

Accounting for Context in Markup: Which Situation, Whose Semantics?

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Markup and meaning

- Markup systems let us control the assignment of meaning to the structures that appear in documents.
- Thus the output of markup systems both resemble artificial languages and retain many of the features of natural languages:
 - human-readable labels
 - chunks of natural language text appear to system users
 - a back-and-forth where information is exchanged between agents via linguistic structures.

Scoping out the problem space

- I'm going to be talking about markup structures in descriptive metadata.
- In particular, colloquial metadata records.

By colloquial metadata records I mean:

"metadata records presented in a serialization language with delimiter conventions and a vocabulary of attributes and values but which does not have an associated formal semantics determining how information carried by the delimited tokens within a record should be expressed in a logic-based knowledge representation language (such as RDF or some dialect of first order logic.)"

"The Logical Form of a Metadata Record." Karen M. Wickett and Allen H. Renear.
Poster at the ACM/IEEE Joint Conference on Digital Libraries. Washington, D.C., June 2012.



Why Situation Semantics?

- Situation semantics was developed to support the Relational Theory of Meaning:
 - The meaning of an expression ϕ is conceived as a relation between situations, namely, between an utterance u and a described situation s , written $u [\phi] s$.”
- Metadata records are expressions that describe situations.
 - the situation that a metadata record describes is one in which:
 - the resource being described exists
 - and has the properties ascribed to it by the record

Expressions and utterances

- The relational theory of meaning refers to the utterance of an expression
 - Expressions are timeless
 - depending on your ontological commitments, expressions may not even require the existence of humans or information systems to exist
 - Utterances happen at some time
 - ... and are associated with some agent
 - ... usually with some purpose
- Thinking about metadata records as utterances brings in context.

Purposeful markup

- Metadata records function to serve a purpose
 - Purpose is frequently mentioned in discussions and definitions of metadata quality, but not typically modeled explicitly
 - The same expression may be functioning in service of different purposes in different scenarios.
- My goal is to expose how purpose shapes the assignment of meaning, by examining three metadata scenarios:
 - A documentary scenario
 - A transport scenario
 - A discovery scenario
- The distinguishing factors between these scenario lay in the purpose and scoping for the metadata record.

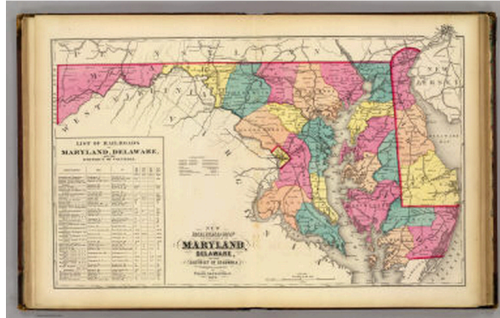
Documentary Metadata Scenarios

- In a documentary scenario, the purpose is to make assertions about an object in order to describe what it is.
 - the object of attention is a resource
 - resources may be objects of any kind (intellectual, visual, physical)
 - and come from a variety of domains (cultural, scientific, business).
- A metadata creator makes assertions about an object
 - pertaining to the resource itself, logical or physical parts of it, its creator, etc.
 - resulting in a descriptive record
 - that encodes the assertions about the resource in a consistent way
 - accessible within an information system
 - and, in some sense, “stands for” the resource.



documentary example

Detail View: David Rumsey Historical Map Collection: New railroad map of the states of Maryland, Delaware, & District of Columbia.



Author: Gray, Frank Arnold
Date: 1873
Short Title: New railroad map of the states of Maryland, Delaware, & District of Columbia.
Publisher: Stedman, Brown & Lyon
Publisher Location: Baltimore
Type: Atlas Map
Obj Height cm: 40
Obj Width cm: 62
Scale 1: 633,600
Note: Hand col. lithographed map. Includes table of railroads in Maryland, Delaware and D.C. with lengths. Prime meridian: Washington.
State/Province: Delaware
State/Province: District of Columbia
State/Province: Maryland
City: Washington (D.C.)
Subject: Railroad
Full Title: New railroad map of the states of Maryland, Delaware, and the District of Columbia. Compiled and drawn by Frank Arnold Gray, 1873. (Published by Stedman, Brown & Lyon, Baltimore. 1873)
List No: 2239.006
Page No: (43-44)
Series No: 9
Publication Author: Gray, Orlando Willis



