

Management Software for Monitoring Related Versions of Cultural Heritage Artifacts for Libraries and Museums

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ABSTRACT

In cultural object conservation, tracking provenance has served as the foundational method of managing information for historical artifacts. To find data points, archivists identify related versions of an artifact at various time points. In this paper, we discuss four categories with versioned examples to display the importance of data points for identifying patterns over time through events in history, cultural heritage, performing arts, and fine arts. We describe our use of the Ashurbanipal diristry to document scholarly research regarding library tools and technologies for the preservation of cultural objects as well as the implementation of PORTAL-DOORS Project (PDP) utilities for tracing provenance and distribution of cultural objects and interoperability with bibliographic formats such as BIBFRAME and MARC from existing archival methods.

KEYWORDS

PORTAL-DOORS Project; time points; cultural heritage; archiving; artifact conservation.

INNOVATIONS IN INFRASTRUCTURE

With the creation of cities, our definition of design principles has continuously changed to fit innovations of infrastructure in numerous fields of study. Buetow (2005) describes how biomedical database infrastructure, a fundamental archiving system, could improve the cross disciplinary transfer of knowledge between various communities. Similarly, infrastructure takes on many terms, from biomedical database infrastructure to civil engineering infrastructure which actively serves communities. During the Great Plague of London, without a plan to salvage the European sewage system, lack of maintenance led to the decline of the quality of city life (Bramanti *et al.*, 2019). Following the plague, Bazalgette, the chief engineer of the Metropolitan Board of Works in London, proposed developing a system of collectors to drain sewage that overflowed from the River Thames (De Feo *et al.*, 2014). These design principles have served as the basis for sewage infrastructure for decades, building on the foundations of basic infrastructure to iterate more effective forms of design in the future. Universally, the creation of infrastructure can be attributed to design principles that inform its use, meaning, and underlying features. Design principles are subject to iterations, changes, or improvements that in select cases create different versions of the same entity, or a form or variant of a type or original (Gançarski & Jomier, 1994). To evaluate the changes between key iterations of an object between various points in time, we examine sequential points in time and their comparable versions in a variety of fields: cultural heritage, events in history, fine arts, and performing arts.

IDENTIFYING PATTERNS OVER TIME

Each domain-specific field uses its own defined methods of tracking related versions of historical artifacts. We explore four fields of study that aid in identifying trends in history, including events in history, cultural heritage, performing arts, and fine arts.

Events in History Historians identify events in history either through time points or across space (countries, cities, regions); these time points are then used to track economic, political, and social trends among centuries (Allison, 1984). While history is often tracked and recorded based on the sources and evidence of the era, when there's a lack or destruction of regional evidence, certain important persons and events often get lost in history. Hatshepsut is known as the Lost Pharaoh of Egypt and is regarded as one of the most successful pharaohs of Egypt. Following her death, her figure was chiseled off statues and stone walls and records of her existence in obelisks were smashed and destroyed and records listing her name were destroyed. With the hypothesis of the "Hatshepsut Problem" and misalignment between pronouns and the ruler at the time, her name was reinstated into history (Roehrig, Dreyfus, & Keller 2005).

Cultural Heritage In cultural heritage, information archives, e.g. Library of Congress, are developed through museums and libraries to preserve objects over time for "information literacy" regarding social life and the identities of groups (Baker, 2013). The Mayas were known in A.D. 900 for their impressive constructions that plummeted

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following colonization, intense drought, and military conflict. Archaeologist Takeshi Inomata helped discover thousands of structures through radiocarbon dates at Ceibal, a center for chronologically tracking the exact population size of a civilization (Haug *et al.*, 2003) Collecting data points for each cultural object or event in history centers around the creation of a timeline for such event through past archaeological discoveries, and a variety of primary, secondary, and tertiary sources (Chen & Tu, 2007).

Performing Arts In performing arts, two pieces can be compared at a single point in time in the piece although played in different location; if one examines their comparable attributes, they can be deemed similar or related. If an opera is performed once in one location and another time in another location by the same cast, each point in time in the musical can be considered related or versioned performances (Tsai *et al.*, 2008). Versions of performances can be compared between differences in casting, a performer, composer, or even alterations to a plotline.

Fine Arts Fine Arts is used to represent aesthetics and beauty relating to works of poetry, sculpture, or various types of paintings and techniques. Many versions of paintings are displayed, either through alteration from restoration, or versions created by the original artists themselves. A single artist may either iterate through different steps in the painting process on different canvases or paint different iterations of the same painting on the same canvas (Orozco, 2019). Figure 1 references *La Taureau* by Pablo Picasso, a series of paintings he completed to display the aesthetic of a minimalist bull and show the iterative process to create related versions of the painting.

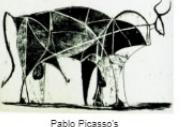
	Cultural Heritage	Events in History	Performing Arts	Fine Arts
Version 1	 Bernardo Bellotto's <i>Dresden Market with the Frauenkirche</i> (1749)	 Papyrus <i>Heqanakht's Letter</i> (1961 BC)	 Charles Strouse's <i>Annie</i> (1982)	 Pablo Picasso's <i>Le Taureau</i> (1945)
Version 2	 The Frauenkirche Church (February 1945) <i>Bombing of Dresden WWII</i>	 Amate <i>Huexotzinco Codex</i> (1521)	 Charles Strouse's <i>Annie</i> (1999)	 Pablo Picasso's <i>Le Taureau</i> (1945)
Version 3	 The Frauenkirche Church (Present 2021) <i>Dresden, Germany</i>	 Letter Paper <i>Modern-Day (1980s - Present)</i>	 Greg Kurstin's <i>Annie</i> (2014)	 Pablo Picasso's <i>Le Taureau</i> (1945)

Figure 1. Comparing Sequential Versions

CULTURAL ARTIFACT ARCHIVES

The PORTAL-DOORS Project can be described as an *archiving system* that, as part of the implementation measures to track related versions of cultural objects, is able to store metadata relating to the provenance of associated scholarly research and cultural artifacts (Taswell, 2010). Bibliographic formats currently used by the Library of Congress include MARC (Machine Readable Cataloging) and BIBFRAME in a modern transition to semantic web technologies (Xu, Hess, & Ackerman, 2018). To accommodate software management of related versions, we have continued development of the Nexus-PORTAL-DOORS-Scribe (NPDS) Cyberinfrastructure in conjunction with the PORTAL-DOORS Project to include import features for mapping current bibliographic formats to the NPDS format. This method includes storing information related to resource provenance and distribution, based on which initial import format is preferable to curators accessing PDP diristries (Taswell, 2008). Provenance can vary based on the discovered history of the object or a transfer between various libraries, museums, and archives. Time features and metadata stored in NPDS infosubsets can be mapped to existing bibliographic formats of MARC or BIBFRAME through the import feature without the curator having prior knowledge of system use. When discussing the provenance of a cultural artifact, e.g. a historical bust, one might track from the discovered history of the artifact and through its archivists, including the archaeologist, restorer, preservationist, and cataloguer (Patel *et al.*, 2005). We have developed the Ashurbanipal diristry as a catalog for documenting library tools, technologies, and multimedia about the preservation, restoration, and curation of cultural artifacts. Its contents includes a range of scholarly literature that details cataloguing techniques for cultural heritage objects including methods in painting restoration or repairing water damaged artifacts in an effort to track documentation relating to the preservation of cultural heritage.

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