Video Adaptation for Small Display Based on Content Recomposition

B. Vivek Vardhan
Department of CSE
CMR Technical Campus, Hyderabad, T.S, India

Abstract- *The browsing of quality videos on small hand-held devices is a common scenario in pervasive media environments. In this paper, we propose a novel framework for video adaptation based on content recomposition. It differs with the conventional schemes because they passively attempt to adapt the plain frame but not the actual content it contains. Consequently, this adapting process is forced to specify a desired area of the source frame and uniformly stuff it onto the target screen.*

Our objective is to provide effective small size videos which emphasize the important aspects of a scene while faithfully retaining the background context. That is achieved by explicitly separating the manipulation of different video objects. A generic video attention model is developed to extract user- interest objects by adopting three types of visual attention features: intensity, color, and motion. The extracted user interested objects are resized and the background holes created by these objects are refilled by an in painting algorithm.

Keywords:- Content recomposition, media aesthetics, region of interest, video adaptation, visual attention model, inpainting algorithm.

I. INTRODUCTION

On the internet, multimedia content has been widely used for sharing information among users. Their transparent access formal most everywhere at anytime through all kinds of devices is desired and often required. To enable such universal multimedia access(UMA),one key technology is video adaptation [1]. In general, itis defined as the mechanism of transforming a video stream with one or more operations to meet specific application needs, such as device capabilities, network characteristics, and user preferences.

The conventional schemes that have been proposed for adapting videos on a small display can be divided into two categories: spatial transcoding and frame cropping.

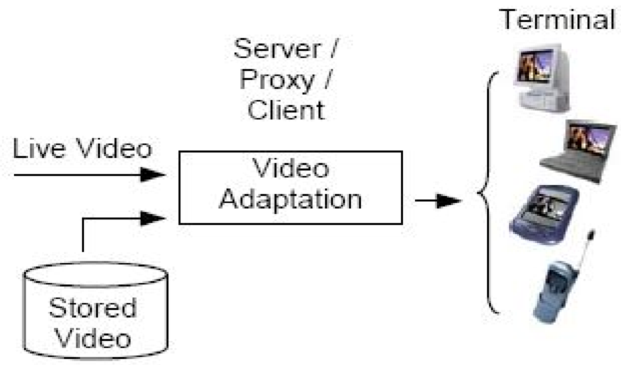

Fig1.Role of video adaptation in pervasive media environments

II. PROPOSED WORK

In this work, we propose a novel framework for video adaptation based on content recomposition. Our objective is to provide effective small size videos that emphasize important aspects of the scene while retaining the background context for adaptive delivery.Wefocus on nonuniform process in gof different video regions by giving more display resource to the important ones and less to the other parts. With regard to the background, these objects are downsized at a light level and with constant aspect ratio(AR).

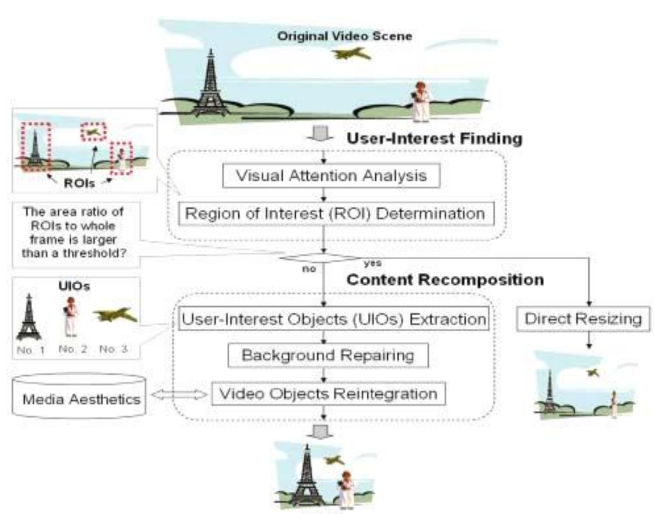

Fig 2.Flochart of the proposed framework for conducting video adaption.

III. USERINTEREST FINDING

UIOs are the semantic objects that catch part of the viewer's attention in videos, such as a walking person, a flower, an automobile, etc. Accordingly, an ROI is defined as the rectangular frame portion that contains some UIOs. Since the actual UIO shapes can be arbitrary, the ROIs serve as the tight bounding boxes of them. Their correct identification is the first key step for successful content recomposition.

