Bootstrapping Ontology Evolution with Multimedia Information Extraction

http://www.boemie.org

The BOEMIE project aimed to add meaning to the ever-increasing quantities of multimedia on the Web, and provide easy access to it. BOEMIE developed novel technology for knowledge extraction and evolution, using a rich multimedia semantic model. Driven by domain-specific multimedia ontologies, BOEMIE information extraction systems identify high-level semantic features in image, video, audio and text and then fuse these features for optimal knowledge acquisition. The ontologies are continuously populated and enriched using the already extracted semantic content. This approach is called bootstrapping, since the enriched ontologies are used, in their turn, to drive the multimedia information extraction system. Figure 1 provides a high-level view of the BOEMIE approach.

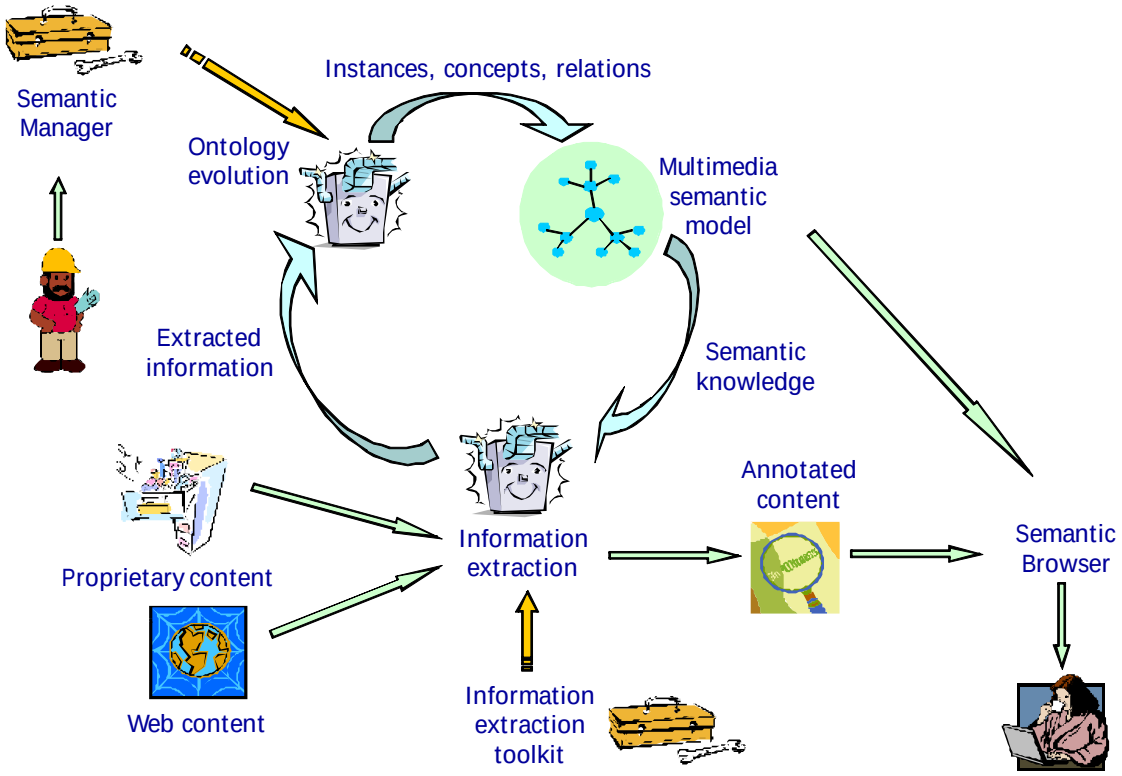

Figure 1. BOEMIE bootstrapping approach.

The first main component of BOEMIE is the **information extraction toolkit (RMDF)**, which implements the BOEMIE extraction methodology. The toolkit integrates various novel extraction methods for images, video, audio, video OCR and text, as well as abductive reasoning techniques for multimedia interpretation. Figure 2 illustrates graphically, the BOEMIE approach to information extraction.

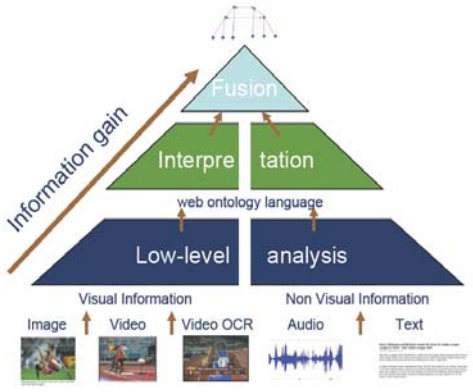

Figure 2: Extraction of metadata from multimedia in different levels of abstraction.

The second major component of BOEMIE is the **ontology evolution toolkit (OET)**, implementing the BOEMIE evolution methodology. The toolkit includes innovative ontology population, enrichment and coordination techniques. Furthermore, it provides an advanced graphical user interface that allows the domain expert,

who is possibly not an expert in knowledge technologies, to monitor and assist the ontology evolution process. Figure 3 provides a screenshot of the interface of the OET.

