Augmenting the World using Semantic Web Technologies

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Handheld Information Browsers

Wikitude

Peak.ar

Layar
Visual Search

Meal Snap

Take a picture of your meal & we'll take care of the rest!

Google goggles labs

Golden Gate Bridge

Web Results

Golden Gate Bridge - Wikipedia, the free encyclopedia
The Golden Gate Bridge by night, with part of downtown San Francisco... Golden Gate Bridge is the most popular place to commit suicide in the United States...

http://en.wikipedia.org/wiki/Golden_Gate_Bridge
Seacliff Webcam - Weather Seattle, Golden Gate Bridge Webcam
Do I have time?

What kind of *music* do they play?

Are my *friends* attending?

How much are the *tickets*?
Do I have me?

Are my friends attending?

What kind of music they play?

Do I have time?

How much are the tickets?

As time goes by ...
How to create information?

How to update information?
Creating augmented media

Link location/object with digital media
Creating augmented media

Standard approach: direct links to content

...<mainresource>http://www.klimmstein.com/before.jpg</mainresource>...

Updating augmented media

Standard approach: manual update

...<mainresource>
http://www.klimmstein.com/before.jpg
</mainresource>
...

→ outdated information
Our approach

Link to concepts, not to content

Retrieve the content at runtime

Less effort for updating augmented scenes

Potential added value due to context-sensitive retrieval
Our approach

Link to concepts, not to content

Retrieve the content at runtime
What is augmented - Thing of Interest – TOI

who | what?

when? | where?
Link to concepts, not to content

Concept

Link to structured machine-readable data in ontologies (Linked Data)
Events:
- Clubbings, festivals
- Small to midscale

Authors:
- Event organizers
- Public relations
Link to concepts, not to content

display region = location

concept (URI or tag) = digital media
Link to concepts, not to content

TOI
Thing of Interest

structured description of an augmented object
**Thing-of-Interest (TOI)**

What does it represent?

How is it represented?

- URI - concept
- Location - rectangle

http://www.smartreality.at/rdf/toi
<toi:segment_annotation >
<toi:representation>
<toi:hasDisplayLocation>0.59, 0.03</toi:hasDisplayLocation>
<toi:hasDisplayDimension>0.44, 0.31</toi:hasDisplayDimension>
<toi:hasLocatingInformation>0.11, 0.03</toi:hasLocatingInformation>
<toi:hasDimension>0.44, 0.34</toi:hasDimension>
</toi:representation>

<toi:represents>
</toi:represents>
</toi:segment_annotation>
Our approach

Link to concepts, not to content

Retrieve the content at runtime
Retrieve the content at runtime

- **Image Recognition DB**
- **Object Recognition**
- **SmartReality Server**
- **Semantic Web Services**
- **Web of Data**
- **TOI Repository**
- **Thing-of-Interest Initialization**
- **Content Retrieval**
- **Tracking and Rendering**

**Augmented Reality Client**
Recognize TOI

Object Recognition

ID

Millions of Images

Augmented Reality Client
Get meta data

Thing-of-Interest (TOI)
What does it represent?
How is it represented?
http://www.smartreality.at/rdf/toi

Sesame Triple Store

SmartReality Server

TOI Repository

TOI TOI TOI ...

Uses:
Artist, Event, Club, Show, Recording, Track

Timeline, Event, Dublin Core

Image ID

Thing-of-Interest Initialization

Augmented Reality Client
Get more meta data

Linked Open Data Collector

TOI classification + Crawling Rules RDF/N3

e.g., for each Music Group crawl also each member

SmartReality Server

Content Retrieval

Augmented Reality Client

Get more meta data
Get content

<table>
<thead>
<tr>
<th>Information type</th>
<th>Service match</th>
</tr>
</thead>
<tbody>
<tr>
<td>playfm:Recording, playfm:Track</td>
<td>Service for play.fm audio playback</td>
</tr>
<tr>
<td>mo:Performance (date &lt; today)</td>
<td>Service for YouTube video look-up</td>
</tr>
<tr>
<td>mo:Performance (date &gt; today)</td>
<td>Service for event ticket purchase</td>
</tr>
</tbody>
</table>

| Service                      | Instance                     | Result                                                               |
|------------------------------|------------------------------|                                                                     |
| Play.fm audio playback       | Play.fm Recording            | Play.fm player widget and parameter for recording playback           |
| YouTube video lookup         | Music performance            | YouTube video links                                                  |
| Event ticket purchase        | Music performance            | Seekda event widget and parameter for this event                     |

Semantic Web Services

Rank and execute web services

Discover relevant web services

RDF Service Repository (WSMO-Lite)

SmartReality Server

Content Retrieval

Augmented Reality Client
Challenges

- Effort to extend it beyond existing use case?
  - Suitable Ontologies
  - Crawling Rules

- Performance (roundtrip currently ~ 10 seconds)

- How to capture the context?
  - User Model, Context Model (e.g., FOAF, Activity Streams)
3D Challenges

• Semantic Descriptions of 3D Models?
  o Retrieving interesting 3D content
  o Concepts for 3D content

• Localization/Detection/Positioning
  o Beyond image recognition?
  o Any kind of object recognition
  o Any kind of location information

• Creating a 3D scene automatically?
  o More than 2D layout
  o Interaction?
Summary

• Goals
  o Context-aware information access on real objects in-situ
  o Minimize creation effort for authors (non-programmers)

• How?
  o Semantic Web Technologies for content retrieval
  o Augmented Reality for content presentation

• Challenges
  o Not yet able to model visually compelling (3D) scenes
Thank you for your attention.

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www.smartreality.at