

# Video Processing and its Applications: A survey

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## Abstract

*A video is considered as 3D/4D spatiotemporal intensity pattern, i.e. a spatial intensity pattern that changes with time. In other word, video is termed as image sequence, represented by a time sequence of still images. Digital video is an illustration of moving visual images in the form of encoded digital data. Digital video standards are required for exchanging of digital video among different products, devices and applications. Fundamental consumer applications for digital video comprise digital TV broadcasts, video playback from DVD, digital cinema, as well as videoconferencing and video streaming over the Internet. In this paper, various literatures related to the video processing are exploited and analysis of the various aspects like compression, enhancement of video are performed. There are many issues and challenges still exist related to the video processing inclusive of security issues, and those are briefly discussed in this paper.*

**Keywords:** Video processing, compression, recognition, security

## 1. INTRODUCTION

The first development of video technology is for mechanical television systems that were soon replaced by cathode ray television systems (CRT). After the advancement of new display devices, the technological aspect of video processing gets broader. With the emergence of new media, mobile media and social media, micro video as a new form of network video, the transmission case came into being. Transmission of videos in different network mode became very popular nowadays. For transmission purpose, it is desirable to occupy less bandwidth of the medium and less time for transmission. Video communication using video phone, video streaming, and video broadcasting has become more and more attractive with the fast pace of development in the wireless industry in present era. In order to transmit such rich multimedia content, it is desirable to occupy less bandwidth, the size of the original video signal must be reduced by some compression technique, without degrading video quality or data loss. To get rid of such hurdles, video compression techniques provide efficient solutions to represent video data in a more compact and robust manner so that the storage and transmission issues of video can be realized in cost effective way. Digital video has become a necessary part of everyday life. A part from compression it is well known that video enhancement as an alive topic in video processing has received much concentration in recent time. The aim behind it, is to improve the visual appearance of the video, or to provide a better transform representation. Accomplishing video enhancement understands the cause

of low quality video. The common cause of the degradation is a challenging problem because of the various reasons like low contrast, signal to noise ratio is usually very low etc. The application of image processing and video processing techniques is to the analyze the video sequences in traffic flow, traffic data collection and road traffic monitoring. Various methods are present including the inductive loop, the sonar and microwave detectors has their own Pros and Cons. Video sensors are relatively cost effective installation with little traffic interruption during maintenance. Furthermore, they administer wide area monitoring granting analysis of traffic flows and turning movements, speed measurement, multiple point vehicle counts, vehicle classification and highway state assessment [5].

A video signal is a sequence of 2D images, captured onto the image plane of a video camera from a dynamic 3D scene. Basically in color scene, the color value obtained at any point in a video frame records is the reflected light at a particular 3D point in the observed scene. It is well known that light abide of an electromagnetic having the wavelength range between 380nm to 780nm in which the human eye is sensitive. The grasped color of light lean on its spectral content (i.e. its wavelength composition) e.g. "Red" light has its energy concentrated near 700nm while "White" appears if the light has equal energy across the entire visible band. In general, "Spectral color" is nothing but light having very narrow bandwidth. On the other hand, "Achromatic" light is synonymous to the white light [12]. Illuminating sources radiate an electromagnetic wave including the sunlight, TV monitors, bulb & so on [2]. The sensed color of an illuminating light source lean on the wavelength range in which the energy is emitted. Additive rule is followed by the Illuminating: i.e., the sensed color of several mixed illuminating light sources depends on the sum of the spectra of all the light sources.

## 2. LITERATURE SURVEY

V. Kastrinaki et al. suggested the applications of video sensors in traffic management and monitoring with the help of video processing and analysis methods. They recommended an overview of image processing and analysis tools used in these applications and relate these tools with complete systems for specific traffic applications. It is based on the automatic lane finding methodology. There are basically three solutions for their three purposes, first, to classify image-processing methods used in traffic applications. Second, to provide the pros and cons of these algorithms. Third, from this unified consideration, struggling towards evaluation of

shortcomings and general needs in this field of active research [5]. Alain Traïmu et al. worked on color image and video processing. Multiple area of present scopes like color vision, perception, and interpretation, acquisition systems, consumer imaging applications, and medical imaging applications, issues, controversies, and problems of color image science have analyzed by them. The science of color imaging may be defined as the study of color images and the application of scientific methods to their measurement, generation, analysis, and representation. It includes all types of image processing, including optical image production, sensing, digitalization, electronic protection, encoding, processing, and transmission over communications channels. They presented an extensive overview of the up-to-date techniques for color image analysis and processing [6].

Yunbo Rao and Leiting Chen [1] described about the Video enhancement. According to them video enhancement is the most important and difficult components in video research. The motive behind the video enhancement is to improve the visual appearance of the video, or to provide a better transform representation compared to earlier for future automated video processing, such as analysis, recognition, detection, segmentation, surveillance, automatic traffic control systems, criminal justice systems. Brief survey of the existing techniques of video enhancement, which can be classified into two broad categories: (i) Self-enhancement and (ii) Frame-based fusion enhancement have performed by them. Finally they are able to describe the advantages and disadvantages of algorithms of image/video enhancement. They have described recent developments, methods of video enhancement and point out promising directions on research for video enhancement for future research. S. Ponlatha and R. S. Sabeenian compared the different video standard and concluded that there is a constant improvement in video compression factors, new techniques and technology, and some new formats in the horizon of H.265 and VP8: H.265 compression is still in the process of being formulation, and motive to gain a 25% improvement in the compression factor while lowering computational overhead by 50%: for the same perceived video quality. VP8 is a codec from On2 Technologies, which claims that the codec brings bandwidth savings and uses less data than H.264: to the extent of 40%. There is currently a fight over the standard to be chosen for Web video, and VP8 is bashing it out with H.264 [4]. W. Puech et al. briefly described about the secure signal processing and the recent cryptographic challenges in video processing. they has given an overview of approaches and challenges that exist in applying cryptographic primitives to important image and video processing problems, including content encryption, secure face recognition, and secure biometrics. basically their work aims to help the community in appreciating the utility and challenges of cryptographic techniques in image and video processing [15-16].

