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 with final remarks

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)

Some information:

- Ontology Web Language (OWL; *some*, *only*, *cardinality*, *negation*, *property chains*)

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:

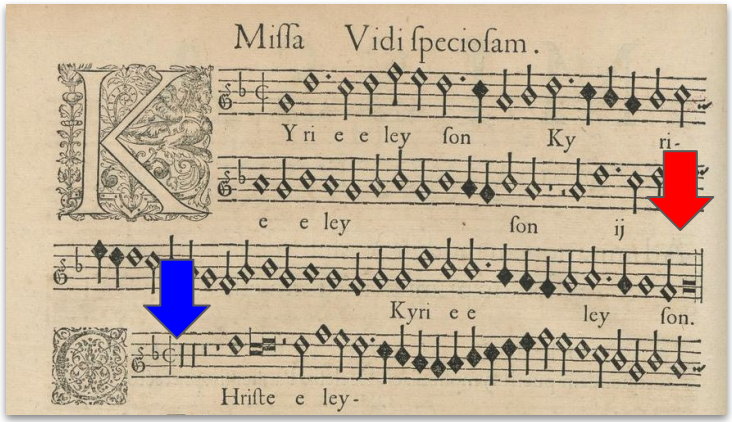
Two sections from the **first movement** (Kyrie) of the

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

They are distinct but inseparable parts of a single

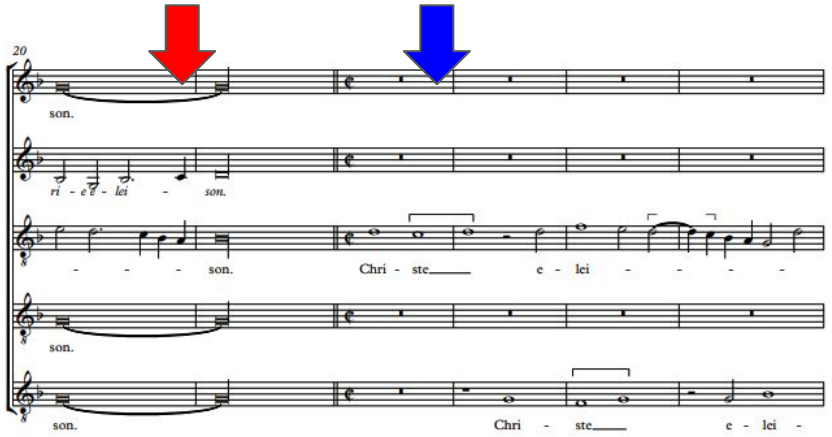
movement of a larger work.

Listen!



End of Kyrie

Beginning of Christe

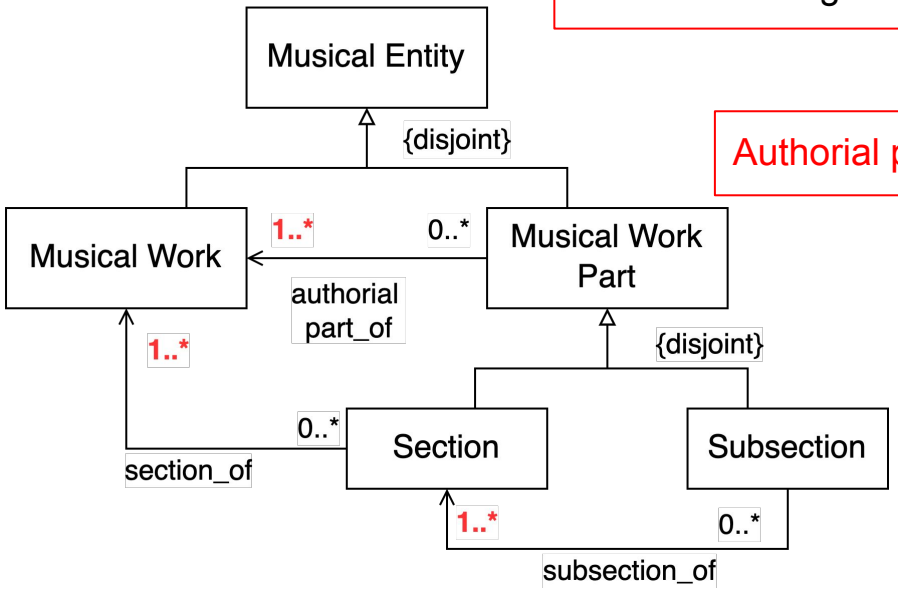


Musical Work Module (partial view)

