Video.

[1] A. Buades, J.L. Lisani, And M. Miladinovi´C, Patch Based Video Denoising With Optical Flow Estimation, Ieee Transactions On Image Processing. In This Paper The System User Principal Component Analysis (Pca) And Robustness Technique For Ensures The Correct Preservation Of Fine Texture And Patch Comparison.

[2] Video Denoising Via Empirical Bayesian Estimation Of Space-Time Patches, Journal Of Mathematical Imaging And Vision, (2017). In This Paper The System Used Estimators For The Eigenvalues Of Spatiotemporal Patches For High Dimensional Spaces To Avoid The Risk Of Inaccuracies Caused By Motion Estimated Error.

[3] M. K Ozkan, M.I. Sezan, And A.M. Tekalp, Adaptive Motion-Compensated filtering Of Noisy Image Sequences, Ieee Transactions On Circuits And Systems For Video Technology, They Used The Adaptive Weighted Averaging (Awa) Filtering, For Effective Noise Suppression In Image Sequences Without Introduce Visually Disturbed Blurring Artifacts And Also Mmse Filter For Low Signal To Noise Ratio And Abruptly Varying Scene Content...

[4] M. Protter And M. Elad, Image Sequence Denoising Via Sparse And Redundant Representations, Ieee Transactions On Image Processing, 18 (2009), This Paper Focuses On Utilizing Space And Redundant Representation For Image Sequence Denoising. This System K-Svd Algorithm Is Used To Train A Sparsifying Dictionary For Corrupted Image. It Performs Is Experimentally Compared To Several Start-Of-The-Art Algorithm.

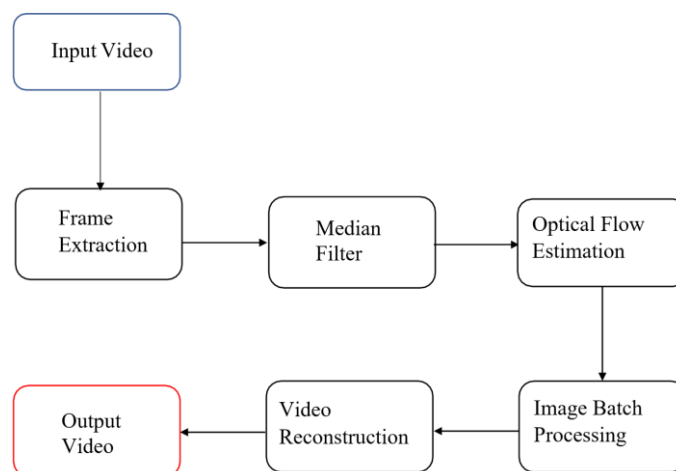
III.EXISTING METHOD

By offering the mix to the preliminary development marker, video clamor decline computation helped a blend of spatial Wiener and common channels produce more. The most prevalent channel in the area of spatial commotion isolation is the spatial Wiener channel. This channel can sufficiently reduce commotion. But interestingly, it can also lead to clouding, especially in areas with low noise levels. We suggest increasing filtering activity in areas with high noise levels and decreasing it in areas with low noise levels to prevent this darkening. Applying the spread in locations with high levels of noise and few visual elements completes the isolating movement rule. Of course, we use the cloak in areas with little noise and lots of visual characteristics. The spread will outmaneuver the cover as well as noise abatement in areas with high levels of agitation. Applying the spread intermittently causes darkening, especially in areas with lower levels of disturbance. The current approach uses the breaking point to determine which spread should be used based on

the amount of uproar in order to combine the benefits of the two cloaks. Even more firmly, use the shroud in areas with high clamor levels to reduce the majority of noise, and use the spread in areas with low clamor levels to expect a fundamental activity in the preservation of the image edges.

