

EDUCATION WITH “LIVING ARTWORKS” IN MUSEUMS

Roberta Beccaceci^(*), Francesca Fallucchi^(†), Cristina Giannone^(†)

Francesca Spagnoulo^(*) and Fabio Massimo Zanzotto^(*,†)

^(†) *Dipartimento di Informatica, Sistemi e Produzione, University of Rome “Tor Vergata”, Italy*

^(*) *Facoltà di Lettere e Filosofia, University of Rome “Tor Vergata”, Italy*

Keywords: Museums, Conversational Agents.

Abstract: Museums need to find innovative ways of communicating if these institutions want to survive in the new era and want to play their active role of educators. In this paper, we will present our idea of *living artworks*. Using *conversational agents* we want to give artworks the capability of talking to visitors. A *living artwork* attracts attention, being a funny and novel combination of art and technology. The mix of experience and action has a beneficial effect in learning new concepts or facts. We will then present our methodology for building *living artworks*, the enabling technologies, and a case study.

1 INTRODUCTION

There is a growing interest in using museums as places where to informally deliver educational contents (Severino, 2007). Artworks are not simply “artists’ messages to audience” but also tools to create links between cultural contents and audience. Yet, to positively play the role of informal educators, museums have to deliver content in a novel way. According to the analysis reported in (De Biase, 2008), many visitors, around 33%, forget the names of artists and the artworks they saw into museum, 50% of the visitors remember not much about artworks, and 32% of them mixed subjects up with others never seen. These are clear indicators that somehow traditional museums are not well suited to play this important role of informal educators.

To win against different media and forms of entertainment, museums are seeking innovative ways to deliver their contents to the public. In their battle for surviving, these institutions are opening to novel technologies. There are active communities looking and monitoring new trends in technologies. The MuseTech Central¹ is a place to share information about technology-related museum projects such as social tagging for artworks (Trant and Wyman, 2006). The awareness of the role of informal educators and the technology fertile ground make museums wonderful places where to experiment with novel and in-

formal ways of communicating educational content. This will be beneficial both for museums and for audiences.

Our idea is to create *living artworks*. We want to give to artworks the capability of talking, in order to have a “dialogue” with visitors. We will use *conversational agents*. In a nutshell, conversational agents are software systems that can have conversations with users. These software systems come from the tradition of Artificial Intelligence (AI). Building systems able to replicate the human ability to communicate is one of AI’s main goals, see for example the Turing Test (Turing, 1950). Conversational agents have been already used for educational purposes and we believe that artworks that can tell their own history will attract people.

In this paper, we will present this idea of *living artworks*. We shortly review the related work, i.e., the use of conversational agents as tutoring systems (Sec. 2). We will then present enabling technologies and our methodology for building *living artworks* (Sec. 3). We finally describe the application of our methodology (Sec. 4).

2 CONVERSATIONAL AGENTS IN EDUCATION

Education is showing a growing interest towards new technologies and new media as innovative means to

¹<http://www.musetechcentral.org/>

support learning. Multimedia technologies mix language and images that are the basic blocks in the process of thinking and learning. These technologies build new suitable communication channels for teachers that want to exchange educational messages with their students. Yet, technology will not substitute but broaden pedagogical strategies available for teachers (Dede, 1992).

Artificial Intelligence (AI) has been often seen as an interesting way to support traditional and distance learning. AI systems can make distance learning more attractive (Moore and Kearsley, 2005). People, in general, and children, in particular, are increasingly more acquainted with contents delivered with new technologies. Children play with videogames and chat over the Internet with astonishing ease. Using new technological channels can attract students stimulating their curiosity. A simple way to introduce new technologies is to use software embodied agents, i.e., virtual puppets on a screen, as storyteller. In (Damiano et al., 2006), these agents have been used to guide children inside a museum. A more attractive way is to use interactive agents called *Conversational Agents*. These are able to establish interactive communication with users using natural language. Conversational agents have been used for language education in (Jia and Ruan, 2008) or for teaching physical and procedural tasks using a virtual reality environment in (Rickel and Johnson, 1998). Some recent works in Human-Computer Interaction field (HCI) (Core et al., 2006) explored the use of virtual agents for educational and training. In this environment, users train their skills interacting with virtual agents like in a videogame.

