Geographies of Place in Digital Art History

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1. Introduction

Representation and description of material culture in structured data systems has long been a quest of the digital humanities. To capture the multiplicity of meanings and dimensions within objects that art history, archaeology, and material culture studies have always dealt with, further nuance is required in modelling related fuzziness and uncertainty. Conversely, informationally enriched digitised objects still suffer a perceived lack of 'aura' (a debate that goes back to Walter Benjamin)[1] while digital methods, especially quantitative ones, may appear to flatten their perspectival and interpretive complexities. These concerns led Johanna Drucker to ask whether there really was a 'digital' art history.[2] Although the field of digital art history has recently expanded, these remaining challenges must be addressed, to reconcile these two scholarly paths.

By drawing on the example of spatial data, this paper considers how current Linked Open Data (LOD) systems struggle to represent the historical and cultural context of art objects, from production to modern reception. It aims to review digital standards for representing 'space', highlighting their peculiarities, advantages, and challenges.

In art historical and archaeological research, we tend to frame, represent, and discuss the 'spaces' of objects throughout their lifecycles and their surrounding networks.

This paper consequently describes an object's various paths, physical and metaphorical, through time and its myriad historical and cultural contexts, as its 'itinerary'. The research originated during the Getty Institute in Ancient Itineraries in 2018 and 2019, where the authors comprised a working group focused on spatial questions related to modelling and visualising ancient art objects using LOD methods. Following the Ancient Itineraries framework, we draw on a broad spectrum of critical insights from the fields of art history, digital art history, archaeology, and the digital humanities. This paper uses the term 'art object', even when the specific focus is on ancient art objects, in the belief that similar spatial concerns with provenance, exchange, histories of use and display pertain also to more recent art objects.

The idea of object itineraries resonates with both Kopytoff's notion of 'object biography',[3] influential in museological and archaeological research, and Tobler's first law of geography, which asserts that 'everything is related to everything else, but near things are more related than distant things.'[4] Applying Tobler's law within digital art history involves particular problems, however, due to the complexity of the relationships that constellate around most art objects, and the incalculable abundance of associated geographical locations, intrinsic and extrinsic. Furthermore, these locations are highly heterogeneous in character – encompassing real and currently known sites, named but unidentifiable ancient places, and mythical loci – each posing distinct conceptual and representational challenges.

Traditionally, gazetteers have represented spatial locations, recording lists of names, name variants, and (ideally) mappable coordinates. Such gazetteers underwrite the field of Geographical Information Systems (GIS) and have substantially enabled the digital spatial turn, particularly regarding ancient world geographies. However, as currently understood, a gazetteer is insufficient to capture the range of locational concepts associated with an art

object, their uncertain relationship to geographical information, and the accuracy of their recorded data. Capturing and modelling the myriad types of fuzziness in the data is a necessary and foundational undertaking: for a *digital* art historian, the production of knowledge through analysis of the art object and interpretation of its significance, in diverse contexts along its itinerary, requires that such fuzziness be rendered explorable as machine readable data.

There already exist a vast array of vocabularies and infrastructures that attempt to represent the myriad aspects of objects as machine-readable data. Many systems discussed in this paper use LOD and recognise the need to model complex conceptions of Place. The following survey suggests, however, that none of these systems, in isolation, offers a sufficiently accurate and flexible description of place and space to fully account for an art object's itinerary. Alongside current solutions, therefore, this review identifies critical areas for developing enhanced description of such spatial itineraries.

The paper begins by introducing the premise and rationale behind our discussion: that digital methods of art historical scholarship may require the reconceptualisation of object geographies, or the surfacing of otherwise implicit knowledge. The second and core part of this paper offers an analytical review of current schemas and vocabularies used for describing spatial aspects in cultural heritage. We conclude by summarising current challenges and possible solutions for improving the representation of space in digital art history.

2. Rethinking Geographies: Objects and Their Multiple Spaces

Traditional definitions of geography tend to emphasise place as the sum of relationships between the physical world, human development, and experience.[5] Massey's observation

that places function as '...integrations of space and time; as *spatio-temporal events*' [emphasis in the original] is helpful here in pointing to the *event* as a necessary higher-level entity for a location's formal ontological description. [6] Indeed, the nuance allowed by this event-driven model of place as a sum of relationships and spatio-temporal mobilities is crucial for our current purposes. A model that supersedes the constraints of terrestrial referentiality will enable the fuller application of new digital methodologies to the study of art objects that occupy a multiplicity of physical, conceptual and imagined spaces, simultaneously and dialogically.