Transport Metadata Scenarios

- The purpose of metadata in a transport scenario is to maintain the integrity of a record across a change in technical environments.
 - The object of attention is a metadata record (or a set of them).
- A system packages up metadata and sends it off to be received by another system.
 - often using a standard "wrapper" that can be generated in response to a server request
 - and operates on top of a transmission protocol.

transport example






```
▼<OAI-PMH xmlns="http://www.openarchives.org/OAI/2.0/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.openarchives.org/OAI/2.0/
http://www.openarchives.org/OAI/2.0/OAI-PMH.xsd">
  <responseDate>2015-07-22T20:53:43Z</responseDate>
  <request verb="GetRecord" identifier="oai:lcoal.loc.gov:loc.gmd/g3791p.rr002300"
  metadataPrefix="oai_dc">http://memory.loc.gov/cgi-bin/oai2_0</request>
  ▼<GetRecord>
    ▼<record>
      ▼<header>
        ▼<header>
          <identifier>oai:lcoal.loc.gov:loc.gmd/g3791p.rr002300</identifier>
          <datestamp>2005-11-21T17:08:59Z</datestamp>
          <setSpec>gmd</setSpec>
        </header>
      ▼<metadata>
        ▼<oai_dc:dc xmlns:oai_dc="http://www.openarchives.org/OAI/2.0/oai_dc/"
          xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
          instance" xsi:schemaLocation="http://www.openarchives.org/OAI/2.0/oai_dc/
          http://www.openarchives.org/OAI/2.0/oai_dc.xsd">
          ▼<dc:title>
            New railroad map of the state of Maryland, Delaware, and the District of Columbia.
            Compiled and drawn by Frank Arnold Gray.
          </dc:title>
          <dc:creator>Gray, Frank Arnold.</dc:creator>
          <dc:subject>Railroads--Middle Atlantic States--Maps.</dc:subject>
          ▼<dc:description>
            Shows drainage, canals, stations, cities and towns, counties, canals, roads
            completed, narrow gauge and proposed railroads with names of lines. Includes list of
            railroads.
          </dc:description>
          <dc:description>Scale 1:633,600.</dc:description>
          <dc:description>LC Railroad maps, 230</dc:description>
          <dc:description>Description derived from published bibliography.</dc:description>
          <dc:publisher>Philadelphia</dc:publisher>
          <dc:date>1876</dc:date>
          <dc:type>image</dc:type>
          <dc:type>map</dc:type>
          <dc:type>cartographic</dc:type>
          <dc:identifier>http://hdl.loc.gov/loc.gmd/g3791p.rr002300</dc:identifier>
          <dc:language>eng</dc:language>
          <dc:coverage>United States--Middle Atlantic States</dc:coverage>
        </oai_dc:dc>
      </metadata>
    </record>
  </GetRecord>
</OAI-PMH>
```

Discovery Metadata Scenarios

- The purpose of a metadata record in a discovery scenario is to address the information need of a user
 - the object of attention is the user's information need
- in response to a query, the system provides a user with a set of metadata records
 - for objects that have a good chance of addressing the core information need

discovery example

HomeCollectionsMapTimelineAboutApps

View:     frank arnold gray map 

Search Results

Your search for frank arnold gray map returned 19 results.

Items per page: 10 20 30 40 50 Sort by: Relevance 1 2

Refine search

By Format

image 17

Contributing Institution

David Rumsey 17

University of Nevada, Reno, University Libraries 2

Partner

David Rumsey 17

Mountain West Digital Library 2

By Date

From: Month Day Year

To: Month Day Year

Update

By Language

English 2

By Location

Philadelphia 11

World 2

United States 2


South Paris, Maine 2

Reno (NV) 2

More »

IMAGE


New rail road map of the State of Ohio, compiled and drawn by Frank Arnold Gray, 1872. (Published by Stedman, Brown & Lyon, Cincinnati. 1872. Entered ... 1872, by H.F. Walling, and O.W. Gray, and H.H. Lloyd & Co. ... Washington) Gray, Frank Arnold; Gray, Orlando Willis; Lloyd, H.H.; Walling, H. F



