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Video Quality Assessment by using Median Filter

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ABSTRACT: Internet is the most famous think in the world. Now a day's internet is the addiction of people. When they watch some video they expect that video should be clear, but many times the video is distorted that means not clear, so measuring the video quality is most important thing. Video quality is characteristics of a video, when video is passing through various processes it degrade the quality of video. Digital video typically pass through various processing stages until it reach to the end user so that the noise/distortion is added in the video. Distortion means changing the waveform of video signals. For finding the distortion of the video VIIDEO (Video Intrinsic Integrity and Distortion Evaluation Oracle) algorithm is used. In that the algorithm is find the score of distortion that how much distortion or noise is present in the video. VIIDEO algorithm is just used to find the score of distortion it was not reduce the distortion so for that purpose median filter is used. Median filter is used to reduce the distortion in the video.

KEYWORDS: Frame Extraction, Median Filter, Reduce Distortion, Video Quality Measurement, Video Intrinsic Integrity and Distortion Evaluation Oracle (VIIDEO) Algorithm.

I. INTRODUCTION

Today digital video transmission is increases it can be wireless or wired. Digital video typically pass through various processes until it reach to the end of the user but in that process video will be distorted. Now a days on the social media video transmission is increases. The physical transmission of the video and capture and display the video sometimes lost some data from the original image or video. So it will degrade the quality of video. The Video Intrinsic Integrity and Distortion Evaluation Oracle (VIIDEO) algorithm is used to overcome from this problem. VIIDEO algorithm is predicting the quality of the video without using external knowledge like original sources or human judgment. But here the problem is not solved because the distortion is still remained in the video, just score of distortion is finding out. So for reducing the distortion in the video median filter is used. Median filter is a non-linear technique for noise reducing. It is hardware implementation is easy it will not require more sources. Median filter is mainly used in digital image processing.

The use of the median filter with VIIDEO algorithm is very important because in manufacturing companies, Film Industry and TV has the work only on the video so they will face this problem many times since they have to provide the good quality of video to the user. There are many other algorithms also but the VIIDEO algorithm provides the better result as compare to other algorithms. Median filter improves the existing system by reducing the distortion in the video. VIIDEO algorithm is just used to find the score of distortion it was not reduce the distortion so for that purpose median filter is used. Median filter is used to reduce the distortion in the video and again the score of distortion is calculated after reducing the distortion.

II. REVIEW OF LITERATURE

Many algorithms are used to find the score of distortion in the video, but many times it will take more time to find the score, performance is not better or not give the approximate result and it have to take the external knowledge to find the score of distortion. VIIDEO overcome this problem it performs better and find the result without using external knowledge. Now a days there is increase the use of digital data, on the data traffic there is more than 50% of data is the video data that should be wired or wireless. For controlling this traffic and predict the quality of data there is the quality analyser.

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The new algorithm which are invent in this paper is based on Video Quality Analyser that is Video Intrinsic Integrity and Distortion evaluation Oracle (VIIDEO) algorithm, which is used to predict the quality of the video without any external knowledge [1].

Video BLIND algorithm are proposed in blind prediction of natural video quality paper. In which the spatio-temporal natural scene statistics (NSS) is proposed for the video. Again they proposed the motion model that quantifies the motion coherency in the video scenes. This algorithm is predict the quality of video by using external knowledge [2].

For controlling and monitoring the quality of video is most important think in today's word. In this paper the principle of predicting video quality and different algorithms are given. A visual communication analogy is also discuss in this paper [3].

The median filtering algorithm has good noise-reducing effects. The median filter is a nonlinear filter and it has widely used in digital image processing because of its good edge keeping characteristics and reducing impulse noise ability. The median filter is a rank-order filter [4].

Image distortion is also the important think, many times we can't see the image because of the distortion so for predict the image completely blind image quality assessment is introduced in this paper. In this paper the image distortion is calculated without using external knowledge that is pristine sources or human judgment because of that it is called as completely blind method [5].

A Gaussian scale mixture model for the frame and the frame differences is used in this paper for calculating the amount of spatial and temporal information of reference and targeted video. The combination of spatial and temporal differences is used for the spatio-temporal-reduced reference entropic differences [6].

In this paper video quality assessment on mobile devices is studied. They evaluate several objective image and video quality assessment (IQA/VQA) algorithms for predicting video quality [7].

In this paper no-reference algorithm is used for the predicting the video quality by using the natural scene statistics (NSS) and motion coherency. The framework for evaluation of video quality is tested on the LIVE VQA database [8].