Art objects inevitably exist across different geographies, their spatial dimensions overlapping or embedded: they could be created at one place, used in another, collected in a museum, at different chronological points. Every place involves and is shaped by a variety of human actors each possessing multiple, diverse relationships to the object and to one other, all subject to continuous revision. Most of these relationships can be treated as geospatial entities: they manifest at given locations and times, figure as elements of the actor network around the object and may, in principle, be recorded in the object's metadata. Considering an ancient Greek vase decorated with Homeric scenes, we should acknowledge the provenance site of the clay, the place of production, the exchanges that brought this vase from its production place to its archaeological finding site, and from there to its current museum case.

A further multiplicity of spaces is referenced *within* an object. A figurative object may depict an identifiable topography, an ideal imagined location, or be an iconographic representation particular to a given culture. For example, while scenes from Homer can be associated with specific geographic features, the 'world' of Homer is a distinct conceptual *place*, containing multiple imagined entities, associated with mythological characters.

Additionally, the creator, 'Homer', here stands for generations of poets in an oral tradition, with the audience for any given performance interacting with the epic through the lenses of their own place and time.

This example illustrates the equal importance that should be afforded to modelling geographies of those spatialised entities that inform the object's creation. For the researcher, the *intellectual* space of the object and the practical choices available to its creators - materials, performative decisions, etc. - must be understood as inseparable, comprising the cultural *milieu* that influences and enables its production in a specific place and moment. Beyond this, the subsequent modes of interpretation or classification to which the artefact is subject during its biographical itinerary and the interplay between them must similarly be supported by the chosen technologies of representation.

Whilst none of these relationships can be directly or unconditionally associated with terrestrial geographies, current advances in gazetteer design provide some inspiration. A gazetteer is essentially a structured index of geographic place names, but with supplementary information that might include linkages to other places and classificatory systems, often involving Uniform Resource Identifiers (URIs) and LOD.[7] Innovative digital approaches to gazetteer creation are now starting to provide the flexibility required, with examples such as *PeriodO*,[8] a non-geographic gazetteer comprising a collection of attestations on named periods, demonstrating how to move away from anchoring gazetteers to terrestrial geography.

Ideally, Hades, London, Athens, the Metropolitan Museum would each be represented by a URI, their connections expressed within a central gazetteer, thereby facilitating representation of an artwork's multiple, complex and involuted itineraries. However, as we will argue, such a solution to bringing together these different 'spaces' is

not yet available. This level of granularity, encompassing notions and approaches to spaces across different fields - art history, archaeological science, geography, mythology, etc. - would require a substantial multidisciplinary effort to bridge and map spatial concepts, that might include disappeared sites, or the old and current names of a location. As a first step towards exploring possible solutions for developing richer digital representations of object itineraries, the following section focuses on common solutions in digital humanities for representing spatial data, highlighting challenges encountered in representing fuzzy and multiple geographies.

3. Common Descriptors and Infrastructures for Data

Web technologies can be used to connect concepts and entities such as time and space, to represent an object's origin and trajectories. Various initiatives have sought to capture these connections using LOD principles. This section reports on some of these initiatives, focusing on how existing standards, schemas and ontologies might contribute, by extension and/or combination, to the design and creation of a system that would more effectively situate art historical concepts and objects in their geographical and intellectual space.

3.1 Descriptor and Infrastructure Types

3.1.1 Vocabularies

Drawing on the Getty Research Institute's definition, we defined 'vocabularies' as controlled lists that contain 'structured terminology', are 'compliant with international standards', and 'provide authoritative information'.[9] We consider here four well-established vocabularies that were discussed at length during the Ancient Itineraries programme. All are regularly applied in the ancient world domain and relate, wholly or partially, to geographical spaces. Our intent is to highlight their potential for recording ancient places and objects' itineraries.