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

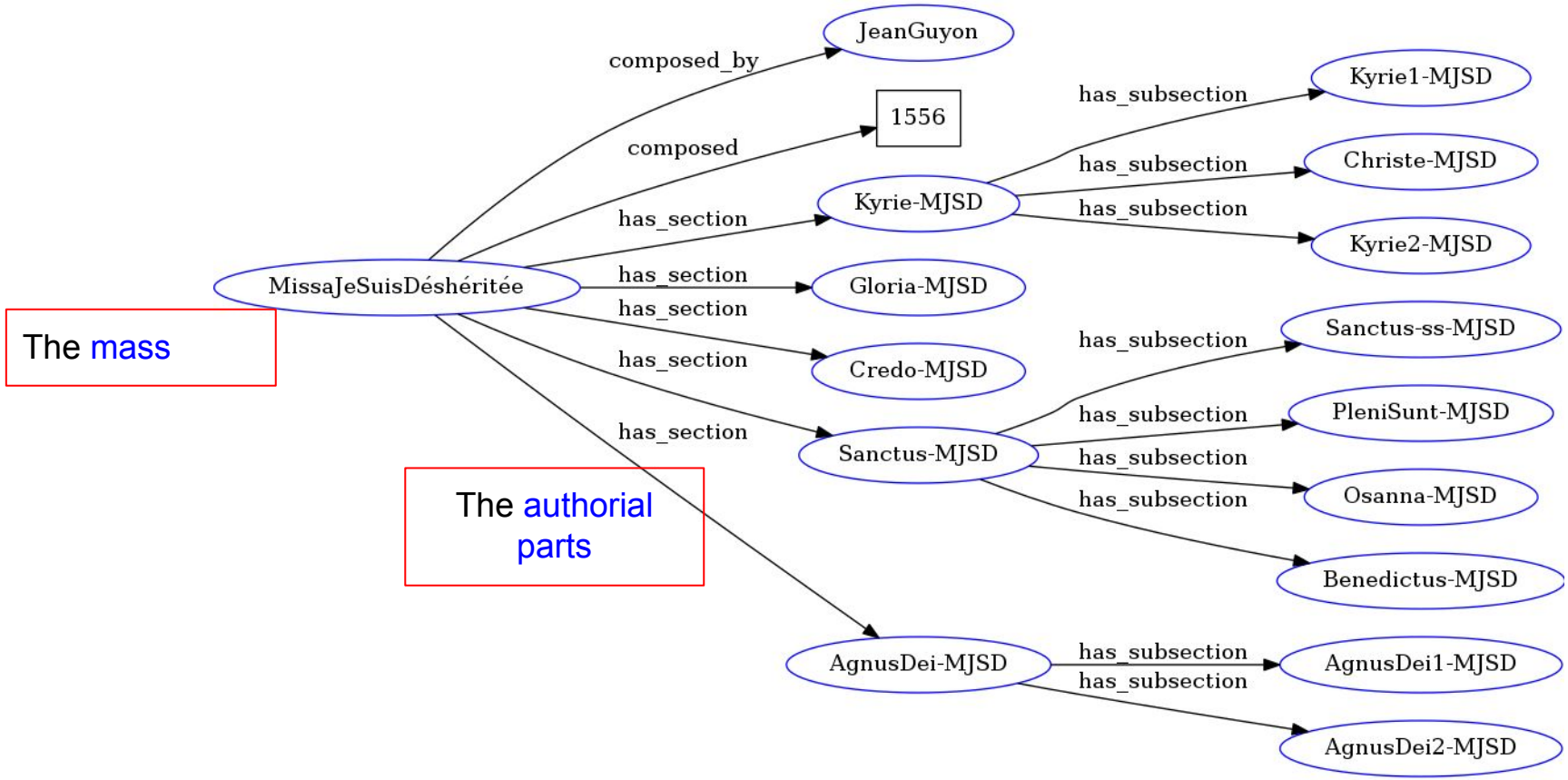


OWL 2 object property chains like:

