



Automatic Segmentation Of Moving Object From HEVC Compressed Surveillance Video-Survey

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ABSTRACT

Moving object segmentation and classification from compressed video plays an important role for intelligent video surveillance. Compared with H.264/AVC, HEVC introduces a host of new coding features which can be further exploited for moving object segmentation and classification. In this paper, we present a real-time approach to segment and classify moving object using unique features directly extracted from the HEVC compressed domain for video surveillance. In the proposed method, firstly, motion vector interpolation for intra-coded prediction unit and MV outlier removal are employed for preprocessing. Secondly, blocks with non-zero motion vectors are clustered into the connected foreground regions using the four connectivity component labeling algorithm. Thirdly, object region tracking based on temporal consistency is applied to the connected foreground regions to remove the noise regions. The boundary of moving object region is further refined by the coding unit size and prediction unit size. Finally, a person-vehicle classification model using bag of spatial-temporal HEVC syntax words is trained to classify the moving objects, either persons or vehicles. The experimental results demonstrate that the proposed method provides the solid performance and can classify moving persons and vehicles accurately.

INTRODUCTION:

Moving object segmentation and classification from video data is one of the most important tasks for intelligent video surveillance. Most computer vision methods for moving object detection and classification assume that the original video frames are available and extract descriptions or features from pixel domain [1-3]. Note that most video content are received or stored in compressed formats encoded with international video coding standards, such as MPEG-2[4], H.264/AVC [5] and HEVC [6]. To obtain the original video frame, we have to perform video decoding. In video analysis at large scales, such as content analysis and search for a large surveillance network, the complexity of video decoding becomes a major bottleneck of the real-time system. To address this issue, compression-domain approaches have been explored for video content analysis which extracts features directly from the bit stream syntax, such as motion vectors and block coding modes [7]. The major advantage of compression-domain approaches is their low computational complexity since the full-scale decoding and reconstruction of pixels are avoided. Therefore, compressed domain methods are desired for real time video analysis applications. In this paper, we focus

on moving object detection and classification from HEVC compressed surveillance videos. Specifically, by extracting features from HEVC compressed surveillance video bitstream, the moving objects are located and classified, such as persons or vehicles.

LITERATURE SURVEY:

1.DETECTION AND TRACKING OF MULTIPLE OBJECTS IN CLUTTERED BACKGROUNDS WITH OCCLUSION HANDLING SukanyatharaJ and AlphonsaKuriakose

Segmentation and tracking are two important aspects in visual surveillance systems. Many barriers such as cluttered background, camera movements, and occlusion make the robust detection and tracking a difficult problem, especially in case of multiple moving objects. Object detection in the presence of camera noise and with variable or unfavourable luminance conditions is still an active area of research. This paper proposes a framework which can effectively detect the moving objects and track them despite of occlusion and a priori knowledge of objects in the scene. The segmentation step uses a robust threshold decision algorithm which uses a multi-background model. The video object tracking is able to track multiple objects along with their trajectories based on Continuous Energy Minimization. In this work, an effective formulation of multi-target tracking as minimization of a continuous energy is combined with multi-background registration. Apart from the recent approaches, it focus on making use of an energy that corresponds to a more complete representation of the problem, rather than one that is amenable to global optimization. Besides the image evidence, the energy function considers physical constraints, such as target dynamics, mutual exclusion, and track persistence. The proposed tracking framework is able to track multiple objects despite of occlusions under dynamic background conditions.

2.MOVING OBJECT DETECTION IN HEVC VIDEO BY FRAME SUB-SAMPLING:

Video compression aims to remove spatial temporal redundancies where the encoded bitstream, particularly the motion vectors, may not represent the actual motions in the video. Hence, moving object detection in the compressed video stream is a technically challenging task. In this work, we propose a novel moving object detection algorithm using frame sub-sampling method in the state-of-the-art HEVC video coding standard. Specifically, the number of frames is reduced by means of (temporal) sub-sampling. The frames are re-encoded using HEVC with the same environmental setting to amplify the motion of the moving objects. Sub-sampling effectively increases the motion intensity of the objects, which can be the significant cue for detecting moving object while motions in the background still remain small. Motion vectors and INTRA coding units of moving object obtained via frame sub-sampling and reencoding are selectively utilized to separate the background and moving objects in the video. The segmented results are refined and compared with the result without performing frame subsampling. Results show that the sub-sampling method achieves higher accuracy, with an improvement greater than 0.35 in terms of F-measure.