The *Getty Vocabularies* offer a comprehensive way of describing art object attributes, including the *Getty Thesaurus of Geographic Names* (*TGN*), on which we will focus.[10] Incidentally, it should be noted that *CONA*[11] could be used in conjunction with the *TGN* to describe places depicted in artworks.[12] *Geonames* and *Pleiades* both provide URIs for places, with different remits. *Geonames*[13] is a geographical database with extensive global coverage of modern places, while *Pleiades*[14] is a gazetteer specifically covering ancient places, linking to their *Geonames* counterparts where available. *Trismegistos*[15] began as a metadata platform for the study of texts from Ancient Egypt, although it has progressively expanded to include wider areas of the ancient world (defined as 800 BCE-800 CE). Its *TM Places*[16] database aims to include place names mentioned in ancient sources, or modern places in which these texts have been found or written.[17]

3.1.2 Data Models/Ontologies

The next set of initiatives fall under our broad definition of a 'data model': a schema formalising how data about a particular group of entities should be structured. In some cases, these data models can be considered ontologies, defined by Studer et al. as 'a formal, explicit specification of a shared conceptualisation'.[18] Ontologies seek to represent a knowledge domain with a greater level of expressivity, particularly with regard to relationships between the terms they contain.

Some of these models derive from the cultural heritage domain. In particular, *CIDOC CRM*[19] provides richly detailed object descriptions while aiming for interoperability with subject-specific ontologies.[20] As an event-based model, it conceptualises objects in terms of events associated with them, thereby enabling different descriptions for different points in time, potentially involving different places.[21] Another cultural heritage example is the *Europeana Data Model* (*EDM*), used by contributors when providing data to *Europeana*,[22]

the European cultural heritage data aggregator. *EDM* aims for flexibility, allowing data to be represented using object-based or event-based structures.[23]

Other data models are either more specific or broader in scope. Of the former, the *Linked Ancient World Data* (*LAWD*) ontology was developed to facilitate ancient object representation, by filling the gaps left by existing models.[24] In terms of the latter, the *Simple Knowledge Organisation System* (*SKOS*)[25] is used by many other ontologies to represent hierarchies and relationships between terms. Another example, *Wikidata*, comprises an ontology of classes and properties to represent information about its large dataset and the relationships between them.[26]

An additional set of initiatives aims to improve metadata interoperability and provide consistent, broadly applicable ways of structuring data, with *LIDO* and *Dublin Core* targeted at cultural heritage objects. *Lightweight Information Describing Objects* (*LIDO*)[27] is an XML harvesting schema developed to facilitate metadata aggregation from different cultural heritage organisations. *Dublin Core*[28] is a commonly used metadata schema in cultural heritage organisations and has been incorporated into several of the ontologies and data models outlined above.

3.1.3 Interconnection Formats

Interconnection formats enable connection of resources and establish links between existing vocabularies, increasing the possibilities of linking datasets to each other and to authority files.

Two key initiatives, *Pelagios*[29] and the *World-Historical Gazetteer* (*WHG*),[30] use the *Linked Places* format[31] for building interconnections between places that have been defined using different vocabularies. The *Linked Places* format builds on the *Pelagios Gazetteer Interconnection Format*[32] to connect gazetteers, providing disambiguation and facilitating

discoverability. *Pelagios* and *WHG* connect places mentioned in existing datasets with URIs from gazetteers (e.g., *Pleiades* or *Geonames*). These links take the form of annotations, using the *Linked Traces* format (a work-in-progress and not yet a finalised web standard),[33] which apply the W3C Web Annotation Data Model[34] and are stored separately from the datasets or gazetteers to which they refer. *Pelagios* initially had an ancient world remit but has since expanded to incorporate more recent historical sources,[35] while *WHG* seeks to represent places from all over the world that have been considered historically significant since 1500 CE.[36]

Semantic ENrichment Enabling Sustainability of arCHAeological Links (*SENESCHAL*)[37] was a UK-focused project to address the complexities of aligning archaeological metadata with different formats and structures.[38] It resulted in the *Heritage Data*[39] resource, which facilitates provision of linked heritage data via alignment with existing thesauri.