In this paper the spatiotemporal MAD (ST-MAD) algorithm is used for the video quality assessment. ST-MAD estimates the motion-based distortion by applying the MADs appearance based model to compare the distorted videos STS images and original videos STS images [9]. In this paper they proposed a Distortion Identification based Image Verity and Integrity Evaluation (DIIVINE) for predict the quality of image without using the reference image. DIIVINE is based on the natural scene statistics [10].

The Motion-based Video Integrity Evaluation (MOVIE) index is proposed in this paper. The MOVIE index delivers the video quality assessment score. MOVIE index is tested on the Video Quality Expert Group (VQEG) FRTV phase 1 database [11].

In this paper there is given the study of subjective and objective quality assessment of video. In which LIVE VQA database are used in which 150 distorted video is given that created by using four different medias and also evaluate the performance of the state of the art methods [12].

In this paper there is introduce a visual area V2 for neural representation of natural images. There is used a novel non-linear system identification approach to obtained the spatial tuning of V2 neurons [13]. This paper describe a database which are used in full references, no references and reduced references video quality assessment. They take a 78 distorted video which are encoded with H.264/AVC [14].

This paper is deals with texture analysis based on multiscale stochastic modelling. For representing the detail subbands from multiscale decomposition generalized Gaussian density model is used [15].

III. SYSTEM ARCHITECTURE / SYSTEM OVERVIEW

1) System Overview: The system is for the Median Filter with the Video Intrinsic Integrity and Distortion Evaluation Oracle (VIIDEO) algorithm. The VIIDEO algorithm is used to predict the quality of the distorted video without using the external knowledge such as pristine sources or human judgment because of that this system is also known as the completely blind video integrity oracle. Median filter is a nonlinear digital filtering technique which is used to reduce the distortion in the video and VIIDEO algorithm is find the score of distortion. In this system video is taken as an input to the system. The video is nothing but the collection of images or frames. So after video is given as an input the frames

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are extracted from that video. After the frame extraction the VIIDEO algorithm is applied on the system. VIIDEO algorithm has a multiple steps in which first step is calculating the frame differences.