[View Object](#)

IMAGE


New railroad map of the states of Maryland, Delaware, and the District of Columbia. Compiled and drawn by Frank Arnold Gray, 1873. (Published by Stedman, Brown & Lyon, Baltimore. 1873) Gray, Frank Arnold; Gray, Orlando Willis; Lloyd, H.H.; Martenet, Simon J.; Walling, H. F



[View Object](#)

IMAGE


Gray's New Map of Europe. By Frank A. Gray. (inset) Outline Ethnographical Map of Europe Gray, Frank Arnold; Gray, Orlando Willis



[View Object](#)


IMAGE

Gray's New Map of Ohio. By Frank A. Gray. Philadelphia: O.W. Gray & Son. (inset) Physical Map of Ohio. (inset) Vicinity of Cincinnati. (inset) Historical Map of Ohio. (inset) Vicinity of Cleveland. (inset) Vicinity of Toledo. (inset) City of Columbus, the Capital of Ohio Gray, Frank Arnold; Gray, Orlando Willis



[View Object](#)

Prime meridians Washington D.C. and Greenwich. Relief shown by hachures. Historical map inset shows distribution of Indian tribes: Iroquois, Delawares, Shawnees, Miamis, Wyandots, and Ottawas. First edition was 1875. The maps here are identical to our 1878 Gray's Atlas of the United States. *caveat that this map has 17 large scale maps of Virginia Cities in the rear with a*



What's this *situation semantics*?

- General machinery for characterizing situations
- Situations can be classified into event types.
 - With complex indeterminates that describe the role of an individual in the context of the event type
- Discourse situations are the event type of interest for today.

How to talk about situations

- the general machinery for characterizing situations uses:
 - individuals,
 - relations, and
 - space-time locations (on which basic ordering and inclusion operations are defined)
- These primitives are combined together into constituent sequences, which are associated with one of two truth values (or noted as undefined).

Situations

- We can express any number facts about a situation by
 - constructing a constituent sequence out of an n -ary relation and n individuals and
 - associating that sequence with one of the two truth values.
- So, with the one place relation m , the two place relations j and k , and individuals a , b , and c , we might have the situation s , with:

$s \quad := \quad \begin{array}{l} j, a, b ; \text{yes} \\ k, b, c ; \text{no} \\ m, a ; \text{yes} \end{array}$

Event types

- It is useful to generalize over situations that have elements in common, using event types.
 - using basic indeterminates and roles.
- The basic indeterminates come in the same three flavors as the primitives (locations, individuals, relations).
- Roles are complex indeterminates that are defined for specific event types.
- When all indeterminates from an event type are anchored to specific individuals, relations, or locations, the result is a course of events.

Discourse situations

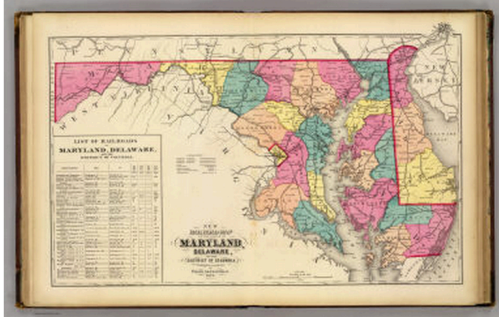
- A discourse situation is an event-type DU with:

DU := at l : speaking, a ; yes
 addressing, a, b ; yes
 saying, $a, [\alpha]$; yes

- where the roles of:
 - speaker (a),
 - addressee (b),
 - discourse location (l),
 - and expression ($[\alpha]$)
- ... are all uniquely anchored.