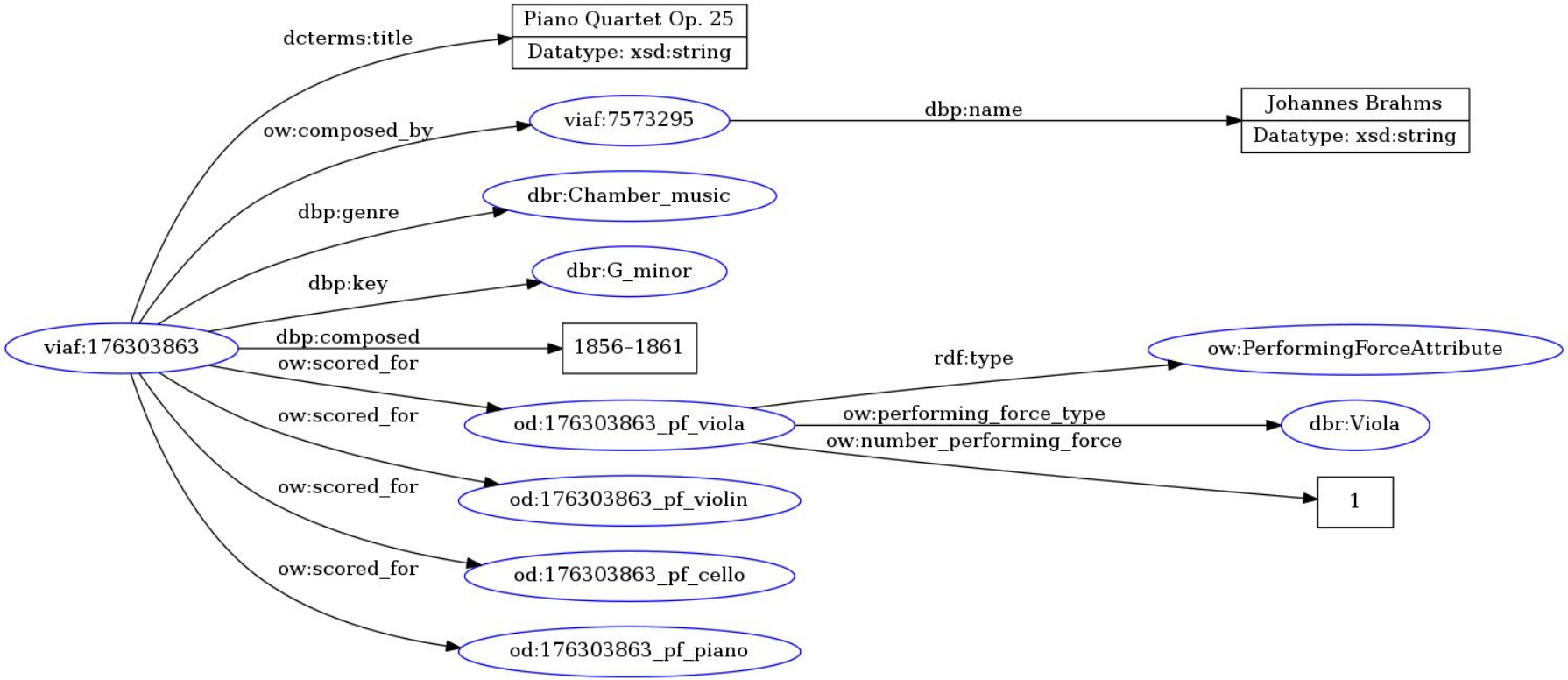
- has section *o* has subsection → has subsection

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

Example (1.) - RDF data graph (with authorial structure)



Example (2.) - RDF data graph (with performing forces)



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., **SimilarityObservations** (covers various subclasses):

