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Survey on image extraction from unstructured big data (video) using HMM

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ABSTRACT: Big data is the collection of both structured and unstructured data that is so large and fast moving. Surveillance video is the highest source of unstructured big data. Foreground extraction is performed to extract images from videos only in HEVC compression format, but Videos are represented in any codec standards. The images or videos should be extracted efficiently from the unstructured big data. To perform efficient extraction Hidden Markov Model (HMM) can be used. HMM is a probabilistic model and it includes both foreground and background extractions.

KEYWORDS: Unstructured data, image extraction, HEVC, HMM.

I. INTRODUCTION

Big data is a broad term for data sets so large or complex that traditional data processing applications are inadequate. Massive amount of data comes from sensors that are used to gather climate information, posts to social media sites, digital pictures and videos, purchase transaction records, and cell phone GPS signals etc [1]. This huge amount of the data is known as “Big data”. Big data describes an enormous volume of both structured and unstructured data that is so huge that it's complicated to process using traditional database and software techniques. Big data includes several challenges. The challenges include analysis, capture, data duration, search, sharing, storage, transfer, visualization, and information privacy.

Big data refers to huge data sets characterized by larger *volumes* (by orders of magnitude) and greater *variety* and complexity, [2] generated at a higher *velocity*. These three key characteristics are described as the three Vs of big data. Volume describes the massive scale and growth of unstructured data outpaces traditional storage and analytical solutions.

Big data is collected from new sources that haven’t been mined for insight in the past. Traditional data management processes can’t cope with the heterogeneity and variable nature of big data, [2] which comes in formats as different as e-mail, social media, video, images, blogs, and sensor data as well as “shadow data” such as access journals and Web search histories. Data is generated in real time with demands for usable information to be served up as needed describes the velocity in big data.

Unstructured data from video demand much more attention in the current Big Data market. Digital devices that generate millions of pixels in a flash are in the pockets of billions of people worldwide. [3] Online video archiving systems such as YouTube, where users upload 100 hours of video every minute.

Big data continues to grow exponentially, and surveillance video has become the largest source. In recent years, more and more video cameras have been appearing throughout our surroundings, including surveillance cameras in elevators, ATMs, and the walls of office buildings, as well as those along roadsides for traffic-violation detection, [4] cameras for caring for kids or seniors, and those embedded in laptops and on the front and back sides of mobile phones. All of these cameras are capturing huge amounts of video and feeding it into cyberspace daily.

Surveillance-video big data introduces many technological challenges, including compression, storage, transmission, analysis, and recognition. [5] Among these, the two most critical challenges are how to efficiently transmit and store

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the huge amount of data, and how to intelligently analyse and understand the visual information inside. High priority queries such as security-related requests not only needed to be in real time, they needed to return accurate and reliable results. Extracting images from videos having same compression formats are not a tedious task, but extracting images from videos having multiple formats is a tedious one.

Paper is organized as follows. Section II includes the related work which actually describes various image extraction techniques for videos. The proposed idea about object retrieval from videos will be represented in Section III. Finally, Section IV presents conclusion.

II. RELATED WORK

This section we compare our efficient image extraction technique for unstructured big data with other possible solutions.

A. "Efficient Foreground Extraction from HEVC Compressed Video for Application to Real-Time Analysis of Surveillance 'Big' Data" [6]

Foreground objects are extracted using novel CTU features of HEVC compressed video. This method exploits the fact that compressed HEVC video is essentially a source of highly de-correlated data having two features that sufficiently describe each CTU block. They have qualitatively and quantitatively evaluated against several other state-of-the-art methods.

The objects are extracted with the usage of Gaussian Mixture model which cannot predict both the positive and negative side during analysis.

The problem is that they concentrated only on videos having HEVC compression format.

B. "Real-time Unstructured Big Data Analysis Framework" [7]

A novel framework method has been used for the real-time analysis of unstructured big data such as video, image, sounds and text. This framework analyzes the big data using CEP engine and uses CQL to modify the analysis conditions in real-time without re-executions of system. In addition, it provides functions to manage several distributed analysis systems using the method of CQL management easily.

Though it appeared to be efficient, problem arises in usage of CEP engine. CEP engines don't handle adapter management or subscription handling mechanisms.

CQL cannot support join and sub query and large result evaluation consumes more time.

C. "Change Detection Approach for Images Using Image Fusion and C-means Clustering Algorithm" [8]

Image changes are detected with help of image fusion techniques and C-means clustering algorithm. The image fusion technique is applicable to determine image differences by using complementary information images. The C-means clustering algorithm is used for classifying changed and unchanged regions in between two images.

This algorithm can be used for efficient extraction of images but the problem with this algorithm is that the apriori specification of clusters must be provided and it can provide better result with lower number of termination criteria but the number of iteration increases.

D. "Robust techniques for background subtraction in urban traffic video" [9]

Various background subtraction algorithms are compared for detecting moving vehicles and pedestrians in urban traffic video sequences. Five specific algorithms are tested on urban traffic video sequences which include frame differencing, adaptive median filtering, median filtering, mixture of Gaussians, and Kalman filtering.

Mixture of Gaussians produces the best results, while adaptive median filtering offers a simple alternative with competitive performance. These algorithms are inefficient in case of improving robustness against environment noise and sudden change of illumination.

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E. "TofCut: Towards Robust Real-time Foreground Extraction Using a Time-of-Flight Camera" [10]

Time-of-Flight (TOF) cameras provide a convenient way to sense the scene depth at video frame-rate. The problem of robust real-time Foreground extraction is well focused. They combine color and depth cues into a unified framework and adjusts their relative importance adaptively to achieve improved robustness.

Quantitative evaluation shows that this approach operates well under a variety of challenging environments with dynamic backgrounds, camera movement and dramatic lighting variations.

The problem with this concept is that it concentrated only on Time-of-Flight cameras.

F. "An Introduction to Hidden Markov Models" [11]

Author presented a brief description about Hidden Markov model, its working and applications. Moreover, it provides the advantage of using this technique in our project. HMM is defined as a doubly stochastic process with an underlying stochastic process that is not observable (it is hidden), but can only be observed through another set of stochastic processes that produce the sequence of observed symbols.

III. PROPOSED WORK

Surveillance video forms the greatest source of unstructured big data. The videos are stored in different compression formats. Extracting objects (Human, Vehicle etc.,) from the videos is a complex task. To make it simpler and to provide efficient extraction Hidden Markov Model can be used. Hidden Markov Model is fully probabilistic based method so using this will increase the efficiency and throughput of image extraction process.

IV. CONCLUSION

In this paper we reviewed about various image extraction methodologies for videos which forms greater source for unstructured big data.

The major challenges in unstructured big data include efficient extraction techniques, complexity and algorithm usage.

Foreground extraction are performed only for videos of particular compression standards, but the videos can be in any codec. Various algorithms were also employed for background subtraction in traffic video, but they lagged in improving the robustness. Similarly usage of C-means clustering algorithm also provided some problems when termination criteria increase.

At last, we claim that usage of Hidden Markov Model will provide effective foreground extraction of images from unstructured big data.

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