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Toward a Core Conceptual Model for (Im)material Cultural Heritage in the Golden Agents project

Storyfying data

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ABSTRACT

This paper reports on the initial idea of a core conceptual model for the Golden Agents Project, which aims to integrate several heterogeneous datasets about cultural heritage of the Dutch Golden Age. We hypothesize that the combination of event and storytelling modeling would provide us a common infrastructure to represent and retrieve some core information regardless to its specific nature: painting, book, notary act or theatre performance. The proposed model was developed based on (i) several discussions conducted with humanities experts and (ii) foundational ontology for grounding the modeling decisions. It is assessed through a case study about Vermeer, the painting 'Girl with a Pearl Earring' and a novel written about the production of the painting. We conclude that the model satisfactorily addresses the case study, and we discuss some next steps to further assess and extend the model, as well as implementing and testing it in practice.

CCS CONCEPTS

• **Computing methodologies** → **Knowledge representation and reasoning**; **Ontology engineering**;

KEYWORDS

Ontology, Cultural Heritage, Storytelling, Events, Golden Agents

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1 INTRODUCTION

In the project *Golden Agents: Creative Industries and the Making of the Dutch Golden Age*[1] we are interested in integrating several heterogeneous datasets in combination of linked open data and multi-agent technology in order to answer complex research questions related to the Dutch Golden Age. The data is about **cultural heritage** including documents such as **notary acts** from the City Archives that might bring relevant information about people and their relation to the creative products. We are particularly interested in characterising features of the production and consumption, both material and immaterial, by modeling events as parts of stories.

To illustrate this model we use the case of Johannes Vermeer (1632-1665), a famous painter from Delft who produced an also famous painting called 'Girl with a Pearl Earring' in 1665. Centuries later, in 1999, this painting inspired Tracy Chevalier to produce a novel about the production of this painting using the same title as the painting. From this, one can conclude that Chevalier 'consumed' the painting (content). Obviously, Vermeer is one of the characters in this story, as well as the unknown young European woman depicted in that painting [1].

An important step to reconcile heterogeneous information from different but related matters is to investigate their common 'nature', reason for which we had several discussions with humanities experts. This paper reports on the initial investigation about a core conceptual model (see Sect. 2) that can serve as a common ground for the experts' information needs. We hypothesize that our core model should combine both event-based modeling and storytelling: records such as notary acts tell (mostly likely) real stories about events in people's life (e.g. baptism, habitation or death); and literary fiction books tell fictitious stories, possibly involving real people or real historical events (e.g. the novel *Girl with a Pearl Earring* tells a story around a real event which was the production of that painting).

A central concept in this work is so called '*idea*' as an abstract product that is created or defined by someone and communicated via an (im)material product. We provisionally adopt this term as it seems to be broad enough as a hypernym for several types we are interested in, such as story and scene, while we are still investigating if there would be a term that fits better our purpose. Other examples are techniques for painting or printing, genres and styles, as well as concepts in the line of [3]. These ideas can be reproduced several times (several editions of a book, or several paintings with the same style or technique) and can also evolve in time (e.g. a painter develops a new style influenced by another) which proposes that they also have a storyline of themselves. The parallel storylines resemble Kubler's representation of time lines of cultural production as multiple fibres [8].

[1] https://www.goldenagents.org/

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This conceptual model is applied to the case study about the 'Girl with a Pearl Earring' in Sect. 3. We consider it to be complex enough as a initial assessment of the hypothesis, while different case studies will be used for assessment in future work. Moreover, more details will be further addressed, such as the characters and props commonly used in storytelling [11].

2 A CORE CONCEPTUAL MODEL FOR THE GOLDEN AGENTS

The proposed common core conceptual model is presented in this section using UML class diagrams. Firstly, we introduce some generic concepts reused from an ontology called Unified Foundational Ontology (UFO) [6, 7] which provides the basic ground for the forthcoming modeling decisions, namely:

Individual is the general class containing all the instances (similar to owl:Thing).

Endurant is the class of individuals whose essential parts are always present in any moment of its existence, e.g. a person, a book or an intention.

An *Object* is an existentially independent endurant (e.g. a person), which can be characterized by one or more of its inherent *Mode*s, e.g. an *Intention* to act. Objects that can intentionally do something are called *Agent*s. Finally, a *Situation* describes an instantaneous setting of one or more related objects and their modes, e.g. a person (intentionally) painting another person.

Perdurant is the class of individuals whose essential parts are present in different moments in time, contrarily to *Endurant*, e.g. a theatre performance.