- has_model, has_derivative + specific CRIM relations

An observation from CRIM Project

A Claim about Structure

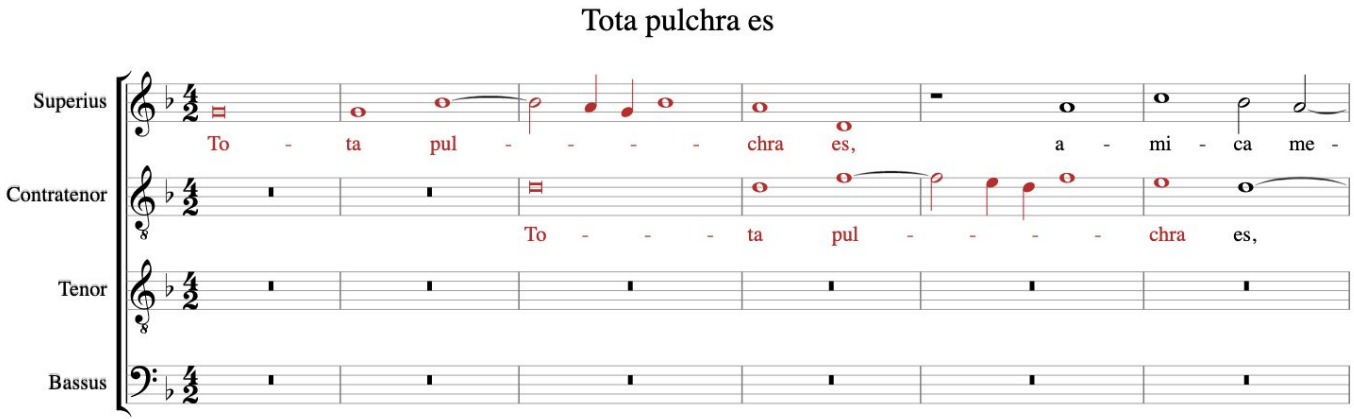
Observation <1>

Observer: Ian Lorenz

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

Score: Claudin de Sermisy, Tota pulchra es

< start >



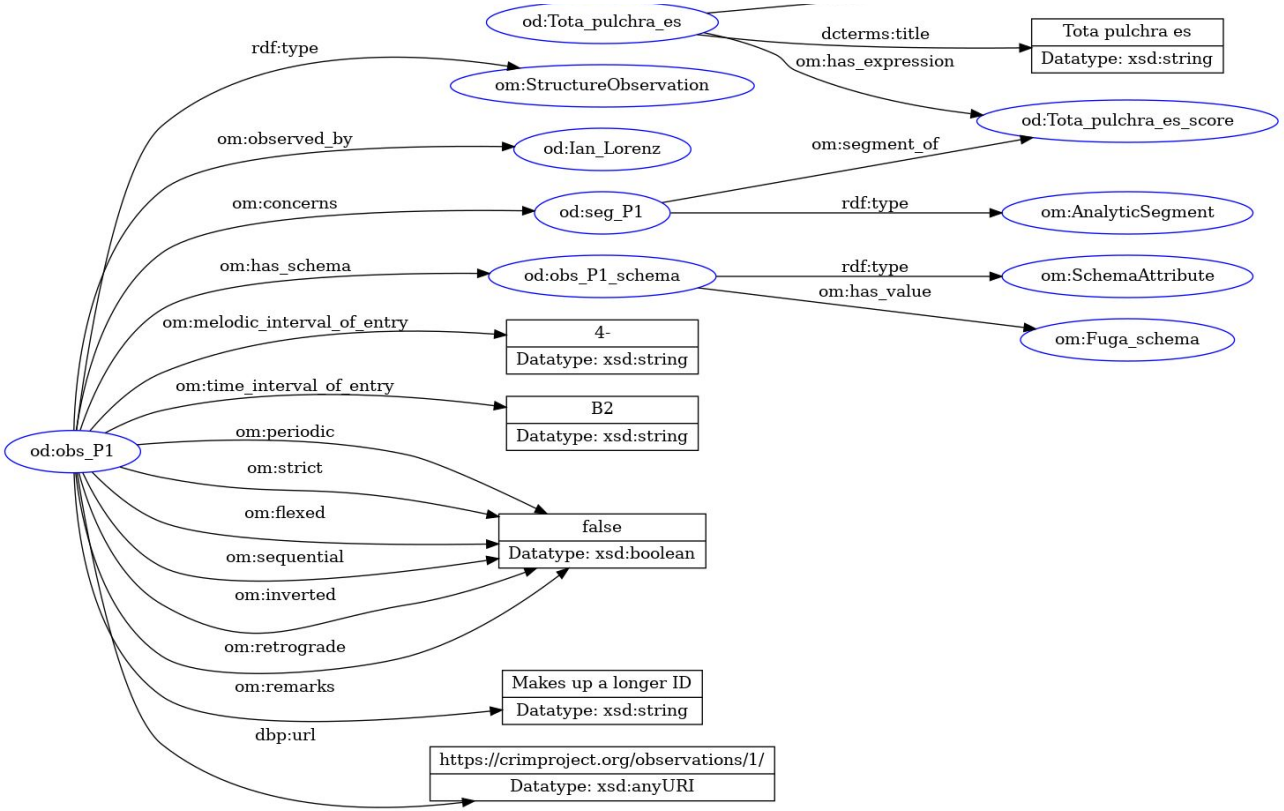
Fuga

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



