An Overview on Video Processing

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Abstract: Video Processing is an area of concern in research related to Computer Science. A Video which is dynamic in nature can be defined as a series of images. Video processing involves many operations such as improving the quality of Video Signals with the help of Video Processors, usage of tools to manipulate a Video Clip, Analyzing a given Input Video Signal and so on, which will be discussed in this paper. The assurance of Video quality for the stake holders of Internet is of great concern. Hence, Video Processing plays a vital role in the Internet of Things. Videos are of diverse nature and this paper is focusing on various Video storage formats and its use in various fields. The Paper also emphasizes on Video Scalers, Video Codecs and other terminologies related to Video Processing. The Paper also discusses about the various steps involved in Video Processing and the literature reviews where Video Processing is considered.

Keywords: Video Scalers, Video Codecs, Video Clip

I Introduction

Video processing terminology is a branch of computer graphics where pixel (picture element) is the basic element. The combination of these pixels will form an image and images sewed together forms a video. Processing of a video is nothing but accessing the information of a given video in depth by considering its pixel qualities such as pixel intensity, saturation ,hue and several other attributes of the pixel.

A digital video can be defined in terms of a series of array of real or complex numbers represented by a finite number of bits. These group of bits are stored in frames or buffers with the help of look up table(LUT).

In the present era of Technology and with the rise of Researchers and Research areas, Video Processing is a challenging area to deal with. Video processing in the previous years was a particular case of signal processing which employed video filters upon the input video files to improve video quality using electronic circuits. Video processing techniques were used in almost all types of Random scan devices to enhance the video quality. Now, it's the trend not only to restrict the processing of video in standalone systems but to advance the video processing technology over the intranet and internet. Systems which adopts scalers are used for converting video signals from low resolution to high resolution, known as upconversion or upscaling. The process of converting a high resolution video signal to a lower resolution will be down conversion or downscaling. A video codec is an encoder or decoder which is used for compression/decompression of video files for the purpose of security while transferring the video files from source end to destination end. The Video quality is of great importance for the stakeholders of webinars such a content providers and service providers. Video processing can also be termed as video image processing as the image information

(static) in the video is made use for the manipulation, analysis, transformation, removal of noise etc. The operations on Video files includes Compression, smoothing, sharpening, applying filters, enhancement of edges etc .With the development of technology, researchers are trying to improve their intelligence and wisdom levels. Video processing can be done on a binary, gray scaled or colored videos. The terms full color video processing is used for colored videos and pseudo color video processing for binary and gray scaled videos.

The rest of this paper is organized as follows. Section II will be the literature reviews. Section III gives the methodology of video processing by discussing its architecture. Section IV gives the information about various video file formats and its uses Section V gives the conclusion.

II Literature Review

This section reveals a brief knowledge about the research papers on Video Image Processing. [1] Video processing in some applications relies upon searching algorithms to search for a given Video in the video cloud by using Greedy algorithm which results in minimum query response time. The query is given by the end user who are in need of the video. The query by the client end will be accepted by the Network which may be wireline or wireless and the search will be based upon the video metadata.. The processing time taken by a mobile unit is more as these devices will have limited computational capabilities. The paper also emphasizes on using the processing scheduling algorithm. [2] In traffic monitoring systems, which rely upon video processing, the researchers have adopted still more advanced methodologies which avoids manpower completely in the monitoring process by building an intelligent traffic monitoring system without intervention of manual monitoring in real time systems where Optical Character Recognition(OCR) technique is used to recognize the license plates of the vehicles. Vehicle detection is done by considering the attributes such as vehicle symmetry, shadow and edge features . The detection system makes use of classifiers by classifying the captured images of the vehicle as positive and negative samples. Positive samples are those in which images can be clearly seen and the rest of the samples are named as negative samples. The system which is designed is capable of capturing and recognizing vehicles with the help of high definition cameras. License plate, color of the vehicle, driving speed detection etc can be determined . Intact details about the vehicle is obtained by accessing the data base . [3] Digital Video is a combination of images called frames. The minimum frame rate of a digital video can be defined as processing of frames and updating the video with minimum frame rate of 16 per second. The processing of an image or video can be done by considering its spatial or frequency domain. During the processing, several transforms can be made use such as the Fourier Transform (FT), Discrete Fourier Transform (DFT) and the Fast Fourier Transform (FFT) and many other forms. The filters play an important role in processing of video images. Several filters are available such as the high pass, low pass and band pass filters. The filters such as Finite impulse response filter(FIR) and infinite response filter(IIR) can be used . In the paper the conclusion is that usage of FIR digital filters has more advantages than IIR filters. [4] The Video Processing involves the processing of individual images. The image has to

