

Significant Properties of Complex Digital Artifacts: Open Issues from a Video Game Case Study

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ABSTRACT

In this poster we present the preliminary output of a study meant to analyze the applicability of the InSPECT Assessment Framework to a particular kind of complex digital artifact: video games. We discuss open issues and possible improvements in the assessment workflow.

Keywords

Digital preservation, significant properties, complex digital artifacts, video games.

1. INTRODUCTION

The concept of significant properties has been central in discussions of digital preservation in the last decade [3] [4] [1] [8] [9] [10]. The Investigating the Significant Properties of Electronic Content over Time (InSPECT) project defines significant properties as “*The characteristics of digital objects that must be preserved over time in order to ensure the continued accessibility, usability, and meaning of the objects, and their capacity to be accepted as evidence of what they purport to record*” [2]. The InSPECT Assessment Framework was developed to help digital curators identify and select significant properties to be preserved. The framework has been tested and evaluated against four basic object types: Audio Recordings, Structured Text, Raster Images, and E-mail [6]. These object types, while common, are not representative of the entire population of digital artifacts, justifying an investigation into the framework’s performance in terms of scalability and expressiveness with more complex artifacts. In this poster we present the preliminary output of a study analyzing the applicability of the InSPECT Assessment Framework to a particular kind of complex digital artifact: video games. This study was part of a set of investigations being conducted into the preservation of video games within the Preserving Virtual Worlds II (PVW2) project at the University of Illinois. Oregon Trail II, an educational simulation game, has been chosen as the object of analysis. Our analysis provides insight into the framework’s applicability, and points to possible improvements in its workflow. We believe the results to be significant in the discussion on digital preservation, particularly with respect to advancing our understanding of significant properties as a central concept in the development of preservation strategies for complex digital artifacts.

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2. PRESERVATION, COMPLEXITY AND SIGNIFICANT PROPERTIES

In a preservation context, at least two levels of abstraction [11] need to be considered to support a digital artifact’s consistent representation:

Targets of Preservation: the ultimate *things* to be preserved in a preservation strategy. These are most likely to be conceptual entities not strictly bound to any specific technological instantiation. In FRBR [5] terms, these entities are most likely to correspond to the Expression level. They express the content and functional behaviors that need to be available to experience a digital artifact.

Objects of Preservation: those *digital objects* against which preservation actions are performed. They encode the preservation target and are most likely to correspond with the Manifestation or in FRBR [5].

We define digital preservation as the activity of ensuring the *possibility* of recreating the *Target of Preservation* from one or more *Object of Preservation* in order to experience its content and functionality. Preservation’s success should be assessed on the basis of a given preservation strategy’s ability to preserve significant properties. However, for complex digital artifacts, the identification of significant properties requires the identification of specific components at both the *Target of Preservation* and *Object of Preservation* levels and that the relations between these components be made explicit.

3. OPEN ISSUES FOR VIDEO GAMES

The InSPECT Assessment Framework appears to lack the level of granularity needed to analyze digital artifacts that — as single complex entities — express complex content and manifest complex interactive behaviors. Here we provide a few examples of the issues we encounter during our analysis of Oregon Trail II.

3.1 Object Type Identification

In the framework *Object Analysis* stage “*The evaluator analyses a representative sample of an object type, identifies a set of functions and behaviors that may be achieved, and the properties that are necessary for their performance*” [6]. The notion of Object Type is slippery. Assigning “Video game” as the object type, while a natural choice, seems problematic. Video games manifest an extreme degree of variation in content and expected behaviors that challenges the assignment of a clearly defined set of significant properties to the whole class of such objects. For example, video frame rate is very significant for a certain kinds of video games (e.g. first-person shooters) but is most likely less so for other kinds of games (e.g., digital board

games such as Go or chess). While video game *is* an object type, the core properties that can be assigned at this general level do not seem sufficient to assess preservation of any specific video game instance. Significance has to be found at a more fine-grained level, making application of the InSPECT Assessment Framework problematic in terms of cost.

3.2 Entity Conflation & Properties Assignment

The InSPECT assessment framework also seeks to identify significant properties for an information object (or object type), rather than its individual components [1]. InSPECT identifies structural properties relating ancillary components of an object — as portrayed in the email attachment example [7]. However, for a correct representation of a complex digital artifact like a game, components not only stand in a, possible, ancillary, relation with the video game, they necessarily participate in the identity construction of the game itself. The video game *object type* needs to be structured, the rich network of components needs to be represented, and their relation properly qualified.

As an example, consider the characteristic of having a particular on-screen resolution. Oregon Trail II, as a game, has a resolution of 640x480 pixel. The same property of resolution, however, has a different value for game components — e.g., the videos included in the Macintosh version of the game have a 640x440 resolution. InSPECT focuses on establishing a significant property for the *game*, but for preservation to succeed, two different significant properties must be recorded, related, and assigned to the correct entities: the game and a specific component — a video — of the game. Strategies need to be identified to adapt the framework workflow to compositionality.

3.3 Objects of Preservation and Significance

The InSPECT framework is based in a Function-Behavior-Structure analysis that seeks to “*identify the functions that have been defined by the creator of a digital object*” [6]. InSPECT’s analysis of the information object is informed by subsequent stakeholder requirements analysis which identifies stakeholders’ needs with respect to a particular object type that is *Target of Preservation*. While theoretically attractive, this framework assumes a consistency of functionality over different *Objects of Preservation* for the same object type that does not appear to exist in the case of complex digital artifacts such as games. It also seems to assume that significant properties exist only at the level of the conceptual information object (Target of Preservation), and not the data object (Object of Preservation), and that curators’ freedom to reformulate objects is relatively unbounded by the data object. The existence of multiple physical instantiations of games (e.g., source code, installation CD, installed version) which afford very different behaviors, and the fact that curatorial institutions some times cannot choose which instantiation they ingest, make those assumptions at least somewhat problematic.

We have examined several versions of Oregon Trail within our research. Two of the early versions are BASIC programs written for CDC mainframes for which we have the source code. Oregon Trail II is distributed on a CD-ROM that includes both the Windows and the Macintosh version of the game, but for which source code is not available. While these versions are clearly of the same object type, we would argue their functionality (and significant properties) to be very different. Assuming homogeneity of functionality across instances of an object type does not seem safe in the case of games. Moreover, for a given version of a game, the physical manifestations available enable very different functionality for users, and enable and

constrain different actions on the part of curators. Availability of source code enables a variety of stakeholder actions not feasible with a binary version, even though both can support the “functions that have been defined by the creator.” The CD-ROM ISO for Oregon Trail II contains two different manifestation of the game — the Windows and the Macintosh ones — only one of which feature video, and which enables functions for a stakeholder that preserving an installed instance of the game would not. We argue that there is another level of significance connected to the specific data object we chose (or are forced to chose) as preservation object, but separate from that of the information object. If we accept the InSPECT definition of significant properties [2] then we must accept that data objects are digital objects, and that a focus on the information object risks loss of valuable information.

4. CONCLUSION

This poster is a preliminary report of our attempt to apply the InSPECT framework to video games. Complex digital artifact manifest representation issues that were not covered in the InSPECT case studies. We believe the result to contribute to the discussion on significant property as a central concept in the development of preservation strategies for complex digital artifacts.

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