An *Event* is an ordered sequence of *Situation*s.

In the UML diagrams presented hereby, these concepts are prefixed with the acronym 'UFO' (depicted in blue background color). Moreover, the stereotype `<<role>>` is used to indicate classes that are contingently instantiated, e.g. an *Individual* eventually plays the role of *Agent* in a certain context.

A first part of the model is depicted in Fig. 1 and introduces concepts and relations 'around' *Person*, *Product*, *Production* and *Consumption* specializing the concepts previously defined. Some notes are included as a box with a 'folded corner' (depicted in pinkish background color) in order to illustrate some of the concepts[2]. The descriptions start with an identifier for further reference (e.g. *(Pr3) novel 'Girl with a Pearl Earring'*). A *Person* can play several roles as an *Agent*, in particular *Producer* and *Consumer*. A producer performs the act of *Production*, which has as outcome a *Product* that can be *Material* (e.g. a painting) or *Immaterial* (e.g. a discourse). A consumer, in turn, performs the act of *Consumption*, which has a product as income. For example, in order to produce the novel 'Girl with a Pearl Earring' in 1999, Chevalier consumed somehow the referred painting produced by Vermeer in 1665.

These concepts are further clarified by relating them to other concepts such as Idea, Story, Communication and Media. Therefore, the model depicted in Fig. 2 extends the previous one (the concepts previously introduced are depicted in gray background color). An *Idea* is an immaterial product that is produced by an *Author* and that can be based in another idea, e.g. the story by Chevalier is based on the scene painted by Vermeer, i.e. both story and scene are ideas. Moreover, an idea can be considered as a *Mode*, since it only exists when inhering an object: a producer, a materialized product or a consumer. A *Story* narrates events and is composed of *Scene*s that narrate situations. A *Painting* materializes a scene, as well as a *Book* materializes a story. Similarly a *Biographic Record* also materializes a story that is believed to be true, e.g. the baptism certificate of Vermeer materializes a story that tells where and when the event of his baptism occurred. A particular type of record is the *Notarial Act* produced by a *Notary*.

In addition, a story is considered to be real when enough evidence can be provided. Although intuitively a product is called evidence, it is the product and a certain context that gives it the role of evidence. For example, the simple existence of a piece of paper stating the baptism of Vermeer is not enough to be considered as evidence, as it should have characteristics that makes it believable as a baptism certificate produced in the 17th century. Therefore, we consider evidence to be a type of *Situation* that provides enough information to consider a story to be real.

Finally, when an idea is consumed, we consider that a *Communication* process was concluded, which therefore includes both the idea's production and consumption. For example, Vermeer's ideas are still being communicated even after his death via his paintings. Therefore the communication of an idea occurs by an *Author* to a *Consumer* via a *Medium*. Media can be either material or immaterial products, e.g. books or theater performances.

3 ASSESSMENT

In order to assess the applicability of the proposed model, an instantiation schema is presented in Fig. 3 for the previously discussed example about Vermeer and the painting "Girl with a Pearl Earring".

First of all, this schema presents horizontal lines as storylines, i.e. a sequence of situations/events narrated by scenes/stories with a common characteristic: e.g. storyline of Vermeer's life or of sources of evidence in general. Callout-ballons present descriptions of situations/events in storylines. Arrows crossing storylines represent that a product in a storyline is narrating a situation/event in another storyline. In particular, purple arrows indicate production events while red arrows indicate consumption events. Dotted arrows indicate that an event that was not explicitly narrated can be derived from a certain evidence. Finally, pentagons labeled with identifiers represent the instances that were exemplified in Fig. 1 and 2.

A baptism certificate from 1632 tells a story about the baptism of Vermeer. Another evidence source indicates a story that later in 1665 Vermeer produced a painting that depicts a scene of a girl wearing a headscarf and a pearl earring looking in a certain way, known as 'Girl with a Pearl Earring'. In this example the painting itself is considered to be the evidence. Centuries after, the painting was acquired by the Mauritshuis (source omitted in the example). In 1999 a source of evidence reveals that Chevalier produced a novel telling a story around the scene depicted in the referred painting (again the evidence is considered to be the book itself). From this evidence, we can also derive another event in Chevalier's life: the 'consumption' of that scene via the painting.

[2] The title '*Girl with a Pearl Earring*' is abbreviated as '*GwPE*' in some of the notes.