be analyzed based on certain criteria. The paper presents the remote visual inspection of Advance Gas Cooled Reactor(AGR) cores in nuclear plants. The designed system checks for the cracks or defects for the safety purposes. The method adopted also analyses the nuclear plant life time extension. 3D geometry principle is used for extracting 3D structural information in the fuel channel . The video was converted to frames using the Scale Invariant Feature Transorm(SIFT) for the purpose of feature detection.[5] There are some disadvantages to detect fire in a sensor based electronic related system. To overcome that, an approach is made to detect flame using the video processing methodology. Here the flame is captured by a camera and the fire pixel and gray pixel are detected. The gray pixel indicates smoke in the image. The fire pixels are recognized using the primary and secondary colors. The primary colors in computer graphics are RGB. The RGB color model has red , blue, green colors and the secondary colors which is known be to the CMYK model (cyan,magenta,yellow,black). The system which is adopted works well for both larger and smaller areas such as schools , colleges farms, forests where fire gets affected. [6] The quality of a video clip diminishes when it compressed for the purpose of security and during transfers. Hence, Multiscaling approach is used in the processing of videos which makes use of Ripplet transform for video compression. After the compression, ,the signal to noise ratio and compression ratio is analysed in the video which was found considerable. [7] In the high frame-rate tracking of multiple color patterned objects , the paper presents the capability of handling 2,000 fps by using cell based labeling algorithm. The paper considers color histograms of 1,024 color patterned objects. Histogram is a graph definined as p(rk) versus rk, where p(rk) is the probability of occurance of the total number of pixels with intensity rk.[8] In the paper fast mode decision for H.264/SVC enhancement layer, the SVC(Scalable Video Coding) is used which is an extended version of H.264 AVC(Advance Video Coding) compression technique.H.264/AVC/MPEG-4 Part 10 allows video compression and provides flexibility for a wide range of network . it has significantly lower bit rate and gives out better clarity videos. The proposed SVC is constituted with still more better features than AVC.

III Methodology

Video processing systems require a stream of processing architecture. This includes video acquisition, video analysis, video manipulation, video compression, video transmission, storage of video and so on. These are the stages in video processing which in turn will have several sub stages for processing the video. The processing can be of any kind. It can be changing the color pixels of a given input video ,combining two or more videos , enhancing the video quality, identifying an object in the video.. The processing can be based on spatial domain or frequency domain. In spatial domain the image pixels are taken into consideration whereas in the frequency domain frequency spectrum of the image is considered. The architecture of the video processing is shown in Figure 1. The first stage in video processing is to acquire the input video which is the video acquisition. Once the video is acquired , the video is sampled and quantized. The analysis of video involves video segmentation. Video segmentation is performed for easier analysis of videos . This involves partitioning of digital video into multiple video segments.