Linked Art[40] is an ongoing project to develop a LOD model for describing art objects, aimed at increasing interoperability between different datasets and fostering collaboration between different organisations, including the J. Paul Getty Trust and *Europeana*.[41] *Linked Art* uses a simplified version of the *CIDOC CRM*, to minimise confusion and ambiguity.[42]

3.2 Defining Place

The initiatives discussed above define places and spaces in different ways, which can pose difficulties in their alignment. Most are very literal in their definitions; for example, *CIDOC CRM* considers Place as a physical/geographic location, which can be defined to differing degrees of precision.[43] Similarly, the concept of Place in *EDM*[44] is explicitly location-based, i.e. relating to a definite point on the Earth's surface.[45] Although these initiatives ensure unambiguous definition that allows precision in representation, restricting the notion of

Place to the physical world does not fully capture all the nuances of geographies and spaces discussed in Section 2.

TGN is less rigid and allows some fuzziness and uncertainty to be represented, including historical sites whose exact coordinates are no longer known.[46] Nuance is added also by the notes relating to dates (e.g., in the record for Sparta[47], one such note starts 'name used locally since 1834...'), indexed using the broadest possible date range covered by the note, to facilitate discovery.[48]

Pleiades takes a different approach, considering places to be conceptual identities that may or may not resolve to real world coordinates. Their definition of Place is derived from Tuan's[49] description of 'a center of meaning constructed by experience'. This more fluid approach facilitates mythological or unknown place inclusion,[50] affording a more intuitive approach to the multiplicity of places discussed above.

Still more flexible in its definition of Place is *Dublin Core*, which is intended to be lightweight and non-discipline specific. Since it does not provide detailed object descriptors, its only space-related property, 'spatial',[51] is generic in representing any spatial characteristics of the object (not restricted to a physical location). This lack of specificity could facilitate the use of 'spatial' as a property for connecting all ideas of geographies/spaces, with more specific terms (ideally from existing ontologies) to denote the nature of the space being described.

Such connections have been made by *Wikidata*, which uses terms from the above initiatives, and others, to combine different methods for representing Place. Its properties can convey information about physical locations on the Earth, galaxies and exoplanets, and historical and modern places. As such, they could be extremely useful in describing the

geographies/spaces relating to ancient art objects; however, there is minimal scope for describing imagined, conceptual, or intellectual spaces.

3.3 Structures and Relations

Most initiatives considered in this article contain multiple terms relating to the concept of Place, with many incorporating temporal information to represent change over time. In the *TGN*, this information is included in descriptive fields, associated with place name changes. However, despite the potential for including detail and facilitating readability by humans, the data contained within these fields appears in an unstructured, inconsistent format that impedes machine-readability.

Conversely, *Pleiades* includes dates in the form of attributes, which ensures that the data is machine-readable and thereby amenable to integration with other resources. *Pleiades* incorporates its own chronological periods' vocabulary,[52] including information such as names of associated civilisations and geographical areas, as well as the date range. However, structuring the data in this way does not allow contributors to include additional contextual information to explain the significance of a period.[53] It therefore lacks the potential for detail provided by the *TGN*. An approach combining the advantages of machine-readability and detailed information could therefore be preferable.

Data models that describe physical or digital objects often include multiple place-related fields, which use different methods for representing change over time. For example, in *LAWD*, Place can be associated with the generic 'where' property, when the object's relationship with a place is unclear, as well as the more specific 'origin' and 'foundAt'[54]. These latter properties go some way to representing an object's journey through time and space, although as they do not specify the nature of related events, they are insufficient to convey a full itinerary. *Wikidata*'s terms provide more detail in indicating how the

geographical boundaries and/or mode of description of a place have changed over time (e.g., 'structure replaced by', P167; 'located in present-day administrative territorial entity', P3842). Similarly, *EDM*, which largely uses terms from other vocabularies, includes its own ontology term 'edm:isNextinSequence' to represent a sequence of layered archaeological deposits.

A more nuanced approach is taken by *CIDOC CRM*, whose place-related entities (E) and properties (P) allow objects to be associated with different places in different ways at different points in time, could more accurately convey the idea of an object's itinerary than a vocabulary that treats places as distinct, static entities. The proposed spatiotemporal extension, *CRMgeo*, should enhance these capabilities further.[55] *EDM* also offers an event-centric model, to allow *CIDOC CRM* compatibility, alongside its original object-centric model.[56] Similarly, place appears in *LIDO* (an application of *CIDOC CRM*) in relation to events involving the object in question. It also includes terms that describe the subject area to which an object relates (thereby addressing some of the complexities in representing geographies) and allows rich metadata.