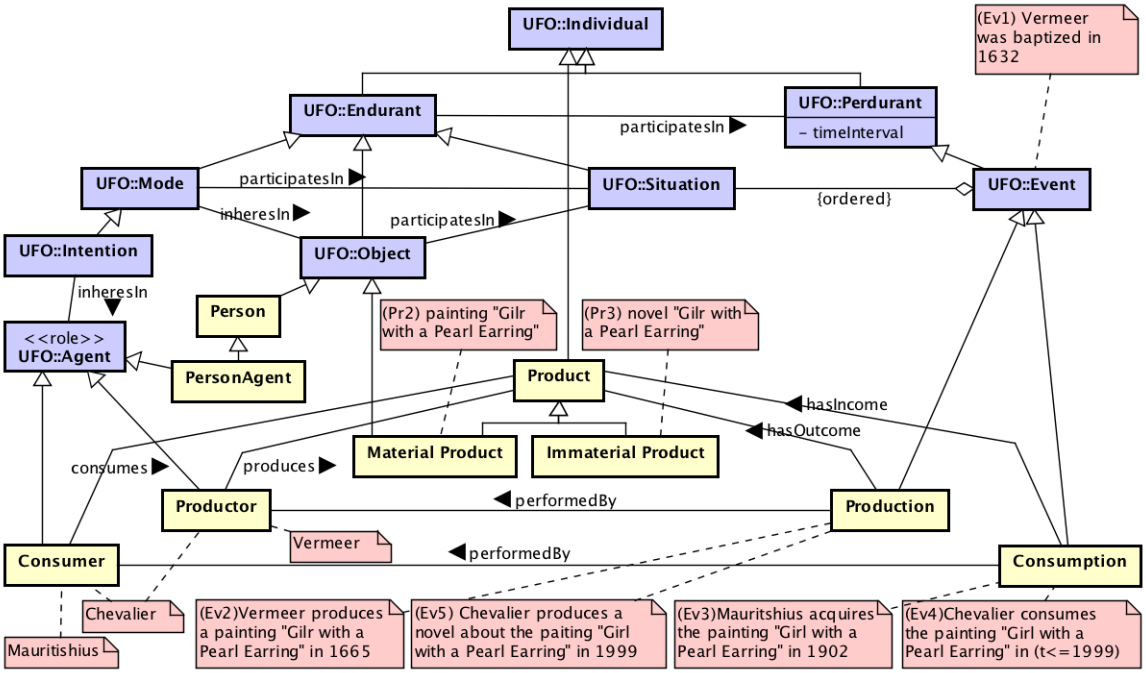

Figure 1: Part of the model Concerning Events, Production and Consumption.