IV. PROPOSED METHOD

With The Use Of Optical Stream Estimation, The Structure Isolates Each Packaging Of The Edge And Then Channels The Internal And Block Disturbance Of The Video. This Makes The Suggested Video Denoising Technique Less Novel. An Important Method For Determining The Growth Of Picture Powers—Which Can Be Attributed To The Development Of Objects Inside The Scene—Is Optical Stream, Or Development Estimation. A Very Fundamental Concept That Appears In Some Form In The Majority Of Video-Interacting Figurines Is Optical Stream. Calculating Assessments Of The Evolution Of The Image Controls Over Time During A Video Is Supported For Optical-Stream Systems. Then, It Would Be Possible To Investigate The Stream Data To Create Divisions Into Locations That Might Be Related To Moving Objects. Even In Close Proximity To Camera Development, Optical-Stream Or Development Estimate Computations Are Typically Predisposed To Identify And Depict Clearly Moving Objects. Obviously, Computationally Astonishing Optical-Stream Based Approaches Need For Quick Hardware And Programming Solutions To Achieve. As The Optical Stream Is Just A Differential Sum, Estimating It Is Incredibly Prone To Interference; Increasing The Upheaval Affectability Can Suggest Increases In Complexity. Camera-Based Visual Perception Systems That Use Optical-Stream Tallies, Or Something Similar, Should Currently Be Equipped With Crucial Processing Resources, Like An Absurd Dsp Chip, An Fpga, Or Another Device That Can Revive A Specific Justification. In Truth, Video Perception Systems With Fundamental Astute Capabilities Are Being Imagined And Made Sense Of In View Of The Fact That Such Headways Are Being Familiar With Sharp Camera Development. In Contrast To Square Organizing, The Optical Stream May Be A Differential Technique That Operates By Approximating The Auxiliary. It Serves As The Spatiotemporal Confinement Condition's Least-Squares Gauge. To Regularize The Check, A Smoothing Term Must Be Added To This Bungle Term. Methods For A Lagrange Multiplier Show An Inclination Smoothness Term In The Horn And Schunck System. Due To Its Really Thorough Speed Test, This Measure Has Been Widely Employed In Computer Vision. It Is Occasionally Used In Video Pressure. Nevertheless, Optical Stream Checks Are Widely Used In Video Filtering, Where There Is No Requirement To Broadcast The Ensuing Development Vectors. There, It Is Capable Of Producing A Seamless And Reliable Show With Little Development Collectibles. The Eliminated Blueprints Are Denoised Using Channels, And The Denoised Edges Will Be Converted Into Video. At The Moment, Commotion In Video Is Prepared And Denoised. The Structure Frames The Video Using Optical Stream Estimation.



V. ANALYSIS OF METHODS

A. VIDEO PRE-PROCESSING

In Video pre-processing, the following steps must be handled in order to attain frames and audio of the video.

B. EXTRACTION OF AUDIO

The audio must be extracted from the video before processing. Since, the video will be processed as frames and the output of our project should have audio signals in the processed video. The system needs extracted audio from the video file such that, when the video is reconstructed. Audio could be attached to the processed video. For audio extraction, the system uses a Media converter and a muxer. An external application, can be used to extract and merge audio to video files. The Media converter and muxer application should be used to extract audio from video before pre-processing and the extracted audio will be attached to reconstructed video.

C. EXTRACTION OF FRAMES

The video processing method involves an image batch processor, an extension that can be used to process collection of images. Our system involves enhancing each frame of the video. Thus, the system needs frames for processing. For frame extraction, Video to JPG converter is being used. An external application is used to save each frame from a video and through this application, the system extracts individual frames from the processing video and will be saved within the folder.

D. MEDIAN FILTER

A non-linear digital filtering method called the Median Filter is frequently used to eliminate noise from an image or signal. A common pre-processing method to enhance the outcomes of subsequent processing is noise reduction (for example, edge detection on an image). Because it has uses in both signal processing and digital image processing, median filtering is frequently employed to maintain edges while reducing noise (though see discussion below). The median filter's primary principle is to iteratively replace each element in the signal with the median of its nearby entries. The "window" is the neighborhood pattern, which moves entry by entry over the entire signal. The simplest window for 1D signals is the first few preceding and following entries, however for 2D data the window must contain all entries inside of an elliptical or radius-based zone.