A. Visual Attention Modeling:

Visual attention refers to the ability of a viewer concentrating his attention on some visual objects or regions.

i) Contrast-Based Intensity and Color Feature Model:

One of the most important ingredients of a visual attention model is the contrast. Inpsychology, perceptual experiments have shown that the intensity and some color pairs possess high spatial and chromatic opposition. Accordingly, we include three contrast based feature models: intensity, red-green color contrast.

ii) Motion Feature Model:

Object motion plays an essential role to directan audience's attention across the scene space of a video. Two feature models: x-motion and y-motion are, respectively, used to represent the horizontal and the vertical motion information in a scene. To find the motion activity of a specific direction, the two-dimensional (2-D)

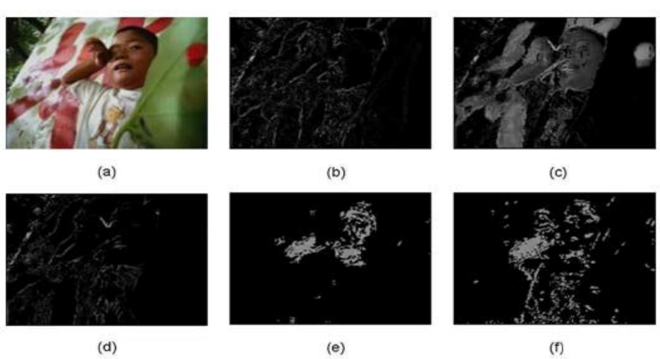

Fig.3.Example of feature maps. (a) Original video frame. (b) intensity.(c)Red-green colour. (d) Blue-yellow colour.(e).x-motion. (f) y-motion feature maps

B. Video ROIs Determination:

In our work, an ROI is defined with two attributes: centroid position and region size (as described in the following). In this subsection, we describe how to compute the attributes for each ROI from a saliency map. Since there may be multiple key objects in a video frame, a method for dynamically determining the number of ROIs is also presented.

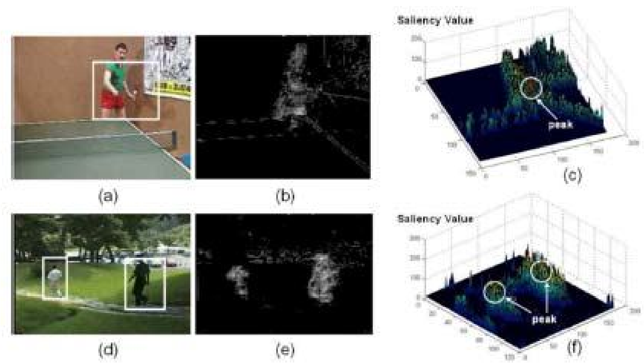

Fig.4. Examples of a video frame with (a) one and (d) two ROIs (indicated by the white squares). (b) and (e) Corresponding saliency maps. (c) and (f) The 3-D profiles of the saliency maps of (a) and (d), respectively.

IV. CONTENT RECOMPOSITION

In this section, we explain in detail the process of recomposing video content to fit within a target screen. After obtaining the ROI information, exact UIOs are separated from the background. Since the removal of UIOs leaves some scene holes on the background, an inpainting algorithm is applied to refill them. To emphasize the UIOs, we increase their relative scales with regard to the scene; mean while, to retain the video context, we resize the background to match the screen dimensions. The adapted result is then obtained by reintegrating all of the modified video objects.

A. UIOs Extraction:

For simplicity, we assume that each ROI contains one single UIO. A forementioned, the only difference between ROI and UIO is in the inclusion of partial background or not. In this definition, a UIO can possess one to several semantic objects. An ROI is composed of a set of no overlapped rectangular borders with one-pixel width.

B. Background Repairing:

To repair unfilled scene holes left by UIOs extraction, we develop an exemplar-based inpainting algorithm based on the work in which the visible parts of a frame serve as a source set of exemplars to infer the target region.

Fig.6. Example of video objects separation. The columns from left to right are successively the original frame with ROI, extracted UIO, and repaired background.

C. Media Aesthetics Based Video Objects Reintegration :

As the final step, we reintegrate all of the separated video objects for content recomposition. Since the background is directly resized to match the target screen size, the reintegration task becomes making a proper arrangement of enlarged UIOs on the resized background.

