

Software Application Development to Backing the Legitimacy of Digital Annals: Use of the Diplomatic Archives

Harshini Priya Adusumalli

Department of Computer Science, Kent State University, Kent, Ohio, USA

*Corresponding Contact:

Email: harshinipa.gs@gmail.com

ABSTRACT

As a fundamental design feature of their digital archives, this approach was applied to the project. It has so demonstrated considerable potential in terms of defining and condensing crucial data pieces that support the presumption of authenticity across a wide range of record formats. The purpose of this study is to offer a conceptual technique, which will be referred to as object-oriented diplomatic in this work. In this methodology, the focus is on creating digital records that can maintain their authenticity over time and when they are removed from their original systems. This is accomplished through the extension of archival diplomatic theory and the application of object-oriented programming (OOP) principles. A new way to supporting the presumption of authenticity of digital records is presented in this study, which makes use of concepts from archival diplomatic theory, which are combined with OOP principles. It is the author's goal that this work may spark a more fruitful collaboration between archivists and records managers and software developers in the development and implementation of digital repositories in the future.

Keywords: Electronic Records Management, Archiving, Systems Design, Object-oriented Programming (OOP)

9/20/2017

Source of Support: Nil, No Conflict of Interest: Declared

This article is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Attribution-NonCommercial (CC BY-NC) license lets others remix, tweak, and build upon work non-commercially, and although the new works must also acknowledge & be non-commercial.



INTRODUCTION

In a world where technology is changing at a faster rate than our ability to develop procedures for dealing with its by-products, the issue of articulating what constitutes an authentic record in the digital environment is becoming increasingly important from the perspectives of business, law, societal development, and research. When a record is withdrawn from its original system of creation, or when it goes through a migration or conversion process, providing confirmation of its validity becomes difficult (Adusumalli, 2016a). In order to meet this challenge, the author proposes the integration of concepts from the centuries-old discipline of diplomatics into the contemporary object-oriented programming paradigm in order to communicate archival authenticity metadata

requirements to software developers in a language they are comfortable with. It is referred to as object-oriented diplomatic (OOD) design because it brings together archival theory and software development to create structured, standardized, and authenticity self-aware record objects that contain not only (what is traditionally viewed as) the digital record but also the metadata that provides support for the record's authenticity (Pasupuleti, 2015a). In order to articulate into a common model for all records, regardless of type or format, what essential data elements that support authenticity should be captured, standardize those elements across all record types while retaining the ability to extend additional elements for functional groups of records, and construct these authenticity supporting elements into standardized record objects for ingestion into a preservation or record-keeping system are the objectives of this approach.

A computer program's records are represented as informational constructs called objects, which have attributes and associated procedures of behavior that vary depending on the type of object being created. Object-oriented programming (OOP), one of the most widely used programming language paradigms in the twenty-first century, represents records as data structures called records. Objects in object-oriented programming (OOP) are designed as abstract representations of the desired form, and they are given substance by assigning data to the attributes of the objects through the process of instantiating them (Adusumalli, 2016b). Before a digital record can be formed within a computer system, it must first have its origins in this ideal object as stated within the software that generates it. This ideal object is the starting point for all digital records.

UNDERSTANDING DIPLOMATIC

Dom Jean Mabillon, a Benedictine monk from France, created a scientifically based approach for evaluating the validity of a particular record whose content or origins was in issue in the seventeenth century. Mabillon constructed a process of analysis based on examining specific departures from the processes of creation, content, and linguistic style utilized in other works of documented provenance, which he used to medieval charters in comparison to other charters of a comparable date, type, and origin. After being challenged by a Jesuit Bollandist named Daniel van Papenbrock, who questioned the legality of charters on which France's Abbey of Saint-Denis based its claims to patrimonial rights, this repeatable, systematic process of investigation was developed (Skemer, 1989). A large number of people were familiar with Mabillon's work; it was utilized extensively and served as a focal point in judicial debates about the legitimacy of documentary evidence known as the *Bella Diplomatica* (so termed after the title of Mabillon's book). Although diplomatic studies did not gain popularity until the second half of the eighteenth century, the discipline's methods were taught in the Faculties of Law at major European universities, and they served as the foundation for the laws of evidence that we know today. During the second half of the eighteenth century, the importance of the discipline that became known as diplomatic studies continued to rise, and its methods were taught in the Faculties of Law at major European universities.

ARCHIVAL DIPLOMATIC

Because of the study undertaken by the InterPARES project, which began in the mid-1990s, it has been demonstrated that Diplomatic is just as applicable to twenty-first-century records constituted of binary data as it was to seventeenth-century records composed of pen and parchment. As time has passed since Mabillon's time, the nature of

record-keeping, as well as its transmission and usage, has changed, but the underlying assumption on which diplomatic practice is founded has remained:

Due to the fact that digital records require both hardware and software to be converted into a human-readable format, they are more dependent on the context in which they were created than their counterparts from the medieval period. In response to this rising reliance on technology, InterPARES created the hybrid discipline of archival diplomatic with the goal of better understanding the principles of record and authenticity as they pertain to digital recordings (MacNeil, 2004).