3. IMPLEMENTATION OF REAL TIME MULTIPLE OBJECT DETECTION AND CLASSIFICATION OF HEVC VIDEOS

We present new methods for object tracking initialization using automated moving object detection based on background subtraction. The new methods are integrated into the real-time object tracking system we previously proposed. Our proposed new background model updating method and adaptive thresh holding are used to produce a foreground object mask for object tracking initialization. Traditional background subtraction method detects moving

objects by subtracting the background model from the current image. Compared to other common moving object detection algorithms, background subtraction segments foreground objects more accurately and detects foreground objects even if they are motionless. However, one drawback of traditional background subtraction is that it is susceptible to environmental changes, for example, gradual or sudden illumination changes. The reason of this drawback is that it assumes a static background, and hence a background model update is required for dynamic backgrounds. The major challenges then are how to update the background model, and how to determine the threshold for classification of foreground and background pixels. We proposed a method to determine the threshold automatically and dynamically depending on the intensities of the pixels in the current frame and a method to update the background model with learning rate depending on the differences of the pixels in the background model and the previous frame. Event detection plays an essential role in video content analysis. On the other hand, according to our analysis, the coding structures in new video coding standard High Efficient Video Coding (HEVC) have a high correlation with video contents. Hence there is large potential to identify events by reusing coding structures in HEVC, which can save a huge amount of computational resources.

4. HYBRID VIDEO OBJECT TRACKING IN H.265/HEVC VIDEO STREAMS Serhan Gul, Jan Timo Meyer, Cornelius Hellge, Thomas Schierl, Wojciech Samek:

In this paper we propose a hybrid tracking method which detects moving objects in videos compressed according to H.265/HEVC standard. Our framework largely depends on motion vectors (MV) and block types obtained by partially decoding the video bitstream and occasionally uses pixel domain information to distinguish between two objects. The compressed domain method is based on a Markov Random Field (MRF) model that captures spatial and temporal coherence of the moving object and is updated on a frame-to-frame basis. The hybrid nature of our approach stems from the usage of a pixel domain method that extracts the color information from the fully-decoded I frames and is updated only after completion of each Group-of-Pictures (GOP). We test the tracking accuracy of our method using standard video sequences and show that our hybrid framework provides better tracking accuracy than a state-of-the-art MRF model.

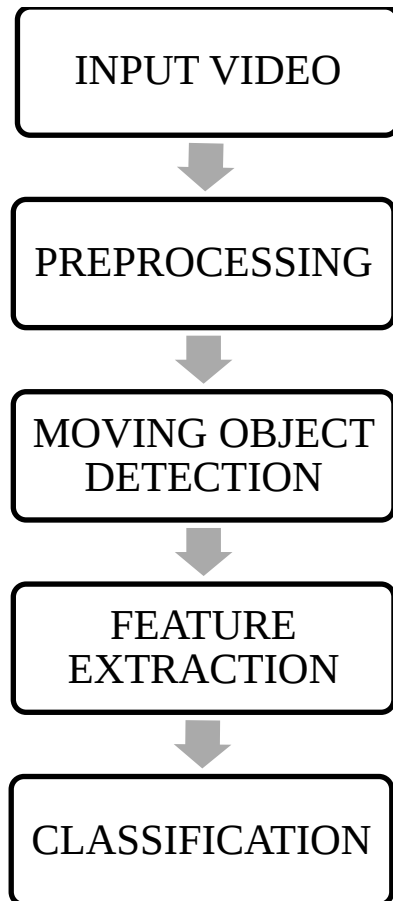
5. HEVC COMPRESSED DOMAIN MOVING OBJECT DETECTION AND CLASSIFICATION Liang Zhao¹, Debin Zhao¹, Xiaopeng Fan¹, Zhihai He²:

Compressed domain moving object segmentation and classification plays an important role in many real-time applications, such as video indexing and intelligent video surveillance. Compared with the previous international video coding standards, such as H.264/AVC, HEVC introduces a host of new coding features. Therefore, moving object segmentation and classification directly from HEVC compressed videos represents a new challenge. In this paper, we develop a method for segmenting and classifying moving objects, specifically, persons and vehicles, in the HEVC compression domain. We first train a classifier to determine if an image patch belongs to the foreground objects or background using HEVC syntax features. This will generate a bounding box which locates the object in the video frame. We then train a second classification model to classify the moving objects, either persons or vehicles, using bags of spatial-temporal HEVC syntax words. Our extensive experimental results demonstrate that the approach provides the remarkable performance and can classify moving person and vehicles accurately and robustly.

