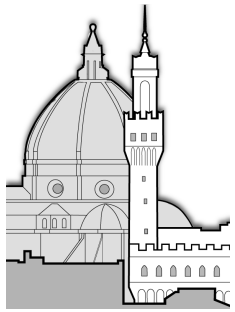

EVA 2011 Florence

Conference

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SmartCity

Innovative technologies for customized and dynamic multimedia content production for tourism applications

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POR CReO 2007-13

Le ali alle tue idee

REPUBBLICA ITALIANA

Regione Toscana

The SmartCity Project

- **New solutions for Content Engineering and Ambient Intelligence supporting Experience Tourism**
- **24 months, 1.8M€ project, 4 italian (Tuscany) partners :**
  - *Space S.p.A., Prato (Coordinator)*
  - *Rigel Engineering S.r.l., Livorno*
  - *CNR-ILC, Pisa*
  - *Meta S.r.l., Florence*
- **Co-financed by the Tuscany's regional Governement**
  - under the program POR CreO FESR 2007-2013, Asse 1, Activity 1.1, Line D ,
  - FESR funds for "Regional Competitiveness and Job Occupation" for the years 2007-2013
  - With a contribution of 1.320.094,39 on the basis of 1.883.464,43 estimated costs.
- **Started in December 2009**

SmartCity aims to

- **Develop innovative methodology & advanced technologies**
  - enabling professional services for cultural tourism applications
    - in urban areas,
    - in archaeological sites,
  - meeting the emerging demand of fruition of the cultural space and cognitive mediation (directly or implicitly expressed by tourists).
- **Focus on**
  - dynamic content production,
  - thorough analysis of the needs and behavioural pattern of the new “experience tourists”.

SmartCity objectives (1/2)

- **Major objectives and challenges**
  - To analyze behavioural patterns & information use in "experience tourism",
  - To develop integrated and collaborative systems
    - for the design, production and delivery of **dynamic multimedia content** for the customized fruition of real or virtual tourist routes, and cultural paths
      - in physical locations (e.g. in the context of art cities),
      - in virtual visits.
  - Direct target users are toursit guide editors from tourism-related publishers.

SmartCity objectives (2/2)

- **Need for a paradigm shift**
  - **From** old manual techniques and “handcraft” manufacturing solutions, characterized by:
    - high intellectual labor intensity,
    - limited productivity (the authors of tourist guides still need to revise the entire material in case of changes in the thematic finalization of the work/route)
    - large investment required throughout the entire cycle of content provisioning (cultural-historical research, writing, adapting to the rhythms and timing of the visit, geo-referencing, translation, voice, sound, compression, etc.)
    - very low flexibility in reuse and adaptation of the content.
  - **To** industrial oriented methodologies
    - suitable for large scale production,
    - aimed at different fruition target,
    - flexible in reuse and content cross-referencing,
    - set-up and management of a digital content repository.
    - *For a systematic, efficient and flexible market coverage of the national landscape of cities and places of culture, starting from Tuscany scenario*

SmartCity results

- **prototyping of innovative solutions for:**
  - the production and delivery of interactive content for the emerging tourist audio guide systems integrating
    - GPS positioning technology,
    - digital audio/video,
    - urban connectivity (Wi-Fi, WiMax)
    - magnetic sensors for orientation.
  - the presentation of audio guide's georeferenced multimedia content in 2.5-D and 3D scenarios,
    - both off-line and on-line,
    - which can be experienced in natural mood through real-time rendering solutions.

Driving forces

- **Radical transformation in cultural tourism due to:**
  - Democratization of travel and cultural consumption (though superficial),
  - Low-cost flights,
  - Single currency in many European countries,
  - Unstructured and personal tourism experience often with strong individual focus,
  - Strong reference to personal assistance and guidance instruments, both in terms of location (GPS navigation) and in terms of cognitive orientation (individual tour guides).
- **Growing interest exists for less obvious and minor touristic target**
  - constituting the long tail of the tourism and culture markets
  - e.g. the more than one hundred minor cities characterizing the Italian landscape beyond the obvious destinations such as Florence, Rome, Naples, and Venice.
- **Wide availability communication and networking equipment**
  - smartphones, PDAs, navigators, tablets,
  - emerges clearly the problem of finding and adapting content to be conveyed to the users / urban explorers.

