Ontology for Analytic Claims in Music (OMAC)

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Overview

Part I: Research context and OMAC ontology (main)

Part II: Insights on ontological analysis (brief)

Conclusions

The Concert (1623) by Gerard van Honthorst

Part I: Research context and OMAC ontology

General research context

Semantic Web languages, models, and technologies:

- Used to handle musical data on the basis of an **explicit formal** treatment of domain experts' knowledge

See the paper for some references, as well as the following **Web repository**:

- MusoW - Musical Data on the Web: https://musow.kmi.open.ac.uk/ (by Enrico Daga et al.)

From music to musicology

The world of music is highly heterogeneous:

- Different **types of entities** (musical compositions, scores, editions, performances, performing requirements, composers, performers, etc.)
- Different **genres**, **styles**, **cultures**, **historical periods**, etc.

It is becoming common for scholars to express:

- **Features** of musical entities like who is the composer of a composition, when a composition was composed, what are its performing requirements … but also …

- **Observations** (aka **scholarly/analytic claims)**. For example:
  - About authorship
  - About similarity
  - About date, etc.

Our work

- To provide an ontology **of music for musicology** that represents both basic aspects of musical entities as well as scholarly analytic claims
- Main focus on: **Early Music** (1200-1600)*

In such a way to **represent** and **share** research results on Linked Data publishing platforms

Development and driving insights based on: **CRIM - Citations: The Renaissance Imitation Mass Project** (ACLS grant - American Council of Learned Societies)

CRIM

Citations: The Renaissance Imitation Mass Project

https://crimproject.org/

Ontology for Analytic Claims in Music (OMAC)

Ontology in OWL

Reuse **existing resources**, e.g.:

- DBpedia ontology: for some classes and relations (e.g., dbp:birthPlace, etc.)
- Dublin Core: for annotations (e.g., dcterms:title, etc.)
- SKOS: for labeling (e.g., skos:prefLabel, etc.)
- VIAF: (testing) to populate the ontology with specific musical works and composers

Available on GitHub: https://github.com/HCDigitalScholarship/OMAC

Competency questions (CQs)

Some CQs driving the development of the ontology:

- Who is the composer of musical work *x*?
- When was musical work *x* composed?
- Which authorial parts (sections and subsections) do *x* have (if any)?
- What are the performing forces of musical work *x*?

Some common features of musical entities

- Which observations are about musical work x?
- What is the model for musical work x?
- What is the derivative of musical work x?
- What is the musical schema of analytic segment x?

Observations (relative to claim-classes in CRIM)

A quick note - Authorial Structure

- Musical **Work** (a whole composition), e.g.,
  - *Missa je suis desheritèe* (MJSD; by Jean Guyon) **[with sections and subsections]**
  - *Ite rime, dolenti* (Cipriano de Rore) **[with sections only]**
  - *Tota pulchra es* (by Claudin de Sermisy) **[no further decomposed]**

- Musical (authorial) **sections,** e.g.,:
  - *Kyrie_MJSD*, *Gloria_MJSD*, *Credo_MJSD*, *Sanctus_MJSD*, and *Agnus Dei_MJSD* (customary five liturgical sections of the Ordinary of the Catholic Mass)

- Musical (authorial) **subsections**, e.g.,:
  - A Kyrie has three subsections: *Kyrie1_MSJD*, *Christe_MSJD*, *Kyrie_MSJD*

A quick note – Authorial Structure

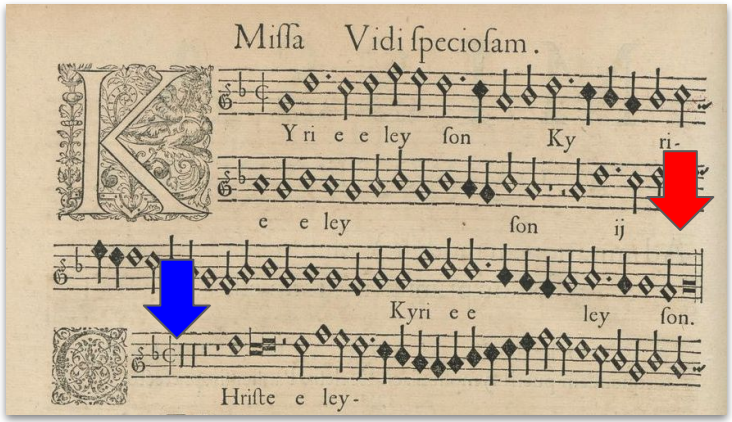
An example from Renaissance Paris:

Two sections from the **first movement** (Kyrie) of the

Missa Vidi speciosam, by **Mathieu Sohier**.