The third pillar of BOEMIE is the **multimedia semantic model (MSM)**, which combines the various ontologies involved in the process, and is augmented with the necessary rules and constraints to form a cohesive and consistent knowledge base. In this context, multimedia, geographic and domain ontologies have been produced and integrated in the current BOEMIE semantic model.

In the context of BOEMIE three Web-based applications have been developed, which will be demonstrated at the conference:

- **The BOEMIE Semantic Browser (BSB)** is an end-user application that uses the semantically-indexed information, in order to provide intelligent interactive browsing of the multimedia content. The application makes content active, by providing entity-specific context menus. These menus allow the user to retrieve information related to a specific entity, e.g. a person in an image. Additionally, the provided information is geo-indexed and can be retrieved through a digital map interface.
- **The BOEMIE Semantic Manager (BSM)** is an advanced application which allows the domain expert to control the semi-automated ontology evolution process. The domain expert is usually a content provider, rather than an expert in knowledge technologies. Therefore, the user interface of the application implements novel ideas for natural interaction with and editing of the acquired knowledge.
- **The BOEMIE Bootstrapping Controller (BSC)** is a back-end application to be used either by a domain expert or a system administrator. It controls the bootstrapping process, including the acquisition of new content, the extraction of information from it and the acquisition of new knowledge from the extracted information.

The three applications will be demonstrated using data from the domain of athletics. Figure 3 presents characteristic snapshots of the three applications.

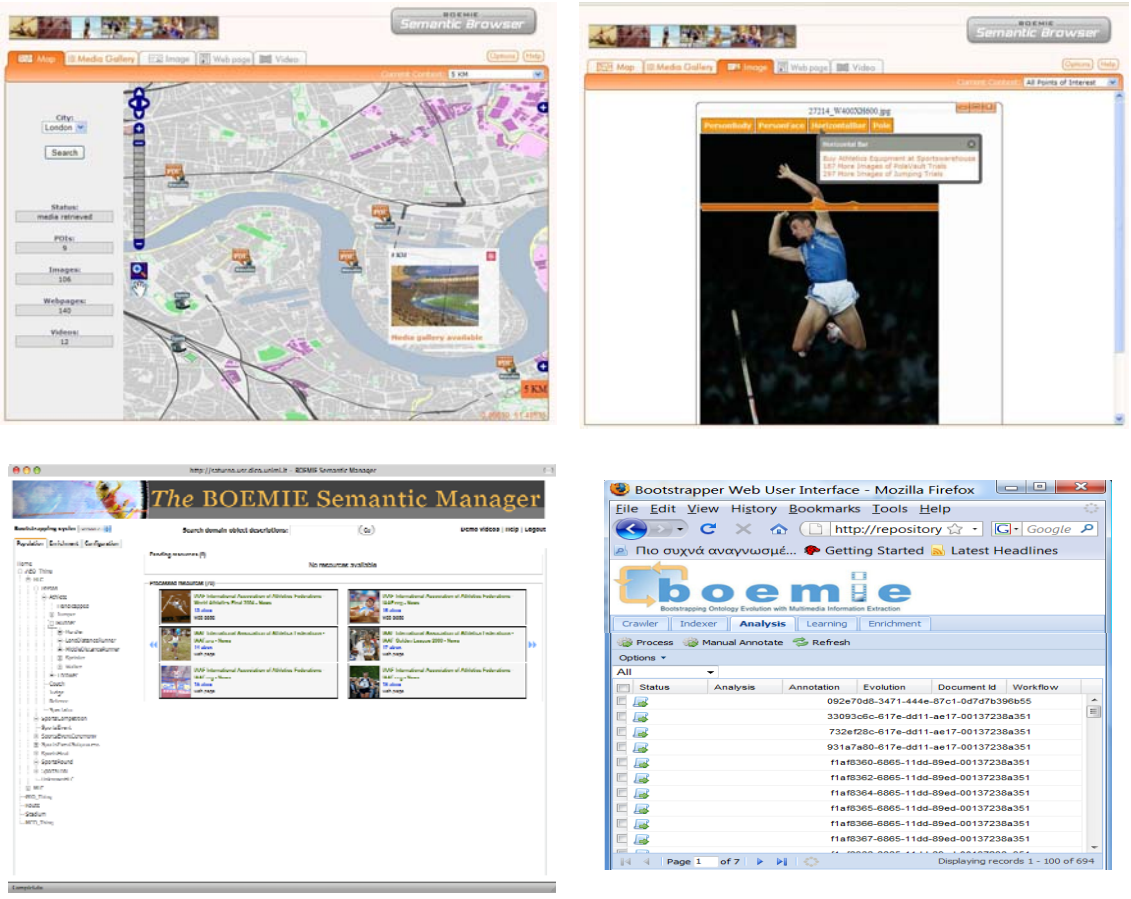

Figure 3. Snapshots of the BOEMIE Web-based applications.