Chapter 8

Intelligent Approaches for Adaptation and Distribution of Personalized Multimedia Content

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ABSTRACT

Telecommunication operators need to deliver their clients not only new profitable services, but also good quality and interactive content. Some of this content, such as advertisements, generate revenues, while other contents generate revenues associated to a service, such as Video on Demand (VoD). One of the main concerns for current multimedia platforms is therefore the provisioning of content to end-users that generates revenue. Alternatives currently being explored include user-content generation as the content source (the prosumer model). However, a large source of revenue has pretty much been neglected, which corresponds to the capability of transforming, adapting content produced either by Content Providers (CPs) or by the end-user according to different categories, such as client location, personal settings, or business considerations, and to distribute such modified content. This chapter discusses and addresses this gap, proposing a content customization and distribution system for changing content consumption, by adapting content according to target end-user profiles (such as end-user personal tastes or its local social or geographic community). The aim is to give CPs ways to allow users and/or Service Providers (SPs) to configure contents according to different criteria, improving users’ quality of experience and SPs’ revenues generation, and to possibly charge users and SPs (e.g. advertisers) for such functionalities. The authors propose to employ artificial intelligence techniques, such as mixture of Gaussians, to learn the functional constraints faced by people, objects, or even scenes on a movie stream in order to support the content modification process. The solutions reported will allow SPs to provide the end-user with automatic ways to adapt and configure the (on-line, live) content to their tastes—and even more—to manipulate the content of live (or off-line) video streams (in the way that photo editing did for images or video editing, to a certain extent, did for off-line videos).

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INTRODUCTION

There is a growing interest on delivering, efficiently, new interactive content to end-users. Such content must be adapted to end users’ characteristics, according to personal tastes, group category, geographic location, or social community. This chapter presents work on content manipulation and distribution, especially the transformation of image and audio content on a video stream by users, service providers or advertisers, and its efficient distribution to a user multicast network. We exploit therefore the application of computer vision and machine learning techniques, traditionally employed on computer vision, into multimedia applications.

Computer Vision in Multimedia Applications

The adaptation of multimedia content can be achieved through the application of computer vision techniques. For instance, upon the detection and modeling of a face on a video stream, it becomes possible its replacement by the face of another person, or even transforming such face in order to make it appear larger, etc. There are currently several computer vision technologies, which may be especially useful, such as: object/face detection and recognition, 3D modeling, deformable contours, multi-feature tracking, head gaze inference estimation, eye detection and tracking, image perspective projections. Other algorithms that are employed to adapt video content are: leaps tracking and movement generation, emotional expression recognition and generation.

New Paradigms for Multimedia Content Adaptation Based on Machine Learning

Several statistical frameworks have been proposed in the literature to capture knowledge stored in the world, in order to learn the relative probability distribution of objects and people in a scene, which can then be employed for content adaptation, as described on the following sections. The goal is thus to enable individual object detection and prediction using the statistics of low-level features in real-world images, conditioned to the presence or absence of objects and their locations, sizes, depth and orientation. Therefore, machine learning offers powerful tools to infer image constraints (such as object locations) for objects, while computer vision provides techniques to transform and insert extra multimedia content representing such objects into the image.

Content Interactivity and Adaptation

Currently it is common for viewers/listeners to search for programs of their interest over an entire set of available/subscribed TV/Audio channels (e.g., news, sports, science, entertainment, music…) that they want to see/listen, especially at system power up or at the end of the program they were seeing/listening. This normally results in the viewer/listener having to manually switch (zap) possibly many channels in order to find what she prefers. And in general, all users receive the same content, and the same advertisements—the later usually in the form of extra content introduced between channel programs (or within scheduled programs). However, on one hand there is a need for advertisers to direct their content to target audiences. On the other hand, there is also the need for users to receive customized content:

- Advertisements should be added directly to channel content, such as a movie. Why not make James Bond drive a FIAT in Italy or a Volkswagen in Germany for the same movie?
- People should be able to customize the multimedia content objects in order to adapt these to their tastes.
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