V. RESULTS

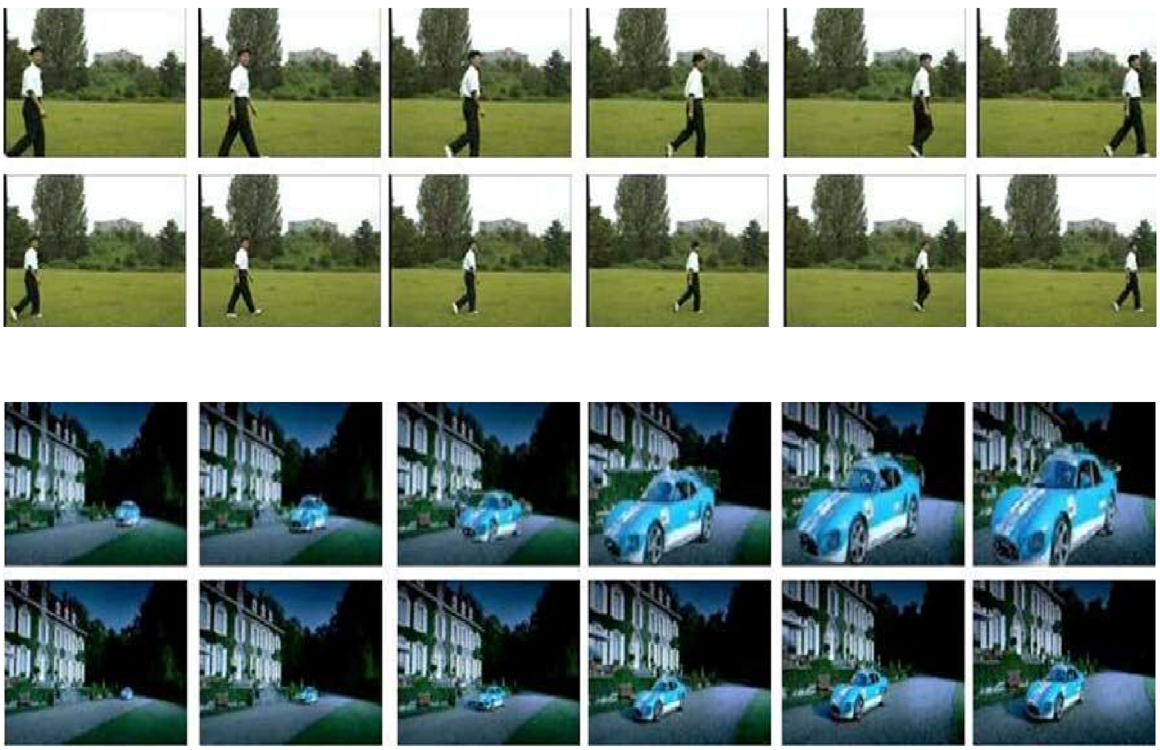

Fig.8. 2ndand 4throws are direct resized frames. 1stand 3rdrows are content recomposed frames(our results).

VI.CONCLUSION

This paper presents a novel framework for video adaptation based on content recomposition. Our approach is superior to existing schemes in that it emphasizes the important aspects of a scene while faithfully retaining the background context. The proposed framework can provide more effective and informative video experience to viewers, in an automatic way. Many aspects of our approach can be improved. For example, currently, we have a fixed expansion factor in the ROI determination module. A risk is that actual semantic objects may not be completely contained in a determined ROI, The phenomenon partially comes from the fact that the visually salient regions are not exactly corresponding to semantic objects. It is one essential limitation of the visual attention models.

REFERENCES

[1] S.-F. Chang and A. Vetro, “Video adaptation: Concepts, technologies, and open issues,” Proc. IEEE, vol. 93, no. 1, pp. 148–158, Jan. 2005.

[2] L.-Q. Chen, X. Xie, X. Fan, W.-Y. Ma, H.-J.Zhang, and H.-Q. Zhou, “A visual attention model for adapting images on small displays,” Multimedia Syst., vol. 9, no. 4, pp. 353–364, Oct. 2003.

[3] I. Ahmad, X. Wei, Y. Sun, and Y.-Q. Zhang, “Video transcoding: an overview of various techniques and research issues,” IEEE Trans. Multimedia, vol. 7, no. 5, pp. 793–804, Oct. 2005.

[4] C. Dorai and S. Venkatesh, “Computational media aesthetics: Finding meaning beautiful,” IEEE Multimedia, vol. 8, no. 4, pp. 10–12, Oct./Dec. 2001.

[5] J. Nam, Y.-M.Ro, Y. Huh, and M. Kim, “Visual content adaptation according to user perception characterstics,” IEEE Trans. Multimedia, vol. 7, no. 3, pp. 435– 445, Jun. 2005.

[6] L. Itti, C.Koch, and E. Niebur, “Amodel of saliency-based visual Attention for rapid scene analysis,” IEEE Trans.Pattern Anal.Mach. Intell., vol. 20, no. 11, pp. 1254–1259, Nov. 1998. Anal.Mach. Intell., vol. 22, no. 9, pp. 970–982, Sep. 2000.