SmartCity methodology

- **Leverage the many existing texts …**
  - in the tradition of historical and art-historical studies, and in tourism literature or local narrative,
  - reflected in the local background for each city, often of considerable value and full appeal, many of which have wider rights or are reusable according to open models such as Creative Commons,
  - These sources are those currently referred by the authors of the texts to be produced in order to feed the touristic audio guides.
- **… by valorizing and functionalizing the sources of the narrative knowledge illustrating the local cultural and tourism resources**
  - developing solutions allowing to acquire existing content into digital format, fragmenting the materials in atoms of properly indexed knowledge (corresponding to the *loci* of interest met during a visit),
  - consequently enabling sophisticated features like
    - thematic, structural and geographical search,
    - narrative aggregation,
    - personalization and customization according to the needs and preferences of users,
    - cross-referencing between different locations (e.g. the 吐ountains route, developing among different cities of the same region),
- **… to dynamically create, from the same flexible knowledge base, endless itineraries in turn adapted to the needs of the specific context**

User experience in cultural tourism (1/2)

- **The project started with an analysis phase focused on user experience and behavioral patterns for tourism fruition, trying to devise use cases**
  - modelling interactions between users and explanatory/additional content
  - modelling interactions between users and portable information devices used to access the content
- **We started by examining users behavior during fruition of tourist and cultural places,**
  - in order to model the behavior of different categories of users in the cultural spaces, both indoor (museums and other cultural containers) and open-air (cities, art and cultural districts).
- **The survey was conducted in the three test sites selected,**
  - i.e. Museo di Scienze Planetarie (Museum of Planetary Sciences) in Prato (Italy), as an example of indoor space,
  - the city of Florence (Italy), as an example of open-air fruition context)
  - the monumental complex of Santa Croce in Florence, as an intermediate case
- **Preliminary work was based on examination and study of the literature on visitor studies, to identify any behavioral patterns of use in cultural places**

User experience in cultural tourism (2/2)

- **Next, we analysed the digital content to be delivered through mobile devices during the cultural experience.**
  - the survey was conducted in conducted in the three test sites,
  - the survey was carried out using multiple choice questionnaires, interviews, and field studies,
  - It was possible to draw a clear enough picture of the dynamics of interaction between the user and the content flow to the cultural contexts examined.
- **During the research, we analyzed expectations, fruition logic, and user satisfaction during digital content fruition by mobile devices as support to a cultural visit.**
  - We also took into account the dynamics developed by fruition processes where the tour guides drive additional content (interactive insights, information, logistics and business, etc.)
  - We analyzed audio materials provided by tour guides in different fruition
- **On the basis of the results obtained, we identified a possible** model **for the relationship between users and illustrative/additional content**
  - The model developed represents the visitor using a digital guidance during the visit of a museum (or a town, or a show), as …
  - … a person with specific information needs associating a cognitive dimension to the purely aesthetic experience of visiting.
- *The current challenge is to ensure an even easier access to content that must be enriched both in quality and in quantity, in order to meet the size and value the intimate and personal dimension of the acquisition of knowledge*

Information Retrieval (1/2)