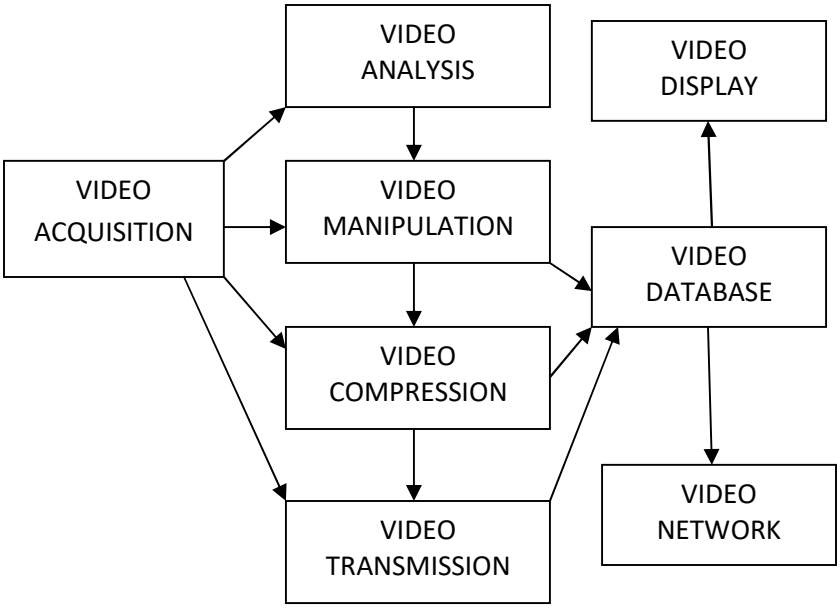

FIGURE 1 : STAGES OF VIDEO PROCESSING

In a hand gesture recognition video , the movement of hand is to be considered, but in the video a lot of false objects are seen. False objects are those part of videos which are not to be considered. The segmentation of video can be applied here for the retrieval of true objects.

Video manipulation is the stage where many operations are involved . The video undergoes with several changes depending on the application. During the manipulation basic features of the video or the image frames will be taken into consideration. Those features are the length, orientation of the image, number of concavities, the color , texture, pattern of the image , shape , border , area , volume , surface etc. Extracting the basic features from image is the process of image analysis wherein the basic knowledge about the images in the video is obtained.

Video compression is done for transferring videos at a faster rate. Video content over the internet is about 64%. To handle such huge volumes and for faster access, research in video processing area is increasing day by day. The video content over the internet may reach up to 80% by 2019. As a reason of improvement in technology, modern devices are enabling more detailed video content. Modern compression methods are smart enough . The modern methods of compression tries not to store the static parts of the frames which are similar . It ignores repetitive images. By this approach video file size is compressed. This is lossy compression.

Video transmission is a stage where the video can be transferred from server end to client end or vice versa(video network). The transfer of video after the processing can also be sent to a display unit. Video databases can be stored in several video cloud platforms or in computers memory.

IV Video File Formats

Various types of file formats are available. Any kind of file can be used depending on the requirement. Some of them are CCIR 601(international telecommunication union – radio communication sector) for encoding interlaced analog video signals into digital video form used by broadcast stations. AVCHD (.mts)-Advanced Video Codec High Definition developed by Sony and Panasonic for HD home theatre systems. It is not a sharing video format. Audio Video Interlaced(.AVI) developed by Microsoft not a sharing format. Flash video format(.flv) sharing format on web. Motion picture experts group(.mpeg) developed by motion picture experts group in 1988. Mpeg-4 part 14(.mp4) is a sharing video format . You tube accepts all types of files and converts all files to .flv or .mp4 formats. Windows media video (.wmv) is used for both streaming and downloading content from internet.

.mov is an extremely common sharing format used to identify an apple quick time movie.

V Conclusion

With an overview of the video processing, the paper covered some of the techniques and areas where video processing is evolving. In brief the search algorithm for video clouds, traffic monitoring systems, usage of FIR and IIR filters , detection of cracks and holes in nuclear plants , flame detection using video processing methodology , Multi scaling approach and usage of ripplet transform for compression, accessing high number of frames per second in a video and SVC approach for video compression methodology were discussed. Other areas of research in this field are surveillance and security, duplicate detection in video clouds, event detection, growth and interaction in bio organisms, protecting copyright etc

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