

Automated Metadata in Multimedia Information Systems: Creation, Refinement, Use in Surrogates, and Evaluation

Synthesis Lectures on Information Concepts, Retrieval, and Services

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Michael G. Christel

2009

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ABSTRACT

Improvements in network bandwidth along with dramatic drops in digital storage and processing costs have resulted in the explosive growth of multimedia (combinations of text, image, audio, and video) resources on the Internet and in digital repositories. A suite of computer technologies delivering speech, image, and natural language understanding can automatically derive descriptive metadata for such resources. Difficulties for end users ensue, however, with the tremendous volume and varying quality of automated metadata for multimedia information systems. This lecture surveys automatic metadata creation methods for dealing with multimedia information resources, using broadcast news, documentaries, and oral histories as examples. Strategies for improving the utility of such metadata are discussed, including computationally intensive approaches, leveraging multimodal redundancy, folding in context, and leaving precision-recall tradeoffs under user control. Interfaces building from automatically generated metadata are presented, illustrating the use of video surrogates in multimedia information systems. Traditional information retrieval evaluation is discussed through the annual National Institute of Standards and Technology TRECVID forum, with experiments on exploratory search extending the discussion beyond fact-finding to broader, longer term search activities of learning, analysis, synthesis, and discovery.

KEYWORDS

multimedia, digital video library, automated metadata generation, speech recognition, image processing, named entity extraction, video surrogate, information retrieval, evaluation, TRECVID

Preface

The author has had the privilege of working with the Infromedia digital video understanding research group at Carnegie Mellon University since its beginnings in 1994. He has witnessed firsthand the benefits and shortcomings of speech recognition, image processing, and natural language technologies for automatically generating descriptions for multimedia repositories. This lecture reports on those experiences through the years, drawing heavily from Infromedia examples and studies. Each chapter concludes with a set of reflective exercises branching out from this Infromedia work. These exercises can be used as supplemental assignments by teachers or as suggestions for further exploration by interested readers.