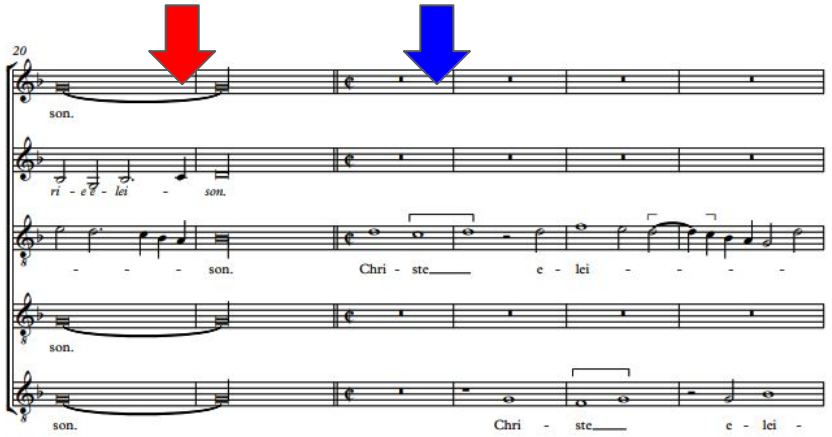
They are distinct but inseparable parts of a single

movement of a larger work.



End of Kyrie

Beginning of Christe

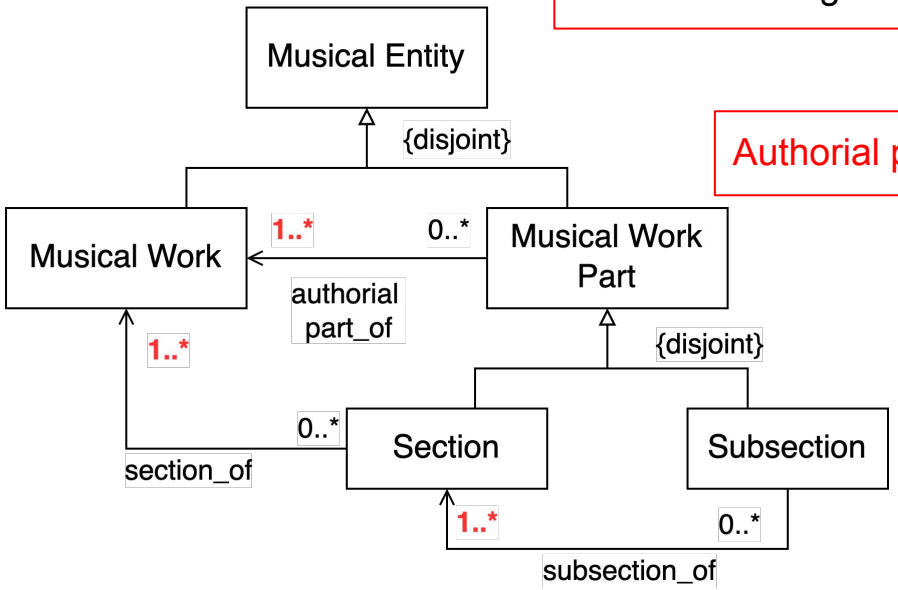


Musical Work (partial view)

Controversial among music scholars whether the same authorial part can be related to **multiple** entities.

- We tend to think that this is **not** possible
- The **identity** of an authorial part is bound to a specific author/musical entity
- In principle, relations of **derivations** could be included to tell that, e.g., a section derives from another one

