Appendix B: Alignment with the Annotation Ontology

The Annotation Ontology (http://code.google.com/p/annotation-ontology/) represents three pieces of information for an annotation: the annotation context \( (\text{i.e., what is being described}) \), the topic \( (\text{i.e., the description of the context}) \), and the annotation itself, which connects the other two. As our model focuses on annotations, their denoted knowledge representations, and the provenance of these, we present an alignment of our model with the annotation and topic portions of the AO. We place no requirements on the representation of context (although see discussion in Related Work section). The following is an RDFS alignment of our model with the AO in N3 notation.

```n3
@prefix kiao: <http://kabob.ucdenver.edu/iao/>
@prefix ao: <http://purl.org/ao/core/>
@prefix aot: <http://purl.org/ao/types/>
@prefix rdfs: <http://www.w3.org/1999/02/rdf-syntax-ns#>
@prefix rdfg: <http://www.w3.org/2004/03/trix/rdfg-1/>

The class ao:Annotation is a more specific kind of kiao:Annotation while kiao:RdfResourceAnnotation and kiao:RdfGraphAnnotation are more specific than ao:Annotation, thus the following relations hold:

ao:Annotation rdfs:subClassOf kiao:Annotation.

kiao:RdfResourceAnnotation rdfs:subClassOf ao:Annotation.

kiao:RdfGraphAnnotation rdfs:subClassOf ao:Annotation.

AO also has several more specific annotation types that could be aligned individually with our model; however, the semantic implications of doing so are not clear. In particular, the AO has the class aot:Qualifier, which is used to “express a relationship between the object of the annotation and a well-defined semantic entity.” In our model, kiao:RdfResourceAnnotation meets that definition, so we can at least state that kiao:ResourceAnnotation is a subclass of aot:Qualifier:
kiao:ResourceAnnotation rdfs:subClassOf aot:Qualifier.

It is unclear if the inverse relation could be made as well, in which case kiao:ResourceAnnotation and aot:Qualifier would be equivalent.

kiao:RdfGraphAnnotation and ao:GraphAnnotation can be declared to be equivalent:

kiao:RdfGraphAnnotation rdfs:subClassOf ao:GraphAnnotation.
ao:GraphAnnotation rdfs:subClassOf kiao:RdfGraphAnnotation.

If AO annotations are being converted to KIAO annotations, there are several ambiguities. AO has two relations ao:hasTopic and ao:body. When an AO annotation has both relations it is unclear what are the intended semantics, and it is likely each would convert independently into KIAO annotations. The relation ao:hasTopic implies that annotation should be translated into a kiao:RdfResrouceAnnotation with a corresponding iao:denotes assertion.

We can assert that ao:hasTopic is also a subproperty of iao:denotes:

ao:hasTopic rdfs:subPropertyOf iao:denotes.

Thus, each ao:hasTopic assertion translates to an iao:denotes assertion.

The relation ao:body is underspecified. This relation can have as an object a Resource, a Graph, or even literal strings. In the context of an ao:GraphAnnotation it is assumed this relation points to a Graph, and thus in this context only ao:body could be translated to a kiao:RdfGraphAnnotation with a corresponding iao:denotes assertion to the graph. In all other contexts the meaning of this relation cannot be unambiguously inferred, although it can generally translated into an iao:denotes assertions (expect in the case of string literals).
For the conversion of KIAO annotations to OA annotations, one may think that
\texttt{iao:denotes} could straightforwardly be made subproperty of \texttt{ao:body}:

\texttt{iao:denotes rdfs:subPropertyOf ao:body}.

Thus, each \texttt{iao:denotes} assertion would translate into a \texttt{ao:body} assertion.

However, \texttt{iao:denotes} is defined to hold not only among annotations but more
generally among information content entities, while \texttt{ao:hasTopic} and \texttt{ao:body}
only pertains to annotations. If this translation was broadly accepted, it is possible
that \texttt{iao:denotes} assertions pertaining to information content entities other than
annotations would be erroneously converted to \texttt{ao:hasTopic} or \texttt{ao:body}
assertions, which would necessarily pertain to annotations. The only generally correct
translation is to convert all \texttt{iao:denotes} assertions \textit{for annotations only} (i.e., with
annotations as the subjects of the assertions) to \texttt{ao:body} assertions. In the context of
instances of \texttt{kiao:RdfResourceAnnotation} it is likely more appropriate to
convert the corresponding \texttt{iao:denotes} assertion into a \texttt{ao:hasTopic} assertion.