Content Repurposing

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Until recently there were a select few ways of accessing online content—mainly accessing the Web through PCs. This situation has changed rapidly, though. The range of access devices today includes cell phones; PDAs; desktop, laptop, and wearable PCs; set-top boxes; and other Internet appliances. Hundreds of device profiles are available for accessing online content and more are announced everyday. These devices are connected through a wide variety of networks that include slow-speed wireless, 2.5- or 3-G wireless, dial-up and local area wired and wireless, and high-speed wired networks. As before, the issue of usage scenarios—activity type, user age and gender, time available, and prior knowledge of the subject matter—continues to exist.

Handcrafting content for each device, network, and use as well as each of their combinations is just not manageable. Among other problems, this approach is too expensive; takes too much time; and leads to multiple, inconsistent versions of the content. Content repurposing tackles these problems by taking content designed for a particular scenario and automatically repurposing it to fit another. Fundamental to this approach is the need to maintain a single copy of the content in its original form and to repurpose the content to fit the desired scenario in real time and in an automated fashion. This special issue focuses on the challenges, architectures, technology, and tools for content repurposing.

A basic understanding

Typically, Web content comprises text, images, animations, and video. Since images, animations, and video are harder to handle, the early content repurposing efforts focused on delivering text. While this is useful for many applications such as stock quotes, weather conditions, traffic updates, and news headlines, users are accustomed to the Web experience and want to receive richer content. In many situations, such as when users are mobile or short of time, they find it easier to comprehend information presented as images and videos. The articles in this special issue focus on rich content only.

The first step in the process of repurposing is to analyze and understand the content. Understanding the content helps us identify the important features of the content that must be preserved as the original content is repurposed to fit a new delivery or use scenario. For example, it is extremely important to maintain the lines representing streets and the text representing street names in a neighborhood map as it's scaled down to fit a small screen. In "Categorizing Images in Web Documents," Hu and Bagga present a system for functionally categorizing images found in Web documents. Their categorization scheme focuses on what an image is used for rather than what's in the image.

Kasik discusses the issue of repurposing images that convey concepts, design characteristics, assembly sequences, and maintenance procedures for physical products. In "Strategies for Consistent Image Partitioning," Kasik partitions large images for display on small screen devices so that the user can easily and rapidly understand the displayed information.

Having analyzed content, the next step in the repurposing process is to describe the content so that it can be understood and processed to fit delivery requirements—whether they're technical or usage based. Standard format descriptions are needed for interoperation and to enable people to develop a broad range of systems to process them. MPEG-7, formally named the Multimedia Content Description Interface, is one such standard.

As content access increases, many other issues crop up—including content management, rights protection, unauthorized access/modification protection, and privacy protection for providers and consumers. The MPEG-21 Multimedia Framework initiative aims to tackle these issues. Tseng et al. describe a system for video personalization and summarization in "Using MPEG-7 and MPEG-21 for Personalizing Video." In their system, a user query for content takes the form of topic preferences, search keywords, media samples, and/or time constraints. This query initiates the customized content retrieval, which is further repurposed to match the end-user's delivery preferences and environment.

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An innovative video repurposing system by Pea et al supports the creation of any number of new video clips from an existing video recording. In the article, "The DIVER Project: Interactive Digital Video Repurposing," the authors take panoramic video recorded with a full 360-degree view that allows the creation of *dives*, which are virtual camera pathways in space and time within the original video sequence. For example, a dive may track a particular event, activity or an individual in the video. Dive clips can subsequently be annotated and used in collaborative discussions.

A number of architectures and approaches are possible for building content repurposing systems, but in "A Model-Driven Approach to Content Repurposing," Obrenovic et al. take a more comprehensive view of and approach to the entire process. They organize their multimedia metamodel into packages for handling physical foundations (media, devices and human sensory), computing factors (logical foundations and presentation platforms), human factors (multimedia communications, human perception, cognition, and social interaction) and content repurposing use cases (content analysis, transformation, and personalization).

Looking ahead

Given the space limitation of this special issue, it covers only a subset of technologies and approaches to content repurposing. Many other approaches and technologies exist, and many more are being invented. Given the pace of development in mobile devices and the rapid growth of the wireless markets, innovative technologies for content repurposing will continue to be in great demand for many years to come. Here's some food for thought for future research. I believe there's a great opportunity in looking at the problem of content repurposing not only from a device perspective but also from a network perspective. Everyone seems to be constantly asking for more network bandwidth, and hence faster networks are being put in place all the time. However, relatively little attention is paid to what gets transmitted on these networks. We can save a significant amount of bandwidth if our networks become device aware. Such networks could then decide to eliminate traffic that a receiving device can't handle anyway. Networks could then evolve from dumb pipes to smart entities aware of the capabilities of their end points and what travels through them! **MM**

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