UML Class Diagram model



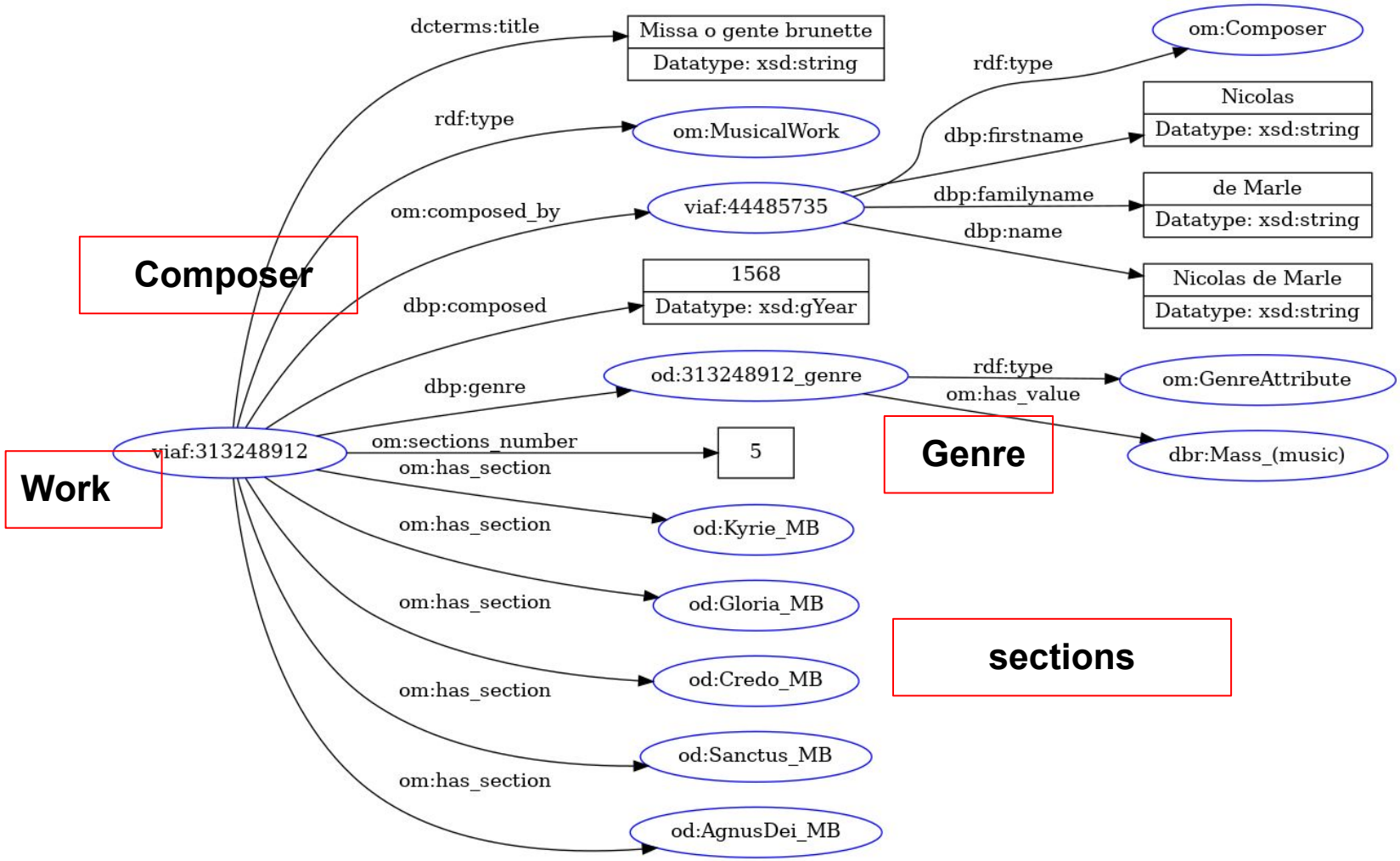
At the current state, the ontology does **not** use cardinality restrictions for the authorial structure of musical entities

OWL 2 object property chains like:

- has section *o* has subsection → has subsection

Example of mass from CRIM's project

See: http://crimproject.org/masses/CRIM_Mass_0003/


dcterms:title
Missa o gente brunette
Datatype: xsd:string
rdf:type
om:MusicalWork
om:composed_by
viaf:44485735
rdf:type
om:Composer
dbp:firstname
Nicolas
Datatype: xsd:string
dbp:familyname
de Marle
Datatype: xsd:string
dbp:name
Nicolas de Marle
Datatype: xsd:string
Composer
dbp:composed
1568
Datatype: xsd:gYear
dbp:genre
od:313248912_genre
rdf:type
om:GenreAttribute
om:has_value
dbr:Mass_(music)
Genre
viaf:313248912
om:sections_number
5
om:has_section
Work
om:has_section
od:Kyrie_MB
om:has_section
od:Gloria_MB
om:has_section
od:Credo_MB
om:has_section
od:Sanctus_MB
om:has_section
od:AgnusDei_MB
sections