According to archival diplomatic theory, in order to establish the authenticity of a given record, it is required to establish its continuous identity as well as demonstrate its integrity (Duranti and Jansen, 2011). Digital records are authenticated in large part by the process and chain of custody, but the authenticity of digital records is also supported by examining and interpreting the documentary form in which it exists.

In a documentary record, the documentary form is an expression of a set of criteria for displaying the material that delivers the message for which the record was originally made. This documentary form is made up of both extrinsic elements, which are those that determine the look of the record, and intrinsic elements, which are those that express the content of the record by providing structure. Overall presentation features (i.e. common appearance characteristics such as text and graphics) and specific presentation features (i.e. fonts, hyperlinks, special layout, and resolution/scale/ sample rates) were included. Extrinsic elements also included electronic signatures, digital timestamps, special signs (i.e. digital watermarks and organizational crest), a personal logo, and an originator identifier (Pasupuleti, 2015b). The name of the author, the name of the originator, the date, the location of origin, the name of the recipient, the attestation, the description of the action, and other intrinsic components have been recognized.

WHAT IS THE OOP PARADIGM?

In the olden days of mainframe computers, application programs were made up of long lines of commands that were processed almost exclusively in a linear fashion in order to carry out the functions and subroutines that were supposed to be executed. As software application requirements became more complex and the physical systems they were attempting to re-create became more complicated, this simple, monolithic programming concept left data exposed to the entire program while allowing for limited interaction between applications and reusability of content. This resulted in greater security concerns, unexpected behavior owing to "bugs," and a higher likelihood of unintended data corruption as a result. Programming became increasingly modularized in order to address the issues of security, segregation, and reliability. This resulted in the development of an object-centric programming paradigm that is centered on creating data objects and crafting the code that defines these objects based on their expected attributes and behaviors (Pasupuleti, 2015c).

Objective-oriented programming (OOP) has the purpose of modeling discernible characteristics of real-world objects as abstract representations in a computer program (Klump, 2001). The physical world is constituted of items; abstracting these objects and converting them into a digital simulacrum that reflects the physical analog's qualities and behaviors provides for a more accurate and intelligible depiction of the complex systems that must be built. As a result, object-oriented programming (OOP) concentrates on the creation and modification of objects that are at the heart of modeled action. Such an

approach represents a significant departure from the previous programming paradigm, which concentrated mostly on the "business logic" that performs the manipulation that results in output (objects). Ontology-driven programming (OOP) begins by describing what the objects are, what behaviors they possess, and how they relate to other objects both within and outside of the program, and then proceeds to design the logic of the program around these requirements. As soon as an object is defined, its properties and actions are grouped together to form a class, which serves as an abstract representation of the idealized form of all objects of a particular type in the system. Thus, OOP can be thought of as a modern-day extension of Plato's theory of forms, which asserts that any chair that is made is in actuality a close approximation to our knowledge of what an ideal chair should look like.

OBJECT-ORIENTED DIPLOMATIC

Understanding how archival diplomatic notions can be integrated within many key object-oriented programming principles – notably those of inheritance, encapsulation, and polymorphism — is essential to comprehending how this suggested preservation record object is developed. In order to simplify the presentation of the preservation object model, a form of object-oriented pseudo-code will be utilized in the following examples. In spite of the fact that it is not technically accurate for any particular programming language, it gives a general idea of the necessary pieces to the archivist while closely mimicking the code construction utilized within most object-oriented programming languages for the developer. OOD records are modeled after their documentary form, with records that have similar classifications placed together into classes (see Figure 1). In addition to assigning each class a distinct name, the intrinsic and/or extrinsic elements that apply to that grouping are provided, together with the needed data type and a description of the type of information that should be included in that field. While it is outside the scope of this paper, it is also important to note that, in addition to modeling the construction of the class of record, it is also possible to model the allowable behaviors on a class-by-class basis – such as who has the ability to add, delete, inspect, and modify the data elements, when they can do so, and under what conditions they can do so, for example.