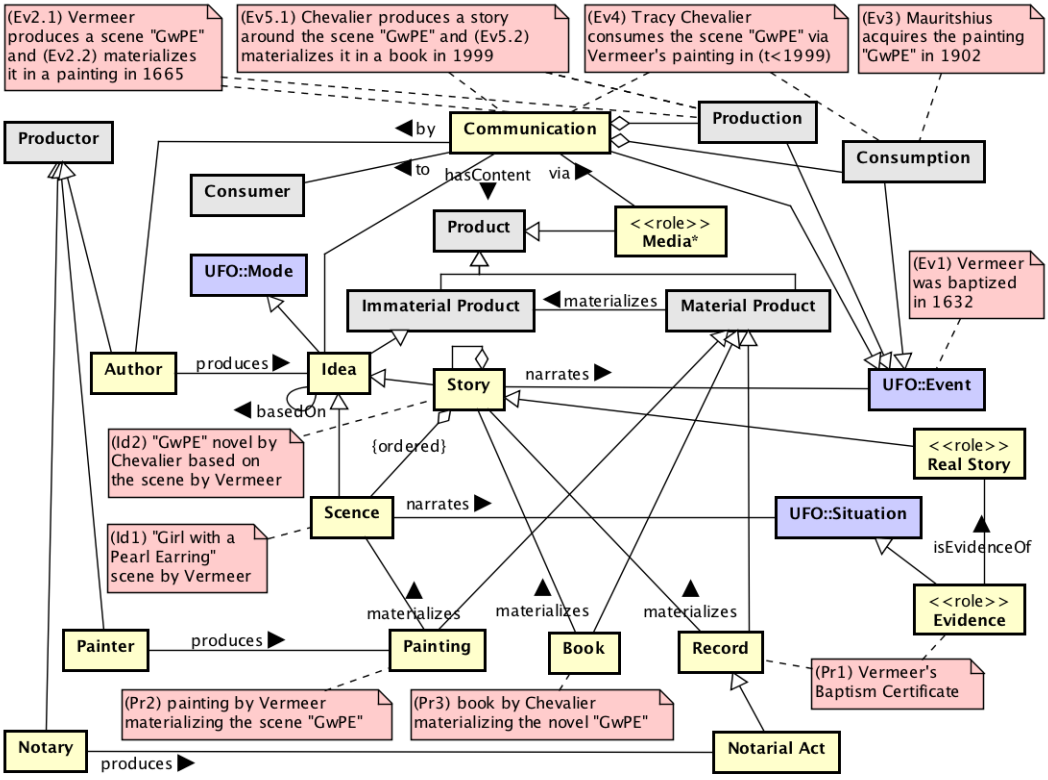

Figure 2: Part of the model Concerning Idea, Story, Communication and Media.

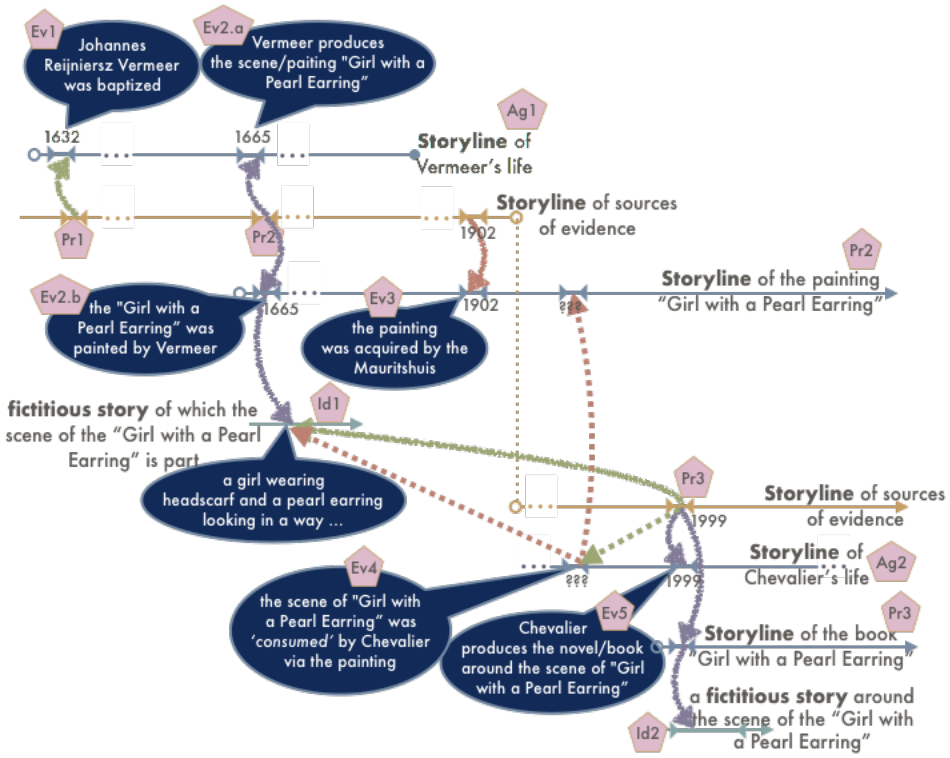

Figure 3: Schema of the case study according to the proposed model

4 CONCLUSION

We conclude that the proposed model does provide a common core infrastructure to express our case study involving a painting, a book and a birth certificate. However, in order to become a conceptual model for structuring and querying heterogeneous data in the Golden Agent project, let alone in cultural heritage infrastructures in general, it still needs to be enriched to fully address the expert's demands, e.g. if/when/how one (type of) art influenced another, or which (type of) person consumed certain artistic productions. In addition we will both: (i) assess the model for different case studies involving other forms of cultural heritage together with the experts and (ii) implement and test it for integrating existing datasets available as Linked Open Data.

With respect to the complexity of the model, despite not covering yet all the information of interest, we would argue both: (i) it is important to deeply understand the complexity of the information at hand in order to find its common structure and (ii) it does not mean that the implementation has to cover all this complexity, but the model can support 'informed' simplifications.

Finally, another important step is to further investigate and align with:

(1) Related models that are commonly used in this domain (e.g. CIDOC CRM [4], FRBRoo [5] and [11];
(2) Related work/projects that used a similar core model (e.g. The Getty Research Institute [2, 10] and CultureSampo [9]);
(3) Foundational ontologies or other theories that support further modeling decisions (e.g. [3] and [8]).

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