### **3. VIDEO COMPRESSION STRATEGIES**

The straightforward form of video compression is to perform two dimensional images coding separately on each frame of a video temporal sequences. The JPEG baseline standard has widely adopted as a means of video compression. In this application, the video compression technique has become to be known as motion JPEG [3-5].

#### **3.1 MPEG-1 video coding standard**

The MPEG-1 video coding standard is universal in terms of functionality. The MPEG-1 video algorithm has been refined with respect to the JPEG and H.261 activities. Crucial features equipped by MPEG-1 constitute frame based random access of video, fast forward/fast reverse (FF/FR) searches through compressed bit streams, reverse playback of video and edit ability of the compressed bit stream. The basic MPEG-1 video compression technique is based on a Macroblock structure, motion compensation and the conditional replenishment of Macroblocks. The MPEG-1 algorithm processes the frames of a video sequence by block based methodology [7-8].

#### **3.2 MPEG-2 video coding standard**

MPEG goes on its typical attempt with a second phase (MPEG-2) in 1991, to provide a video coding solution for applications, which was originally lacking in the MPEG-1 standard. Specifically, MPEG-2 was given the charter to implement video quality not lower than NTSC/PAL and up to CCIR 601 quality. Digital cable TV distribution, networked database services via ATM, digital VTR applications and satellite and terrestrial digital broadcasting distribution were seen to benefit from the increased quality expected to result from the new MPEG-2 standardization phase.

#### **3.3 MPEG-4 video coding standard**

MPEG-4 Systems provides the technologies to interactively and concurrently represent and conveyed audio-visual contents comprises of various objects including audio, visual, 2D/3D vector graphics and etc. MPEG-4 inherits many of the features of MPEG-1 and MPEG-2.

#### **3.4 H.264/AVC**

The ongoing H.264/AVC compression standard is based on the picture wise processing and waveform based coding of video signals [13]. The technology now being expressed for the new standardization project on high efficiency video coding (HEVC) is a generalization of this approach which grants significant gains through modernization such as improved intra prediction, larger block sizes, more flexible ways of decomposing blocks for inter and intra coding and better exploitation of long-term correlations and picture dependencies[9][13]. It will support a wide range of encoder modes, which are typically optimized using mean-squared-error-based or related distortion measures.

#### 4. VIDEO GENERATION TOOLS

There are various video making tools available in present. Some of these are as follows e.g Nutshell, Videoshop, iMovie App, iMovie for Macs, Magisto, Animoto. All above mentioned tools works on different platform but the basic principle of all are same. Animoto takes different camera clicked pictures in its primary memory and processed for adding filters to and embellishment for making the video. It has also the functionality to adding text and sound tracks during the processing of frames as desirable. Animoto offers advanced graphics that exceed either of the previous technologies developed. Like Kizoa, Animoto is cloud based, offering users the ability to create online slideshows that can be linked by URL or embed, but it also allows for a low resolution download in mp4 format. Animoto's main marketing message is its ease of use: users upload photos, add captions, select music, and the program will make its own decisions about effects and transitions. The resulting presentation has glossy, advanced graphics such as fluttering butterflies that look real.

#### 5. ISSUES AND CHALLENGES

**5.1 Challenges related to compression:** As in modern trend we are dealing with tremendous amount of storage and need to transmit voluminous data effectively. Compression performance can be enhanced by employing motion-compensated prediction, which predicts each frame block wise from the previous frame. The prediction error can be more effectively compressed than the original frame data. In video conferencing application we somehow, lagging to produce the satisfactory result in terms of bit rate representation and still a big challenge to deal with.

**5.2 Challenges related to enhancement:**

In enhancement, one aims to process image to improve their quality. An image may be of poor quality because of its contrast is low, or it is noisy, or it is blurred etc. Many algorithms are proposed to remove the degradation but not any algorithm yet developed that doesn't hurt the signal. For ex. Noise reduction algorithms typically involve local averaging or smoothing which unfortunately blur the sides of the frames. It needs to look forward in this area.

**5.3 Challenges related to recognition:** An effective recognition system is not yet developed to detect the generic object lying or either a person having and behaves according if found suspicious. The area has vast scope to deal with.

**5.4 Challenges related to security:** Secure signal processing is an emerging technology to legitimate image/video processing duties in a secure and privacy preserving fashion. It has brought a great amount of research attention due to the boost demand enabling prosperous functionalities for individuals data reserved online. But treating multimedia as ordinary data and applying cryptographic ciphers such as RSA and AES, information leak is minimized so such an approach is

inefficient for practical video processing applications. Cryptographic operations are often computationally expensive. Efficient usage of cryptographic protocols is therefore imperative. Another challenge may occur due to the certain cryptographic techniques that cause cipher text expansion of two orders of magnitude, such as public key encryption of image pixels. Success in this direction will depend on future research efforts to address the question of how to properly define security and the proper level of protection for multimedia data.

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