DISCUSSION

Beginning with the initial design and development of a government digital repository, the proposed modeling methodology has demonstrated a strong potential for developing authenticity self-aware record objects that explicitly articulate extrinsic and intrinsic elements that provide evidence of the record's identity or help demonstrate its integrity. By starting with ideal record models derived from archival diplomatic sources, subsequent ingestion and preservation activities can be explicitly permitted or prohibited from adding, deleting, inspecting, or modifying essential authenticity elements based on permissions, as well as from inspecting or modifying essential authenticity elements. A significant difference between this approach and more traditional methods of records processing is that it explicitly articulates within the record object itself those identity and integrity elements that are expected and/or required – first those elements that are shared by all records and then specific elements depending on record type – and then embeds those elements into the record objects themselves. As a result, the important identification and integrity characteristics that contribute to the assumption of authenticity of a record are considered to be as much a part of the record as the digital files themselves. The information is carried along with the record object as it travels through time and space,

rather than being stored in an external file or database as is the case with traditional data storage methods. Following that, the diplomatic-centric preservation record can be stored as an object file (such as a JSON object), loaded into a database (whether relational or object-oriented), or transformed into another format. The use of such an approach does not preclude the creation of external descriptive metadata files or the insertion of discrete pieces of information into databases, but instead serves to support such efforts by exposing the information in a highly uniform and consistent manner across all record types (Pasupuleti, 2016).

Although the case study on which this paper is based is testing this methodology as a "preservation wrapper" around existing digital records as part of the preservation workflow into a digital archive, the same techniques could theoretically be applied to the initial creation of digital records in the systems from which they were derived as well. Further research and testing (including the development of full diplomatic-based ideal record models) in larger, more diverse technical environments would be beneficial to the concepts presented herein in order to determine their feasibility and practicality in supporting the presumption of authenticity of records through technical migrations and conversion (Adusumalli, 2017). The use of an OOD approach to the creation of new record-making systems gives exciting chances to redefine what legitimate digital records are in the twenty-first century, despite the fact that it is doubtful that huge commercial off-the-shelf software solutions will embrace such an approach (Pasupuleti, 2016a).

CONCLUSION

Making idealized representations of real-world objects isn't a new idea. OOP begins by defining the attributes and behaviors that an ideal record should possess and then develops ideal object models that are instantiated into reality, as opposed to diplomatic, which looks first at the created records to determine what attributes an ideal record of that type would possess and what processes created it. It is possible to work closely with software developers to incorporate features of archival diplomatic importance (e.g. identity and integrity, circumstances of creation, and archival bond) into the preservation record objects themselves through the use of OOD methods. It's possible to design record systems so that all records created within the system inherit the "ideal record's" elements, thanks to OOP's inheritance structure. This ensures that all records have the five characteristics listed above, along with any additional evidence needed to prove their authenticity. Class-based systems produce records that include not only the information needed to be useful for their intended purposes, but also the information required to preserve authentic records without the need to infer their content, creator, context, and so on after the fact and outside their system of creation.

REFERENCES

- Adusumalli, H. P. (2016a). Digitization in Production: A Timely Opportunity. *Engineering International*, 4(2), 73-78. <https://doi.org/10.18034/ei.v4i2.595>
- Adusumalli, H. P. (2016b). How Big Data is Driving Digital Transformation?. *ABC Journal of Advanced Research*, 5(2), 131-138. <https://doi.org/10.18034/abcjar.v5i2.616>
- Adusumalli, H. P. (2017). Mobile Application Development through Design-based Investigation. *International Journal of Reciprocal Symmetry and Physical Sciences*, 4, 14–19. Retrieved from <https://upright.pub/index.php/ijrsps/article/view/61>

- Duranti, L. and Jansen, A. (2011). Authenticity of digital records: an archival diplomatics framework for digital forensics. *Proceedings of the 5th European Conference on Information Management and Evaluation (ECIME), Como*, 134-139.
- Klump, R. (2001). Understanding object-oriented programming concepts. *Power Engineering Society*, 2, 1070-1074.
- MacNeil, H. (2004a). Contemporary archival diplomatics as a method of inquiry: lessons learned from two research project. *Archival Science*, 4(Nos ¾), 199-232.
- Pasupuleti, M. B. (2015a). Data Science: The Sexiest Job in this Century. *International Journal of Reciprocal Symmetry and Physical Sciences*, 2, 8–11. Retrieved from <https://upright.pub/index.php/ijrsps/article/view/56>
- Pasupuleti, M. B. (2015b). Problems from the Past, Problems from the Future, and Data Science Solutions. *ABC Journal of Advanced Research*, 4(2), 153-160. <https://doi.org/10.18034/abcjar.v4i2.614>
- Pasupuleti, M. B. (2015c). Stimulating Statistics in the Epoch of Data-Driven Innovations and Data Science. *Asian Journal of Applied Science and Engineering*, 4, 251–254. Retrieved from <https://upright.pub/index.php/ajase/article/view/55>
- Pasupuleti, M. B. (2016). The Use of Big Data Analytics in Medical Applications. *Malaysian Journal of Medical and Biological Research*, 3(2), 111-116. <https://doi.org/10.18034/mjmbr.v3i2.615>
- Pasupuleti, M. B. (2016a). Data Scientist Careers: Applied Orientation for the Beginners. *Global Disclosure of Economics and Business*, 5(2), 125-132. <https://doi.org/10.18034/gdeb.v5i2.617>
- Skemer, D. (1989). Diplomats and archives. *American Archivist*, 52, 376-382.

--0--