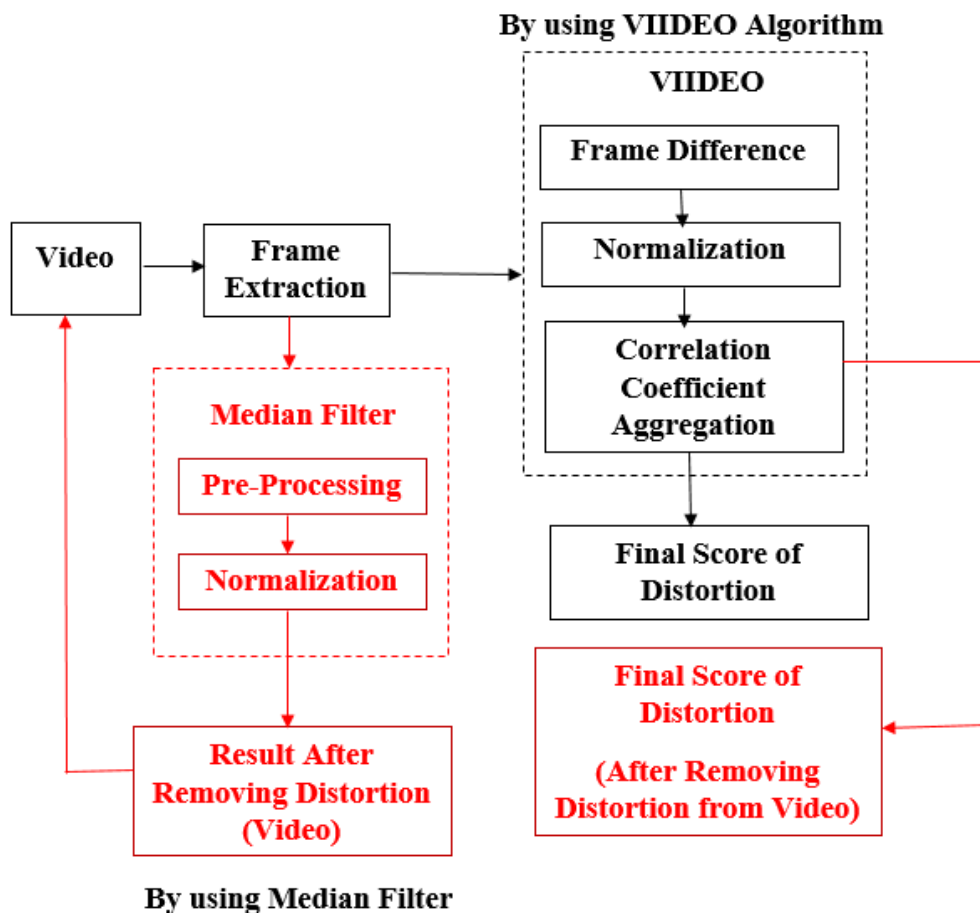


Fig. 1. Block Diagram of VIIDEO Algorithm

Then normalization is calculated after normalization the correlation coefficient aggregation is calculated by using the Pearson Correlation Coefficient (PCC) for finding the mean value. PCC is nothing but the linear coefficient. Then finally we get the score of distortion of the video. In this system video is taken as an input to the system. The video is nothing but the collection of images or frames. So after video is given as an input the frames are extracted from that video. After the frame extraction the VIIDEO algorithm is applied on the system. VIIDEO algorithm has a multiple steps in which first step is calculating the frame differences. Then normalization is calculated after normalization the correlation coefficient aggregation is calculated by using the Pearson Correlation Coefficient (PCC). PCC is use for finding the mean value. PCC is nothing but the linear coefficient. Then finally we get the score of distortion of the video. After finding the score of distortion median filter is applied on the system and remove that distortion of the video. The extracted frame is given as an input to the median filter. In median filter pre-processing is performed in that the distortion is removed of that frames then again the video is created of that frames. After removing the distortion resulting video is again given as an input to the system and again the score of distortion is calculated after removing the distortion.

There are one major entities involved in the process of finding Distortion in video file. They are as follows:
User: User module browse the video from folder and upload video le in system.

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2) Mathematical Model:

Let S be the System as,

$$S = \{I, F, O\}$$

where,

I= Video

O=Score of Distortion, Remove Distortion

F= {F1,F2}

where,

F1=VIIDEO Algorithm,

F2=Median Filter,

F1 is VIIDEO Algorithm.

- Frame Difference:
 - Input=Video
 - Output=Frame Difference

$$\cdot \Delta F^t = F^{2t+1} - F^{2t} \forall t \in \left\{0, 1, 2, \dots, \frac{T-1}{2}\right\} \quad (1)$$

where,

ΔF^t is the frame differences.

F^{2t+1} and F^{2t} is the consecutive frames of spatial dimensions $M \times N$.

T is the total number of frames.

t is the consecutive frame time sample.

- Normalization:
 - Input=Frame Difference
 - Output=Normalization

$$\cdot \hat{\Delta F}^t(i, j) = \frac{\Delta F^t(i, j) - \mu^t(i, j)}{\sigma^t(i, j) + C} \quad (2)$$

$$\cdot \mu^t(i, j) = \sum_{k=-K}^K \sum_{l=-L}^L w_{k,l} \Delta F^t(i+k, j+l) \quad (3)$$

$$\cdot \sigma^t(i, j) = \sqrt{\sum_{k=-K}^K \sum_{l=-L}^L w_{k,l} [\Delta F^t(i+k, j+l) - \mu(i, j)]^2} \quad (4)$$

where,

i is the $i \in \{1, 2, \dots, M\}$.

j is the $j \in \{1, 2, \dots, N\}$.

M and N is the image dimensions.

$w_{k,l}$ and l is the Gaussian weighting function, $w_{k,l} |k| = -K, \dots, K$ and $l = -L, \dots, L$.

- Correlation Coefficient Aggregation and Total Score:
 - Input=Normalization
 - Output=Correlation Coefficient Aggregation and Total Score

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$$\cdot \Omega^{t+\eta k} = \sum_f \theta_f^{t+\eta k} \forall f \in \{1, 2, 3 \dots 12\} \quad (5)$$

$$\cdot \psi = \sum_{t+\eta k} \Omega^{t+\eta k} \quad (6)$$

where,

$\Omega^{t+\eta k}$ is the empirical correlation coefficient.

$\theta_f^{t+\eta k}$ is the empirical correlation coefficient feature vector such that $f \in \{1, 2 \dots 12\}$.

Ψ is the total score.

$t + \eta k$ is the index.

η is the stride.

$k = 0, 1, 2 \dots$

F2 is Median Filter

- Input=Video Frames
- Output=Remove Distortion

$$y[m, n] = \text{median} \{x[i, j], (i, j) \in w\} \quad (7)$$

where,

w is the neighbor defined by the user.

$[m, n]$ is the center parameter of image.

x, y is the axis.

i, j is the parameter.

IV. SYSTEM ANALYSIS

1) Dataset Information: Here, all formats of video can be uploaded on the system. It consist of videos like AVI, MP3, 3GP, MOV, MPG etc. For taking the input offline database is used in the system. That means any video which are stored in the memory are taken as an input. In this system the video which are stored in the drive are taken as an input.