Observations (aka claims)*

Some aspects of observations:

- An observation represents the properties under which an entity is classified **by an agent** on the basis of certain procedures, research studies, background knowledge, socio-cultural contexts, etc.
- Do not necessarily represent true facts (e.g., mistake in authorship attribution)

Also, there can be multiple observation about the same entities – expressed by different scholars (sometimes independently from each other). Hence, it is possible that obs:

- Are not compatible
- Contradict each other
- Represent information at different abstraction levels
- Are reviewed in time

*Based on on-going work with **Claudio Masolo** and **Roberta Ferrario** at **ISTC-CNR**

Observations in CRIM

In the context of the CRIM project, musicologists focus on two types of obs:

- About structure
- About similarity

For some technical readings, see:

https://sites.google.com/haverford.edu/crim-project/vocabularies/musical-types

https://sites.google.com/haverford.edu/crim-project/vocabularies/relationship-types

Observations in OMAC (insights)

Representing claims requires considering at least:

- Agent (who), time (when), "content" (what)

Some modeling elements OMAC for the general modeling of observations:

- Observation (class)
- observed_by, concerns (object properties); stated_at (data property)

+ specific claim-classes/relations; e.g., **StructureObservcations**, **SimilarityObservations** (covers various subclasses):

- has_model, has_derivative + specific CRIM relations

An observation from the CRIM Project

About Structure

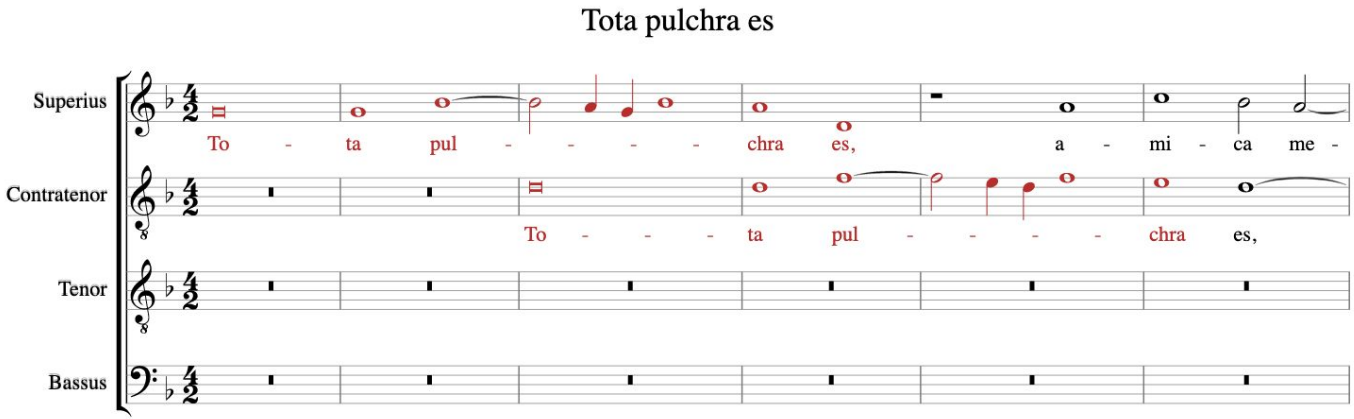
Observation <1>

Observer: Ian Lorenz

<R1> Quotation — Model for <2> Missa Tota pulchra es: Credo

Score: Claudin de Sermisy, Tota pulchra es

< start >



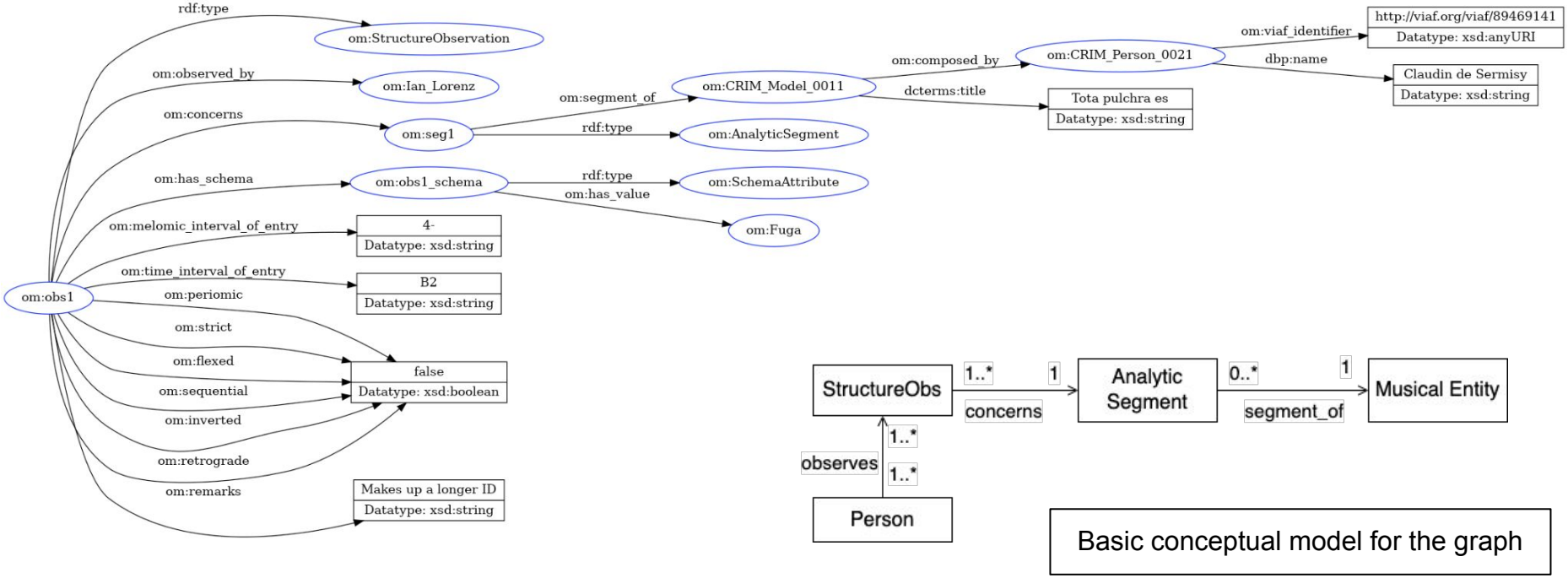
Fuga

Voices:
1: Superius
2: Contratenor

Entry intervals: 4-
Time intervals: B2
Regularity: -
Inverted: False
Periodic: False
Retrograde: False
Sequential: False
Remarks: Makes up a longer ID

See data here: https://crimproject.org/observations/1/

In RDF (data) graph according to OMAC



Basic conceptual model for the graph

A CRIM Relationship

About Similarity

Relationship <R2>

[Duplicate this relationship]

Observer: Ian Lorenz

Non-mechanical transformation

Extent: -
Activity: -
Sounding in different voices: -
Whole passage transposed: -
Whole passage metrically shifted: -
Melodically inverted: -
Retrograde: -
New counter subject: False
Old counter subject shifted metrically: True
Old counter subject transposed: False
Double or invertible counterpoint: -
New combination: False
Self: -