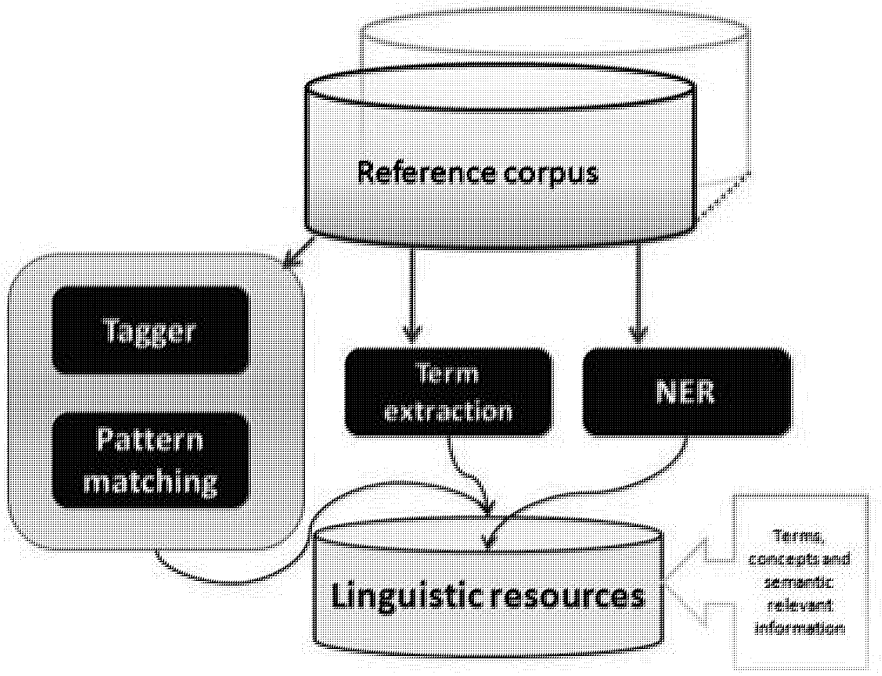
- **The second phase of the project was focused on information retrieval**
  - aimed to develop the methodological and technical foundations for a new approach to content management systems for supplying tour guides
- **Our approach focused on two aspects:**
  - descriptive, topological and semantic *thorough indexing* methods for content resources,
  - interactions between audio and physical space, and between audio and Virtual Reality Spaces.
- **Thorough indexing techniques**
  - definition and production of analytical metadata, both descriptive and semantic,
  - implemented by the standard **MAG (Administrative Metadata Management),** an interesting evolution of METS (Metadata Encoding and Transmission Standard)
    - an XML schema that allows the definition of metadata for bibliographic unit, to its logical structure, the digital images analytical components, and the transcription of OCR pages
    - can provide a complete document management of digital resources,
    - formalizes the key components and processes supporting archiving, management and preservation of digital documents.
    - refers to the Open Archive Information System (OAIS) model, including the Dublin Core metadata set.
  - Our aim was to enhance MAG format in order to implement semantic geocoding extensions.

Information Retrieval (2/2)

- **We developed a "generalized" text enrichment technique**
  - to represent explain all forms of knowledge identified in the text, through various statistical and linguistic analysis technologies available,
  - without using assumptions, structures and ontologies predefined,
  - information extracted is associated to the text in a para-textual formalism, "enrich the text" of all known lexical, semantic, factual, named entities, terminologies.
  - becomes a source of information exploitable by search engines and by classification and summarization systems available
  - TextPower technology developed by the Computational Linguistics Institute “Antonio Zampolli” (ILC) of CNR, derives from the concept of enrichment and enhancement of the text.
- **To create a specific domain reference (text) corpus that contains a network of knowledge, automatically extracted**
  - which offers authors semantic syntheses,
  - useful for finding those information sources that correspond better to own needs.
  - We divided the creation of reference corpus in two phases
  - extraction of documents provided by human experts, for the creation of a repository of documents.
  - extraction of relevant information and semantic concepts are then extracted from this first corpus.
- **Use of the extracted knowledge as basis for a new search strategy of text materials**
  - semantically relevant elements (proper names, names of institutions, names of places, etc.) used as basis for further acquisitions of documents from heterogeneous sources,
  - by using specialized crawlers that work on a bulk of text materials available on-line.