2) Software Requirements: The above system is implemented using 256 (min) MB RAM and above with Speed of 1.1 GHz. The processor used is Intel core i3 and above. 20 GB Hard disk is used for this purpose.

3) Hardware Requirements: Operating System Windows 10 Pro with Java 1.7 is used. Eclipse consider as the development environment. MySQL is used as database for implementation.

4) Performance Parameter: Pearson Correlation Coefficient:

$$r = \frac{N \sum_{xy} - (\sum_x) * (\sum_y)}{\sqrt{[N \sum_{x^2} - (\sum_x)^2][N \sum_{y^2} - (\sum_y)^2]}} \quad (8)$$

where,

N is the number of pairs of scores.

\sum_{xy} is the sum of the products of paired scores.

\sum_x is the sum of x scores.-

\sum_y is the sum of y scores.

\sum_{x^2} is the sum of squared x scores.

\sum_{y^2} is the sum of squared y scores.

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A. Implemented Results:

It is observed that median filter using VIIDEO algorithm gives improved result as compare to the VIIDEO algorithm. Table I gives the score of distortion of VIIDEO algorithm and the median filter with VIIDEO algorithm.

TABLE I: VIIDEO ALGORITHM AND MEDIAN FILTER+VIIDEO ALGORITHM

Sr. No.	Size of Video	VIIDEO Algorithm		Median Filter + VIIDEO Algorithm	
		Frames	Score of Distortion	Frames	Score of Distortion
1	2 MB	38	0.58	25	0.21
2	5 MB	74	0.56	52	0.23
3	33.4 MB	53	0.28	36	0.22
4	34.9 MB	38	0.58	25	0.21

TABLE II: EVALUATION RESULT OF THE SYSTEM

Sr. No.	Time Effect	Time of Video	Size of Video	VIIDEO Algorithm		VIIDEO+Median Filter	
				Frames	Score of Distortion	Frames	Score of Distortion
1	Sunrise	6:00 AM	35 MB	80	0.27	56	0.23
2	Morning	8:00 AM	46.3 MB	106	0.19	76	0.15
3	Afternoon	2:00 PM	40.9 MB	94	0.30	67	0.18
4	Evening	6:00 PM	34.5 MB	79	0.17	55	0.15
5	Night	9:00 PM	1.2 MB	19	0.31	10	0.24

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It is observed that by using time effect median filter with VIIDEO algorithm gives improved result as compare to the VIIDEO algorithm. Table II gives the score of distortion of VIIDEO algorithm and the median filter with VIIDEO algorithm by using the time effect.

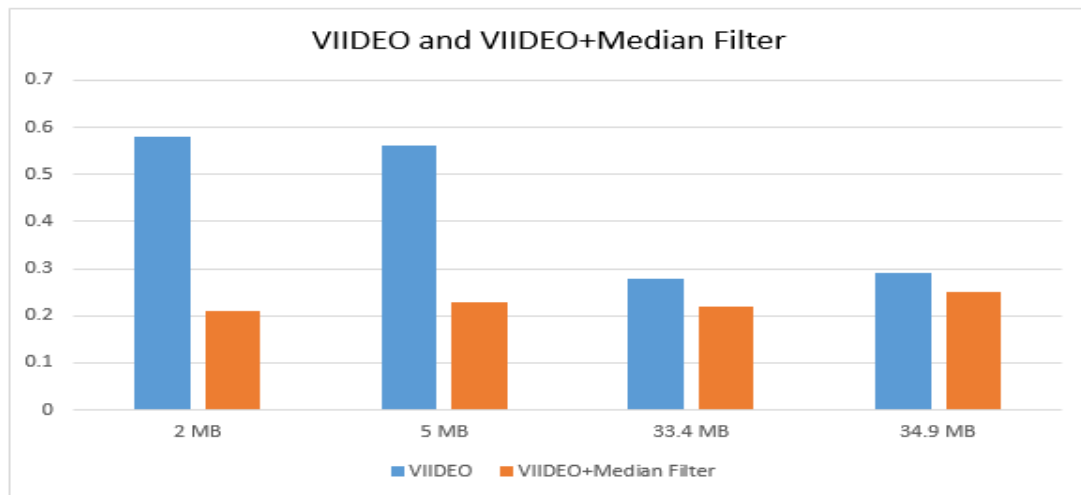


Fig. 2. Result Graph for VIIDEO Algorithm and Median Filter+VIIDEO Algorithm

It is observed that median filter using VIIDEO algorithm gives improved result as compare to the VIIDEO algorithm. Figure 2 gives the score of distortion of VIIDEO algorithm and the median filter with VIIDEO algorithm. The Blue bar shows the VIIDEO algorithm and Orange bar shows the Median Filter with VIIDEO algorithm.

