Introduction to Semantic (Multimedia) Annotation

Tutorial

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Agenda

• Semantic Annotation – What? Why? How?
  1. Definition and characteristics
  2. Challenges in (multimedia) annotation
  3. Methodologies and tools
(1) Why? What?
Why Multimedia Annotation?

• Make multimedia findable
  – Attach „meaning“
  – Make the „background story“ explicit (unleash the „hidden semantics“)
  – Put it into context („interlink“)
Annotate, Contextualize, Interlink
The Semantics of Semantic Annotation

• Annotation [noun]. “A note by way of explanation or comment added to a text or diagram.” (Source: New Oxford Dictionary of English)

• Forms
  – Text annotation
  – Link annotation
  – Semantic annotation

• Dimensions
  – Formal vs. informal
  – Explicit vs. tacit
Classification of the Use of Annotations

- **Decoration**: Annotations are simply commentaries to resources.
- **Linking**: Annotations are a mechanism to provide link anchors.
- **Instance Identification**: The resource annotated is identified as an instance of a particular ontological primitive.
- **Instance Reference**: The Annotation makes an assertion about the subject of a resource.
- **Aboutness**: Annotations establish a loose association between ontological concepts and information resources.
- **Pertinence**: The annotation encodes additional information which is not subject of the resource itself.
Comment-based Approach to Annotation

- (1) Localize a region
- (2) Interpret the content

(Attach yellow post-it to the region)
- Describe: Bing and Bong are traveling on their sofa; both seem to be happy.
Tagging-based Approach to Annotation

• (1) Localize a region
• (2) Interpret the content

Tags: bing, bong, happy, tinyplanets, sofa, vehicle
Semantic Web-based Approach to Annotation

- (1) Localize a region
- (2) Interpret the content

:Region1 foaf:depicts mtp:Bing
mtp:Bing rdfs:label "Bing"
mtp:Bing rdf:type sal:VirtualCharacter
(2) Challenges: Difficulties and Complexity of Multimedia
Why is Multimedia Annotation Difficult?

Image understanding from the human perspective

perception

perceptual content

IMAGE

semantic content

Personal knowledge
Personal experience
Cultural conditioning
Collective memory

Credits: P. Enser
The Semantic Gap

- 45.443272, 10.979848
- Juni 2005
- Verona
- Italy
- Julia
- Casa di Guilietta
- Spring
- Company Trip
- <Company Name>
- 1M pixel; dominant color: green
- Outdoor
- 4 (5?) persons
Levels of Multimedia Description

• Metadata level
  – Administrative, technical, identification

• Content level
  – Textual descriptions, keywords, tags, semantic annotations

• Multimedia level
  – Low-level descriptors, e.g. Color histogram, shape descriptors, ...
Characterization of the Content Level

- **Complexity: Semantic content of images**
  - Object facet
  - Spatial facet
  - Temporal facet
  - Event/activity facet
  - Topic
  - Related concept/object class
  - Abstract concept
  - Context

- **Sources: Where do we get this information from?**
  - Manual classification / annotation
  - User Feedback
  - During image capturing/creation
  - From automatic analysis
  - Background knowledge on the Web
(3) How? Methodologies and Tools
How-to Annotate?

• **Annotation methodologies** provide
  – *descriptions of the process*, participants/roles, and guidelines.
  – *best practices* how annotation should be performed.
  – allow a *systematic, controlled operation* of annotation projects.
A User Centred Annotation Methodology for Multimedia Content
Automation in Annotation

• Manual
  – User-contributed (e.g., UCI)
  – Game-based (e.g., GBI)

• Semi-automatic

• Automatic
  – „Emergent Semantics“-based (e.g., EI)
  – Metadata-based (e.g., AI)
  – Multimedia-analysis-based
Manual Annotation: The SALERO Annotation Tool

Who?

What?

Where?
Manual Annotation: The SALERO Bubble Interface
Semi-automatic Annotation

- **CREAM**
  - Content type: Web pages
  - Annotation support: Machine Learning to suggest annotations based on existing annotations

- **M-Onto-Mat Annotizer / KAT**
  - Content type: Images
  - Annotation support: Extraction of low-level features; suggestions based on existing annotations

- **AKTIVEMedia**
  - Content type: Images, videos, text, 3D
  - Annotation support: Concept suggestion based on content analysis
Semi-automatic Annotation: KAT
Questions?

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STI Innsbruck and University
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