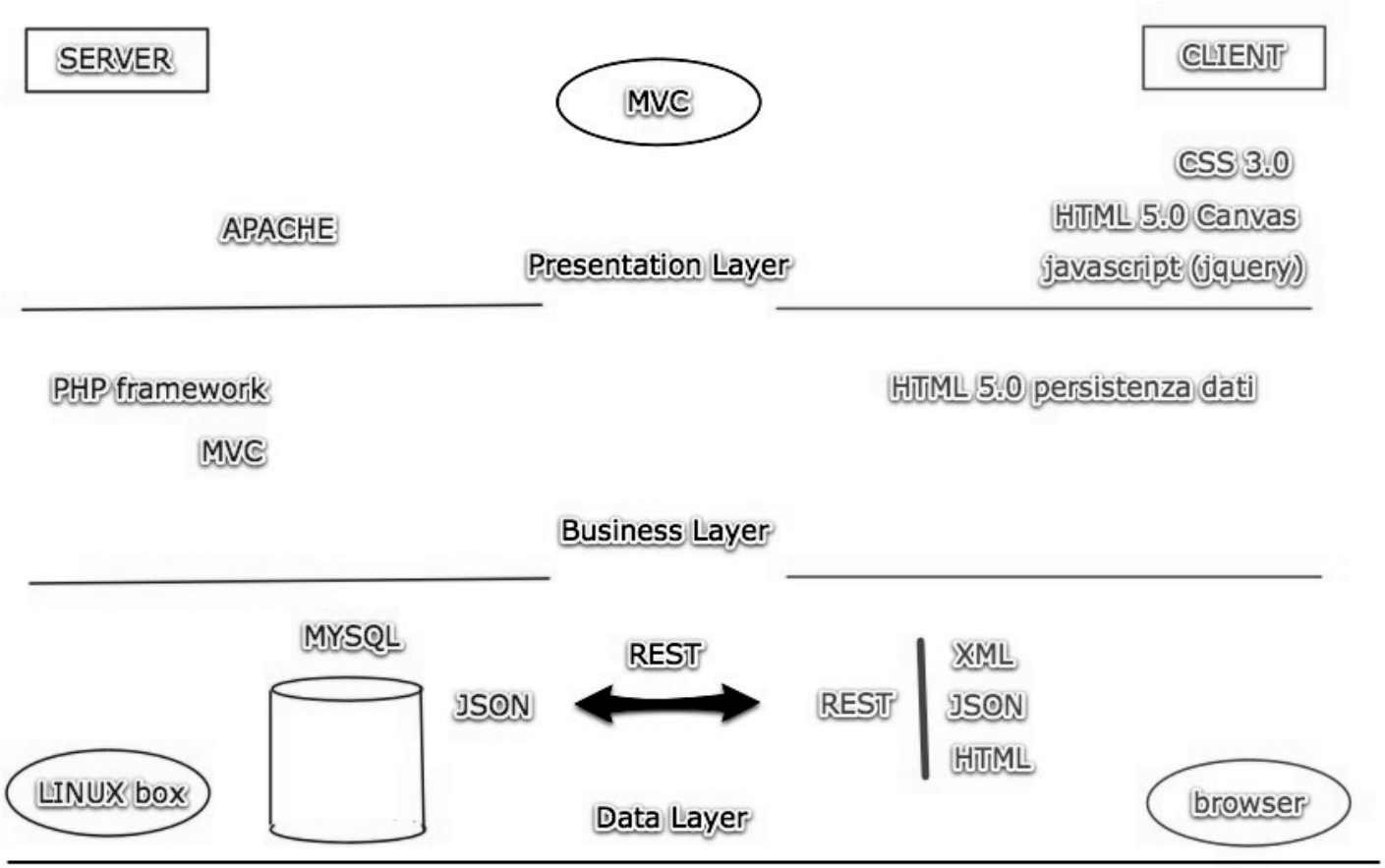
Creation of Linguistic resources

- **Schema**



- **Textual materials are indexed with DBT procedures**
  - DBT (Data Base Testuale, Textual Data Base) is specific module for the treatment and analysis of textual and lexical material
- **PiTagger identify all lemmas and relative POS in each document and associates each word to the related lemma by using the morphological component of the Italian language (PiMorfo)**
  - PiTagger executes text lemmatization and tagging and is part of PiSystem, an integrated system for processing of textual and lexical materials.
  - PiMorfo is a system for morphological analysis of the italian language

SmartCity preliminary Architecture



Conclusions and future work

- **SmartCity is addressing advanced tourist audioguide editing processes**
  - taking advantage of industrial practice, research progress and emerging web 2.0 technologies,.
  - involvement of real users (professional editors of tourist guides) in the development of the methodology and tools is essential for its acceptance in the target markets.
- **The first part of the reseach was dedicated to**
  - accurately and concretely modeling of user needs and behavior during fruition of cultural tourism events,
  - to the analysis and development of an innovative methodology for information retrieval and indexing of a large unstructured knowledge base.
- **Next steps in the project are**
  - to finalize a system architecture integrating the different system components
  - to design and implement the authoring tool for preparing multimedia tourist guides.
  - the authoring tool will be evaluated with real professional tourist guide authors.

web user interface

screenshots

SmartCity …

Thank you for your attention !

FP7 Opportunities

- **Objective ICT-2009.1.5 Networked Media and 3D Internet (ICT 4th call)**
- **Architectures / Technologies for converged and scalable networking and delivery of multimedia content**
  - Social network aspects and personalised contents
  - Multiple user roles (content producer, user or manager)
- **Networked search and retrieval**
  - P2P networks
  - Mobile device adaptation

FP7 Opportunities

- **Challenge 4. Digital libraries and contents (ICT 6th Call)**
- **ICT-2009.4.1. Digital libraries and preservation**
  - Large scale testbeds for preserving digital content
  - Advanced preservation scenarios with intelligent systems which help in preserving complex objects
  - Assembling multimedia digital libraries
  - Personalised views of libraries