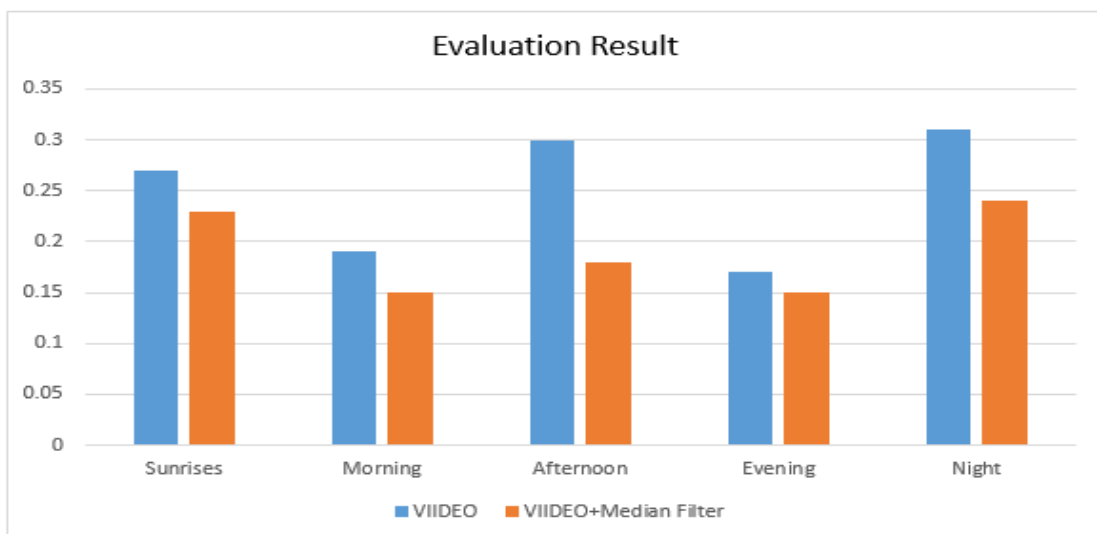


Fig. 3. Result Graph for Evaluation of the System

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It is observed that median filter using VIIDEO algorithm gives improved result as compare to the VIIDEO algorithm. Figure 3 gives the score of distortion of VIIDEO algorithm and the median filter with VIIDEO algorithm by using time effect. The Blue bar shows the VIIDEO algorithm and Orange bar shows the Median Filter with VIIDEO algorithm.

1) Results: We give the video as an input to the system then by using VIIDEO algorithm, the score of distortion is calculated and by using median filter distortion is reduced. As the graph we take four video as an input one by one of different sizes such as 2 MB which has MP4 le format, 5 MB which MP4 file format, 33.4 MB which MP4 file format and 34.9 MB is also of MP4 le format. System is evaluated by using the time effect as shown in table II. For that result different videos are taken of the same place with different time effect that is sunrises, morning, afternoon, evening and night. From that result we can analyse that in night more distortion is find out. From the above graphical and tabular results, we get the score of distortion of the input video. In the result table we take four attributes as size of video, frame extraction, VIIDEO Algorithm and Median Filter with VIIDEO algorithm. From the above graphical and tabular results, we get the score of distortion of the input video

V. CONCLUSION

VIIDEO predict the quality of video. By using the VIIDEO algorithm approximate distortion is find as the base paper, but the median filter is used to remove that distortion. After applying the VIIDEO algorithm it will find approximate distortion score, but it can't remove the distortion so for that purpose median filter is used. For the video of size 2MB, 5MB, 33.4MB and 34.9MB, before applying the median filter the score of distortion is 0.58, 0.56, 0.28, 0.28 respectively and after applying median filter the score of distortion is 0.21, 0.23, 0.22 and 0.25 respectively. Median filter reduce the distortion by 37%, 33%, 6% and 4% respectively. VIIDEO is calculate the exact score of distortion of the particular frame and it also find more distortion of the video. But VIIDEO algorithm is just find the score of distortion it can't remove that distortion so that median filter is used to remove the distortion from the video. Overall 28.25% distortion is reduced by using median filter. From the result it is observed that median filter with VIIDEO algorithm gives improved result as compare to the VIIDEO result. By using time effect it is observed that in night more distortion is find out in the video. Median filter improves the performance of the existing system.

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