A Documentary Discourse Situation

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the expression (α):
the descriptive metadata record in its entirety

the discourse location (l):
anchored by the system interactions necessary to create the record

the speaker (a):
the metadata creator

the addressee (b):
the information system that holds the metadata record

A Transport Discourse Situation

```
▼<OAI-PMH xmlns="http://www.openarchives.org/OAI/2.0/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.openarchives.org/OAI/2.0/
http://www.openarchives.org/OAI/2.0/OAI-PMH.xsd">
  <responseDate>2015-07-22T20:53:43Z</responseDate>
  <request verb="GetRecord" identifier="oai:lcoal.loc.gov:loc.gmd/g3791p.rr002300"
  metadataPrefix="oai_dc">http://memory.loc.gov/cgi-bin/oai2_0</request>
  ▼<GetRecord>
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      ▼<metadata>
        ▼<oai_dc:dc xmlns:oai_dc="http://www.openarchives.org/OAI/2.0/oai_dc/"
          xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
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http://www.openarchives.org/OAI/2.0/oai_dc.xsd">
          ▼<dc:title>
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          <dc:creator>Gray, Frank Arnold.</dc:creator>
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          ▼<dc:description>
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          </dc:description>
          <dc:description>Scale 1:633,600.</dc:description>
          <dc:description>LC Railroad maps, 230</dc:description>
          <dc:description>Description derived from published bibliography.</dc:description>
          <dc:publisher>Philadelphia</dc:publisher>
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        </oai_dc:dc>
      </metadata>
    </record>
  </GetRecord>
</OAI-PMH>
```

The expression (α):
the OAI-PMH document

the discourse location (β):
anchored by a transport
event

the speaker (a):
the originating information
system

the addressee (b):
the receiving information
system

A Discovery Discourse Situation

Search Results

Your search for frank arnold gray map returned 19 results.

Items per page: 10 Sort by: Relevance 1 2

Refine search




By Format 


image 17

Contributing Institution 


David Rumsey 17
University of Nevada, Reno, University Libraries 2

Partner 


David Rumsey 17
Mountain West Digital Library 2

By Date 






From
To

By Language 

English 2


By Location 


Philadelphia 11
World 2
United States 2
South Paris, Maine 2
Reno (NV) 2
[More >](#)

View     frank arnold gray map 

IMAGE


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[View Object](#) 

IMAGE


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[View Object](#) 

IMAGE

Gray's New Map of Europe. By Frank A. Gray. (inset) Outline Ethnographical Map of Europe Gray, Frank Arnold; Gray, Orlando Willis




Prime meridians Washington D.C. and Greenwich. Relief shown by hachures. Full color. First edition was 1875. The maps here are identical to our 1878 Gray's Atlas of the United States, except that this copy has 17 large scale maps of Virginia Cities in the rear with a "Professional Directory of Patrons. Virginia." The 1878 U.S. Atlas has a large map of New England in the rear and a directory of patrons for Rhode Island and Massachusetts. It is ...

[View Object](#) 

IMAGE

Gray's New Map of Ohio. By Frank A. Gray. Philadelphia: O.W. Gray & Son. (inset) Physical Map of Ohio. (inset) Vicinity of Cincinnati. (inset) Historical Map of Ohio. (inset) Vicinity of Cleveland. (inset) Vicinity of Toledo. (inset) City of Columbus, the Capital of Ohio Gray, Frank Arnold; Gray, Orlando Willis



Prime meridians Washington D.C. and Greenwich. Relief shown by hachures. Historical map inset shows distribution of Indian tribes: Iroquois, Delaware, Shawnees, Miami, Wyandots, and Ottawas. First edition was 1875. The maps here are identical to our 1878 Gray's Atlas of the United States. ...

The expression (α):
the subset of the results list,
generated from the metadata
record

the discourse location ($/$):
anchored by a user issuing a
query and the generation and
display of the results list

the speaker (a):
the search engine

the addressee (b):
the user



Summing up

- how communication is working in these scenarios
 - documentary scenarios:
 - the speaker is a human agent
 - the addressee is an information system
 - transport scenarios:
 - both the speaker and addressee are information systems
 - discovery scenarios:
 - the speaker is an information system
 - the addressee is a human agent

Going forward

- Accounting for metadata creation
 - selection and use of data structure standards
 - e.g. Dublin Core
 - selection and use of data content standards
 - e.g. AAT, local controlled vocabularies, identifier generation tools
- This will require incorporating the notions of
 - speaker's connections, which account for referential aspects of language
 - settings, which account for how the assignment of meaning in one part of an utterance shapes meaning of later parts
- Situations and RDF



Thank you!

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