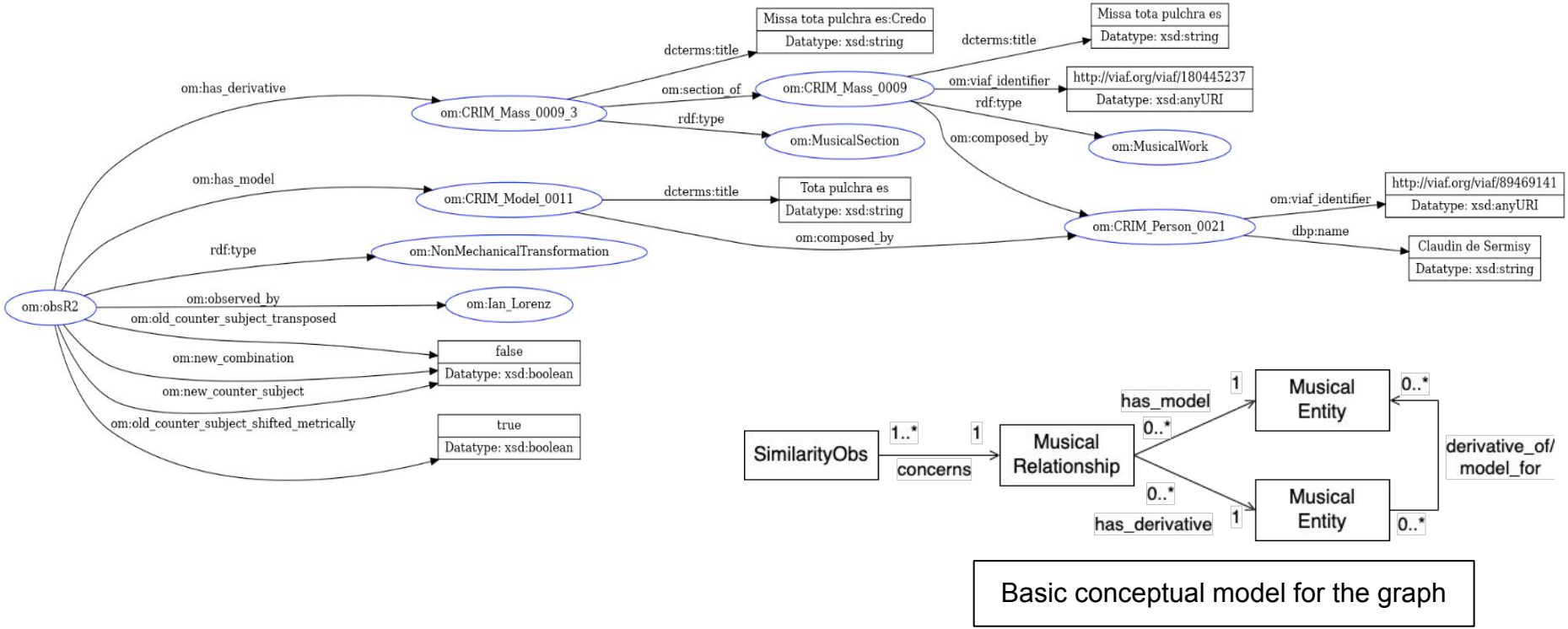
Remarks: Shifted and transposed

Model: Claudin de Sermisy, Tota pulchra es

Derivative: Missa Tota pulchra es: Credo

See **data** here: https://crimproject.org/relationships/2/

In RDF (data) graph according to OMAC



Basic conceptual model for the graph

Part II: Insights on ontological analysis

What is a musical work?

This is **hotly debated** in, e.g., philosophy and musicology (see paper for references).

In different contexts, including common sense, people often classify, e.g., multiple scores as ***alternatives*** for the same work (≅ literary works in different editions)

But then:

- **What kind** of entity is a musical work? **Plethora** of opinions, e.g.,
  - **a.** Abstract Platonic entity
  - **b.** Mental entity in individuals' minds
  - **c.** etc.

For some discussions, see: Sanfilippo, E. M. (2021). Ontologies for information entities: State of the art and open challenges. *Applied ontology*, *16*(2), 111-135.

What is a musical work?

> “[W]ithin the tradition of what we call [...] Western art music, it has seemed axiomatic until quite recently that the basic unit of artistic production and consumption is the **‘work’** - a hard-edged artefact with a clear identity. [T]his common-sense or perhaps naive view is increasingly coming **under fire** from several sides.”
>
> Talbot, M. (2000). Introduction, in: The musical work: reality or invention? Liverpool University Press

Scholars of **Renaissance music** often confront rival versions of a musical text that strain our very notion of the **stable work** in the first place.

What is a musical work?

Our intuition:

- From a library science perspective, a musical work is a **documentary entity** useful for classification purposes to support computational tasks, e.g., relative to data management
- **But then** … the classification of, e.g., multiple scores as alternatives for the same work is an **interpretative act**; e.g., experts sometimes disagree on how to classify a work and its arrangement(s)
- From this perspective, a musical work is a **cultural artifact** relative to specific interpreting communities

Wrt to OMAC:

- The cultural nature of (more generally) **musical entities** is not made explicit in the axiomatic structure since this would requires a heavier logical machinery (see: Masolo, C., Sanfilippo, E. M., Ferrario, R., & Pierazzo, E. (2021). Texts, Compositions, and Works: A Socio-Cultural Perspective on Information Entities. In JOWO 2021, CEUR vol. 2969.)