In addition to the links between time and place, several of the initiatives discussed here have sought to link places to one other. For example, the *TGN* incorporates equivalence relationships, which connect references to the same place; hierarchical relationships, which include the possibility for a single place to be part of multiple hierarchies (for example, if it fell within multiple administrative areas at different points in its history), and associative relationships, where a relationship between places exists but is less clearly defined.[57] While *TGN*'s model provides considerable scope for representing relations between places, greater flexibility is provided by the networked approach taken by *Linked Places*, which incorporates an event-based model like that of *CIDOC CRM*[58] .

3.4 Contributions and Inclusivity

The systems discussed in this section each have different protocols surrounding data production and input, with varying levels of user contributions permitted. For example, *Geonames* allows all users to edit its records via a wiki.[59] Whilst this has the potential advantage of democratising its processes of data creation, there is the risk that *Geonames* could be seen as less authoritative than initiatives whose contribution processes are more heavily controlled. *Pleiades* and *WHG* similarly allow users to contribute new information and edit existing records through a strict editorial process;[60] in these cases, though, assertions relating to names and locations are supported by linking to relevant books, journals, and maps by citation.[61] Consequently, these resources provide a more robust evidential basis for place-related information.

TGN restricts the process to approved contributors, usually organisations such as libraries or museums, which are then reviewed by a central team at the *Getty Research Institute*.[62] This system has the advantage of ensuring that the resulting data is authoritative; however, the influence of contributors' cultures and attitudes should be considered. For example, *TGN*'s primary focus is on the historical western world and it privileges the Roman alphabet by requiring its use for preferred names of entities.[63] As a result, there are significant gaps in the information it can capture about other parts of the world. Such factors must be taken into account when using existing vocabularies to minimise the risk of perpetuating historical and colonial biases in any future system. Indeed, providing the facility for individual users to contribute their own data can, in some cases, help to mitigate potential issues caused by implicit biases held by a small group of largely western, institutional contributors.

3.5 Interoperability

The majority of infrastructures and vocabularies discussed in this article are available as LOD; for example, the *TGN* and *SENESCHAL*[64] can be queried via a SPARQL endpoint and *Pleiades* data is made available using the Resource Description Framework (RDF), via an open licence. Similarly, relationships in *CIDOC CRM* are expressed in the form of entity-property-entity triples; as such, it too is often represented using RDF.[65] These measures ensure interoperability by facilitating connection with external resources, including authority files, in the LOD cloud.[66] *Trismegistos* uses a different open standard, JSON, while Linked Art combines the advantages of both formats, by making their data model available as JSON-LD.[67]

In addition to using open, interoperable formats, each initiative has sought to enable compatibility with other major infrastructures. Users can build on the *Linked Places* format to utilise established ontologies and vocabularies for representing the multiplicities of geographies and space in relation to ancient art objects. By way of illustration, *WHG* has been mapped to existing resources such as the *TGN* and *Wikidata* allowing interoperability and enhancing the information about the places it contains.[68] *LIDO* aims for compatibility with existing standards used in collection management systems, such as CDWA Lite and SPECTRUM.[69] Similarly, *Wikidata* provides a range of properties for linking to gazetteers and authority files, such as the *TGN* (P1667), *Geonames* (P1566) and *Pleiades* (P1584 for place identifier and P2938 for place type). Additionally, *LAWD* maps broader terms to those in existing vocabularies, and complements these with new, narrower terms. Several initiatives, such as *SENESCHAL*,[70] have implemented *SKOS* to state relationships between such generic and specific terms, as well as identifying equivalent terms from different vocabularies and

ontologies (through 'broader', 'exactMatch' and 'narrower' properties). Many systems discussed in this article are therefore already connected.

The EDM was designed to facilitate integration with major standards such as *Dublin Core*, *Metadata Encoding and Transmission Standard (METS*), *Extended Archival Description* (*EAD*) and *LIDO*,[71] as well as enriching organisations' data by connecting it to authority files and vocabularies, such as *Geonames*.[72] As a result, many of its terms are generic and relatively broad: while this approach can facilitate interoperability (the primary purpose of the data model), it also indicates that the *EDM* alone is insufficient and that objects must additionally be described using more specific terms.

