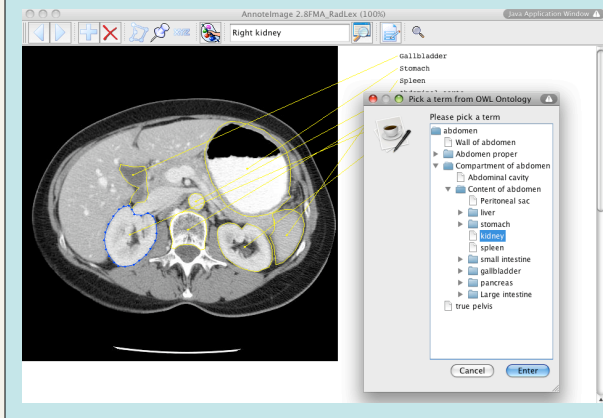


**1. INTRODUCTION.** The use of ontology in data annotation applications has gained wide acceptance. However, it generally entails either hard-coding the ontology elements within the application or embedding the ontology in the local system, both of which result in tedious maintenance and curation of data as well as complicated versioning issues. The continuing evolution of the Semantic Web now offers a third option, which is to incorporate into the application the ability to contact via standard web protocols a remote server hosting an ontology source.

**2. METHODS** We adapted AnnotelImage, an image annotation tool previously created<sup>1</sup>, to access an ontology web service. AnnotelImage had incorporate an entire reference ontology, the Foundational Model of Anatomy (FMA) ontology.<sup>2</sup> We created a materialized "view"<sup>3</sup> of the FMA called FMA-RadLex, that is customized for radiology-related image annotation tasks and converted into OWL (Web Ontology Language). AnnotelImage obtains terms from the FMA-RadLex ontology Web service, in this example the parts of the abdomen. Only structures expected to appear in a radiological image of that region are shown to the user, thereby greatly reducing the number of terms the user needs to browse.

**3. SEMANTIC WEB INTEGRATION.** We used the following SparQL query:

```
CONSTRUCT
{
  ?b fma_radlex:Preferred_Name ?name
} WHERE {
  ?a fma_radlex:Preferred_Name "abdomen"
  {?a fma_radlex:Has_regional_part ?b} UNION {?a
  fma_radlex:Has_constitutional_part ?b}
  ?b fma_radlex:Preferred_Name ?name .
}
```



**4. DISCUSSION.** Advantages of using Semantic Web ontologies for data annotation include 1) **no need to load the entire ontology** into the application at once, 2) the Web service can be a **view of a larger reference ontology**, in this case the FMA, thereby only showing the terms that are relevant to the application while retaining the advantages of a common reference ontology, 3) allows **coordinating particular terms presented with the data content** by the use of SparQL queries within the application, and 4) the ontology content is **always up-to-date**.

As for future work, a web service to save and manage image data annotations would be a logical extension to AnnotelImage, which does not currently allow saving query results. Ideally this would tie into our extensive experience with web systems for online biomedical image management.

Additionally, an application library providing a graphical frontend to walk users through creation of complex queries is needed. SparQL, the query language for the Semantic Web, is powerful but difficult to use and is not as simple or widely known as a traditional query languages such as SQL.

Supported by NIH grant HL087706

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