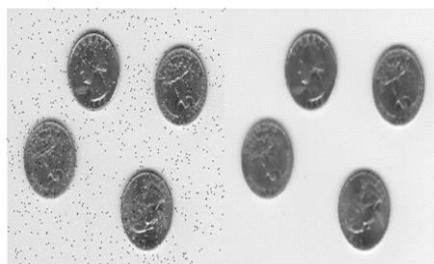


Fig 2. Median Filter

E. OPTICAL FLOW ESTIMATION

The distribution of the apparent velocities of objects in an image is known as optical flow. The velocities of the objects in the movie can be calculated by calculating optical flow between video frames. In general, moving objects will appear to move more visibly the closer they are to the camera and the faster they are traveling than farther away.

For motion-based object detection and tracking systems, optical flow estimation is frequently used in computer vision to define and quantify the motion of objects in a video stream. Several computer vision applications, like image segmentation, object classification, and driver assistance, have trouble estimating the motion of each pixel in a series of images. In general, optical flow describes a dense vector field, where a displacement vector is assigned to each pixel, which points to where that pixel can be found in another image.

A traditional optical flow estimation approach is the Horn-Schunck method. It presumes fluidity over the entirety of the image. As a result, it seeks to reduce flow distortions and favors solutions that exhibit greater smoothness. In this assignment, we will use the updated Horn-Schunck approach to attain improved performance, comparable to the Lucas-Kanade method, by employing a pyramid-based coarse-to-fine scheme. On its foundation, many of the modern optical flow algorithms are constructed.

F. IMAGE BATCH PROCESSOR

Image batch processor is an extension that can be added in MATLAB. IBP can be used to apply the code to selected images frequently at the same time. IBP will load images from a certain folder, the code written in script will process all the loaded images in IBP. The processed image can be exported to workspace or it can be saved in the system. The processed video will be extracted into frames using Video to JPG converter and the extracted frames will be saved within a folder. Once the frames are extracted, the system loads images in IBP using the load image option. In MATLAB, the code edited in the script will be processed using IBP. Using the process all images option, the system will process every loaded image and save in the system.

G. IMAGE ENHANCEMENT

The usage of IBP will open the script window. To enhance the image, the system needs to give input to the script in Image Batch Processor in order to refine the textures and enhance the given image. The given code will enhance the image, Process all image option will process every input image one by one. Thus, the loaded images will be enhanced using Image Batch Processor.

H. VIDEO RECONSTRUCTION

The Video Reconstruction is the process involving conversion of Frames into Video file and attaching the audio file into the video. The Conversion of frames into video involves a MATLAB code which involves features like selective resolution, Aspect ratio and desired file location. The input is given as a file location and the file location will include processed frames. The usage of code will convert the collection of frames into a video. The important note is the name of the files should be in series, then the system will process the video. The last part of video reconstruction is adding audio to the video file, since the frames are converted into video there will not be audio output. So, the extracted audio file should be added using Media converter and muxer. The resultant video will be the reconstructed video.

TECHNOLOGY USED

SOFTWARE REQUIREMENTS- MATLAB

DESCRIPTION

A high-level programming language and interactive environment for numerical computing, visualization, and programming, MATLAB is of the fourth generation. Math Works is the company behind MATLAB.

It enables matrix manipulations, function and data charting, algorithm implementation, user interface design, and interaction with programmes written in other languages, such as C, C++, Java, and FORTRAN, to analyze data, develop algorithms, and create models and applications. Many built-in commands and math functions enable you to perform numerical procedures, create charts, and perform mathematical calculations.

VI. EXPERIMENTAL RESULTS



Fig.1 Salt and pepper noise frame

Fig.2 the noise is filtered and smoothened

In Fig.1 Salt and pepper noise frame is shown, the noise is filtered and smoothened using the proposed algorithm. The resultant image is shown in Fig.2.