Conversely, although *CIDOC CRM* is designed to be as extensible as possible and can be used as much or as little as required,[73] to 'represent knowledge in a more generic form',[74] it provides a rich and detailed ontology. It therefore often affords highly nuanced distinctions between similar terms for fine-grained knowledge encoding. This also has drawbacks, though, including considerable potential for ambiguity to arise in the mapping of concepts between ontologies, reducing interoperability, and potentially acting as a deterrent to its adoption and implementation.[75]

3.6 Common Descriptors and Infrastructures for Data: Summary

The accurate representation of places and spaces related to art object itineraries cannot be achieved by any one existing system in isolation. Therefore, a combination of approaches is required that builds on existing connections between the initiatives discussed above, expressed using LOD technologies. For example, identifying historical places using *Pleiades* implicitly links to equivalents in vocabularies such as *TGN* and *Geonames*. Similarly, using the *Linked Art* model to represent events that relate to an object's itinerary ensures compliance with *CIDOC CRM* and *EDM*, providing a balance between detail and clarity. In

combination with these methods, an annotation-based approach, such as *Linked Traces*, would allow additional detail to be applied to an object's component parts, while incorporating links to vocabularies that describe other entity types, such as *PeriodO* for chronology, or *Standards for Networking Ancient Prosopographies: Data and Relations in Greco-Roman Names* (*SNAP:DRGN)*[76] for people/person-like entities.

It is essential to the continued value of these approaches in enabling good scholarship that care be taken to ensure that any such system, schema or interconnection format does not perpetuate historical biases evident in some existing systems. One effective way to increase inclusivity is to invite contributions from all users, along with explicit critique of issues arising, which are then moderated by a diverse editorial board to retain authority and academic rigour.

4. Conclusion

This paper aimed to address challenges facing digital art history in representing spatial information about its objects. We argued that current initiatives are not capable of describing appropriately the multiplicities of physical, conceptual, and imaginary spaces – and their networks - in which objects are entangled. The core of this paper was an analysis of current data descriptors and infrastructures, mainly drawn from the domains of art history and the history of the Ancient World, and our discussion concluded that no single system was completely satisfactory for the accurate representation of these multiplicities of place and space.

This review of current ontologies, vocabularies, and interconnection format used to describe spatial concepts in cultural heritage objects, highlighted their respective

characteristics and their differences. In reality, we acknowledge those standards are rarely used in isolation: data can be modelled according to *LAWD*, while geographical names can be linked to Pleiades, for example. Consistently mapping these systems against each other (in our vision, using the *Linked Places* format), would allow further linking across datasets and facilitate complex object itinerary description. In parallel, there is also a need for interfaces facilitating the display and interrogation of the multiple spaces of an object, while acknowledging their fuzziness and the overlapping and intersecting spatial networks surrounding them. During the Ancient Itineraries meetings, we explored the possibilities of the different standards – presented in this paper – and we discussed with colleagues in the Institute the affordances of a possible interface for researching, documenting, and visualising such object itineraries.

With this paper's focus on 'geographies' as a frame through which to explore the future of digital art history, we suggest that uncertainty and multiplicity are characteristic of many aspects of object-based research, as well as complex networks that blur boundaries, fostering ambiguity and overlapping narratives. Thus, similar considerations and analysis of existing systems can also be applied to the study of, for example, time, iconography, people, meanings, etc.

An important aspect, discussed only briefly in this paper, is the bias that can be embedded in traditional discourses and presentations surrounding our objects, from the role of the AHD (Authorised Heritage Discourse)[77] to more recent discussions on the origins of collections in Western museums.[78] Many of these biases are still embedded in our datasets and require correction. Addressing the curation of this data in an ethical, polyphonic, and inclusive way is not only crucial for developing new tools for digital

research and as a prior step to applying machine learning to LOD datasets, but will also serve as a test bed for the efficacy of the modelling approach that is here proposed. Therefore, in creating linked datasets representative of the itineraries of art objects, it is also important to remember the spatiality of colonial discourses[79] in modelling and naming spaces and places.

To conclude, we argue that attention to connecting existing LOD solutions in a critical, accessible, and open way offers exciting solutions for moving towards a more granular understanding of the multiple representations embedded in cultural heritage objects.

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