Conclusions

Main result:

- OMAC - Semantic Web ontology in OWL - of music for musicology to express features of musical entities but also musicological claims

Future work includes:

- Further refine/test OMAC wrt CRIM and other collaborations
- Implement the ontology in an application setting relative to CRIM; use of an **Ontology-Based Data Access** (OBDA) architecture based on OnTop to connect OMAC to the project relational database in such a way to make some portions of the project data available in RDF (see next slides for insights)

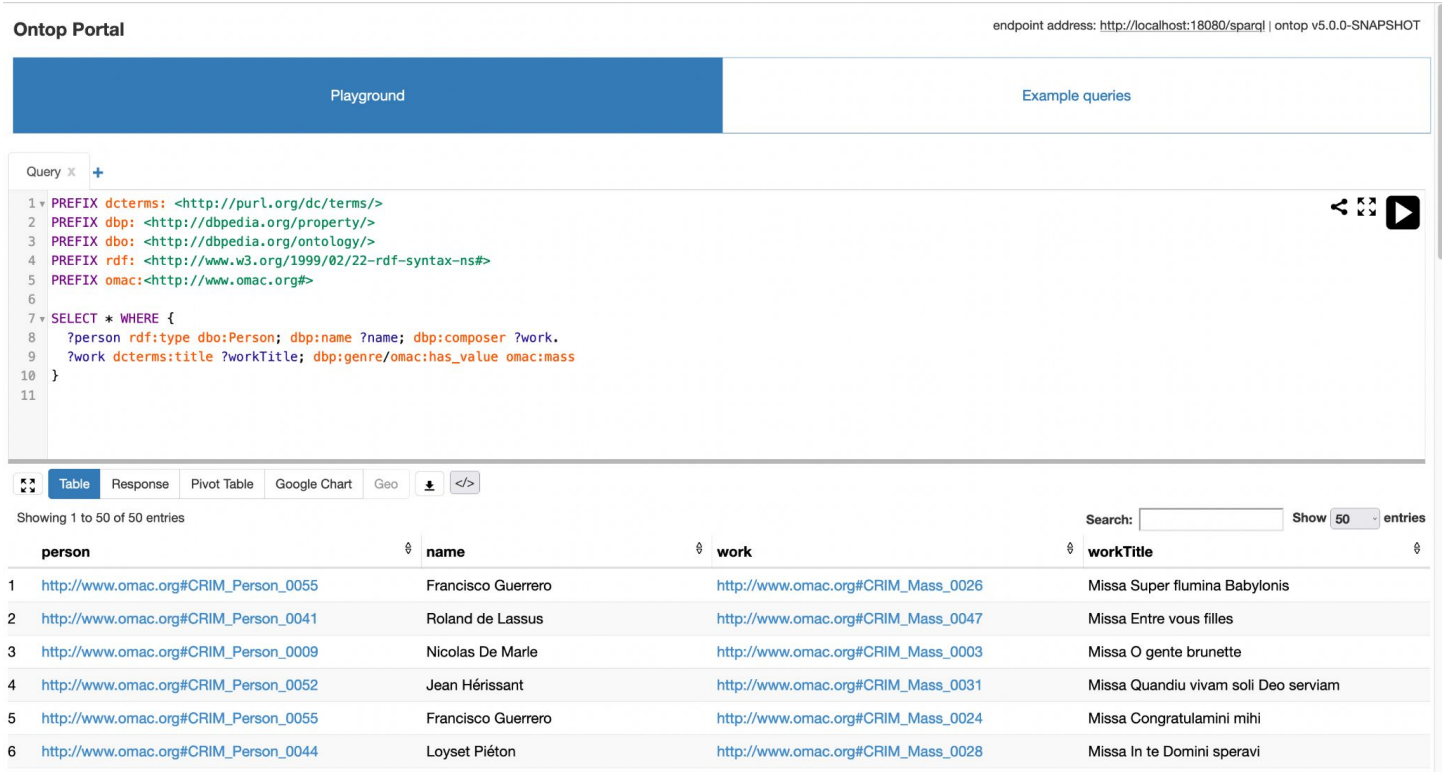
Linking OMAC to CRIM's relational DB (ongoing work)

OBDA architecture via mappings between (some portions of) the CRIM's relational database and OMAC (to be developed)

About OBDA:

> Diego Calvanese, Tutorial on Ontology-based Data Access Made Practical, held at the EDBT-INTENDED Summer School 2022 on Data and Knowledge (EDBT-INTENDED 2022). Bordeaux, France, 4-9 July 2022.

OnTop portal for CRIM (ongoing work)



Running on local machine

Based on Ontop (see https://ontop-vkg.org/tutorial/endpoint/endpoint-docker.html)

Thank you!

For info, comments, and suggestions please write to:

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