A relational CRIM observation

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: -

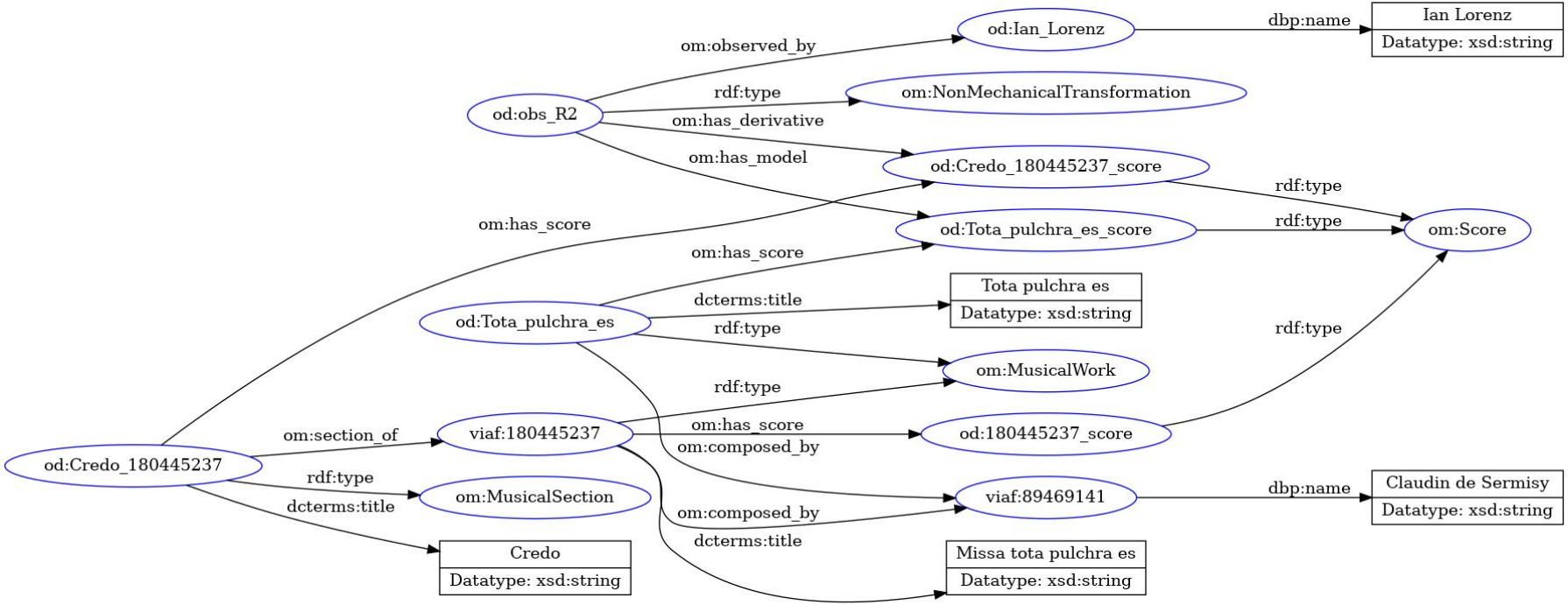
Remarks: Shifted and transposed

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



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 (**FAIR principles**)

Thank you!

For further discussions, reach us at:

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