VII. FUTURE SCOPE

Hence, the system should be provided with less complexity in manual working. Video denoising using optical flow estimation has less complexity algorithm but for future, there must be certain constructed algorithms to maintain work within MATLAB. Our work involves many external applications for extracting and merging frames so, there are some work handled apart from MATLAB and as a future enhancement, all the system work should be maintained within MATLAB.

VIII. CONCLUSION

The channel minimizes commotion and also smoothes the packing while the spoke to denoising calculation, which combines growth estimate and clamor sifting approach, spares the nuances and surfaces. The impact of the various parameters on the denoising outcome has been severely reduced, and execution nuances have been provided. Eventually, the outcomes of the suggested procedure have been looked at and demonstrated. The next step is to expand the current computation to include various types of commotion models, including related noise as well as weight data from video standard weight estimates.

REFERENCES

- [1] A. Buades, J.L. Lisani, and M. Miladinovi´ c, Patch Based Video Denoising with Optical Flow Estimation, IEEE Transactions on Image Processing, 25 (2016), pp. 2573–2586. <https://doi.org/10.1109/TIP.2016.2551639>.
- [2] Video denoising via empirical Bayesian estimation of space-time patches, Journal of Mathematical Imaging and Vision, (2017).<https://doi.org/10.1007/s10851-017-0742-4>.
- [3] M. K Ozkan, M.I. Sezan, and A.M. Tekalp, Adaptive motion-compensated filtering of noisy image sequences, IEEE Transactions on Circuits and Systems for Video Technology, 3 (1993), pp. 277–290. <https://doi.org/10.1109/76.257217>.
- [4] M. Protter and M. Elad, Image sequence denoising via sparse and redundant representations, IEEE Transactions on Image Processing, 18 (2009), pp. 27–35. <https://doi.org/10.1109/TIP.2008.2008065>.
- [5] B. Wen, S. Ravishankar, and Y. Bresler, Video denoising by online 3D sparsifying transform learning, in 2015 IEEE International Conference on Image Processing (ICIP), IEEE, 2015, pp. 118–122. <https://doi.org/10.1109/ICIP.2015.7350771>.
- [6] Matias Tassano, Julie Delon, and Thomas Veit, “DVDnet: A fast network for deep video denoising,” in IEEE International Conference on Image Processing, Sep 2019.
- [7] U. Schmidt and S. Roth, “Shrinkage fields for effective image restoration,” in IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2014, number 8, pp. 2774–2781.
- [8] K Dabov, A Foi, and V Katkovnik, “Image denoising by sparse 3d Transformation-domain collaborative filtering,” IEEE Transactions on Image Processing (TIP), vol. 16, no. 8, pp. 1–16, 2007.
- [9] Kai Zhang, Wangmeng Zuo, and Lei Zhang, “Ffdnet: Toward a fast and flexible solution for cnn-based image denoising,” IEEE Transactions on Image Processing, vol. 27, no. 9, pp. 4608–4622, Sep 2018.
- [10] Eli Schwartz, Raja Giryes, and Alex M. Bronstein, “DeepISP: Toward Learning an end-to-end image processing pipeline,” IEEE Transactions on Image Processing, vol. 28, no. 2, pp. 912–923, Feb 2019.

BIOGRAPHY



Mr.M.Venkatesan
Associate professor
Electronics and communication engineering
Adhiyamaan college of engineering
Hosur



R.Murali Krishnan
Bachelor of engineering (student)
Adhiyamaan college of engineering
Hosur



G.Manjunathan
Bachelor of engineering (student)
Adhiyamaan college of engineering
Hosur

International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization

Volume 12, Special Issue 1, April 2023

10th National Conference on Frontiers in Communication and Signal Processing Systems (NCFCSPS '23)

5th -6th April 2023

Organized by

Department of ECE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India



M. Jayanth
Bachelor of engineering (student) Adhiyamaan college
of engineering
Hosur



S. Nirmalkumar
Bachelor of engineering (student) Adhiyamaan college
of engineering
Hosur



SJIF: 8.423



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INTERNATIONAL CENTRE



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details