MODULES:

1. PREPROCESSING.
2. MOVING OBJECT DETECTION
3. FEATURE EXTRACTION
4. OBJECT REPRESENTATION
5. DECISION MAKING

BLOCK DIAGRAM:



MODULE DESCRIPTION: (IMPLEMENTATION)

1. PREPROCESSING.

In HEVC compressed video, one MV is associated with an inter-coded prediction unit (PU). The motion vectors are scaled appropriately to make them independent of the frame type. This is accomplished by dividing the MVs according to the difference between the corresponding frame number and the reference frame number (in display order). For example, one MV has values (4,4) for reference frame -1 while another MV in a nearby block has values (8,8) for reference frame -2, these two MV values will be corrected to both be (4,4) after the scaling process. For the PU with two motion vectors, the motion vector with larger length will be selected as the representative motion vector of the PU. In the preprocessing process, the MV interpolation for intra-coded blocks and MV outlier removal are employed before the moving object segmentation and classification.

2. MOVING OBJECT DETECTION

After the preprocessing of the MVs, as described in Section II, blocks with non-zero MVs are marked as foreground blocks. These foreground blocks are clustered to the connected foreground regions using the four-connectivity component labeling algorithm [25]. For each foreground region, firstly, we examine its temporal consistency by using object region tracking. Secondly, we refine the boundary of moving object region by using CU and PU sizes of the blocks.

3. FEATURE EXTRACTION

In this work, we have identified three types of features, the length of motion vectors, prediction modes, and motion vector difference (MVD), as effective features for our object classification. The length of the motion vector relates to the velocity of the object, which is a simple yet important feature for discriminating persons and vehicles. This is because vehicles usually move faster than persons. It is observed that persons often undergo non-rigid deformations, it is harder to find a good match for each PU within the region of moving persons. As a result, more blocks within the region of persons are coded with intra modes when compared to the blocks within the region of moving vehicles. Therefore, the prediction mode can be utilized as an effective feature.

4. CLASSIFICATION

For object classification in surveillance videos, we aim to classify the segmented moving objects into persons and vehicles using “bag of HEVC syntax words” in HEVC compressed domain. The “bag of words” representation has been successfully used for object classification in the pixel domain [26-27]. R. V. Badu *et al.* [28] propose to use “bag of words” representation in H.264/AVC compressed domain to classify the video content. The major contribution of this work is to establish a bag of words model in the HEVC domain for moving object classification. This proposed object classification has the following major steps: (1) describing each coding block within the moving object region using HEVC syntax features; (2) constructing a code book using a clustering method; (3) representing each moving object using a normalized histogram of codeword from the codebook; and (4) training a binary classifier to classify the moving objects into persons and vehicles

APPLICATION:

- Compressed domain methods are desired for real time video analysis.

SOFTWARE REQUIREMENT:

- MATLAB 7.14 Version R2012

MATLAB

The MATLAB high-performance language for technical computing integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation.

- ❖ Data Exploration, Acquisition, Analyzing & Visualization
- ❖ Engineering drawing and Scientific graphics
- ❖ Analyzing of algorithmic designing and development
- ❖ Mathematical functions and Computational functions
- ❖ Simulating problems prototyping and modeling
- ❖ Application development programming using GUI building environment.

Using MATLAB, we can solve technical computing problems faster than with traditional programming languages, such as C, C++, and FORTRAN, segmentation of the retinal vasculature.

FUTURE ENHANCEMENT:

The proposed algorithm embeds information by changing the parity of one part of motion vector prediction errors during the quarter-pixel motion estimation process.

CONCLUSION:

In this paper, we have presented a novel approach to segment and classify the moving objects from HEVC compressed surveillance video. Only the motion vectors and the associated coding modes from the compressed stream are used in the proposed method. In the proposed method, firstly, MV interpolation for intra-coded PU and MV outlier removal are employed for preprocessing. Secondly, blocks with non-zero motion vectors are clustered into connected foreground regions by the four-connectivity component labeling algorithm. Thirdly, object region tracking based on temporal consistency is applied to the connected foreground regions to remove the noise regions. The boundary of moving object region is further refined by the coding unit size and prediction unit size. Finally, a person-vehicle classification model using bags of spatial-temporal HEVC syntax words is trained to classify the moving objects, either persons or vehicles. The proposed method has a fairly low processing time, yet still provides high accuracy.

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