3 REVITALIZING MUSEUMS WITH "LIVING ARTWORKS"

Museums need to find innovative ways of communicating if these institutions want to survive to the new era and want to play their active role of educators. We believe that our idea of *living artworks*, i.e., an artwork extended with the capability of talking about itself, can help in this difficult challenge. The integration of different cultural experiences adds value to knowledge accumulation process (Severino, 2005).

We firstly define a *living artwork* and analyze the beneficial effects for museums (Sec. 3.1). We then present the enabling technology, i.e. the stimulus-response conversational agents, (Sec. 3.2) and the procedure to use it (Sec. 3.3).

3.1 "Living artworks" as Educational Tools in Museums

A *living artwork* is a combination of an artwork and a conversational agent. We want to extend the positive experience of storytelling in museums (Damiano et al., 2006) integrating principles and technologies of conversational agents used for educational purposes (Core et al., 2006). The agent should involve visitors in conversations about the artwork.

A *living artwork* wants to attract attention, being a funny and novel combination of art and technology. At the same time, it wants to generate new knowledge. It acts as instrument of cultural communication and as tool of cultural production. A *living artwork* allows a bidirectional communication helping the shift from passive spectator to active spectator. The combination of experience with action has a beneficial effect in learning new concepts or facts.

Given an *artwork*, we can build the related *living artwork* if:

- we have a conversational agent platform with a simple language for describing the knowledge needed for the dialogue
- we completely define the knowledge base to have conversations about the *artwork*

In the next sections, we firstly introduce the conversational agent platform we use (Sec. 3.2) and secondly we define a methodology to build the knowledge base (Sec. 3.3).

3.2 Conversational Agent Technology

A Conversational Agent (CA) is a software technology that uses the natural language utterances to interact with users. Conversational agents can "have a conversation with a user". Among all the possible CA technologies, we selected the simplest, i.e., those following the Behavioral psychological theory (Watson, 1928). According to this theory, human mind can be studied only relating received *stimulus* and emitted *responses*. The human behaviors can be described by the following function:

$$R = f(S) \quad (1)$$

When an individual is exposed to *stimuli* his response is a function of these stimuli.

The behaviorism has inspired one of the first emulative conversational agents. In 1966 Weizenbaum build a software program called Eliza (Weizenbaum, 1966). This artificial agent simulated the Rogersian psychologist behavior. The interactions was grounded on the agent ability to hold control about dialogue,

using as first interaction (stimulus) a question for the user, which will response based on stimulus and his environment. After this, the interest on conversational agent field grew up, drawing the attention of many different research fields like Psycholinguistics or Software engineering. An important mention for ALICE (*Artificial Linguistic Internet Computer Entity*) (Wallace, 2004) that implements a simple framework allows somebody to create its conversational agent by creating a collection of stimulus-response pairs. When a user will ask a question to the agent, the stimulus is searched in the collection. If this stimulus is in the collection, the agent will reply with the related response.

In this study we use ALICE as it offers a simple language to write stimulus-response patterns. This simple technology in the last years has inspired many research works that proposed extension of this technology (e.g. (Pilato et al., 2004)).

3.3 Building Personality of Conversational Agents

As we saw in the previous section, ALICE is simple to use. Building the agent *personality*, i.e. its way to answer to questions, means to write stimulus-response pairs. Furthermore this technology allows to model and store data about current dialogue topic, other data about user, or dialogue in general. This makes possible to program the agent to reply to a great amount of questions with different languages, e.g., a colloquial language with idioms or jokes.

The process we follow to build the collection of stimulus-response pairs has two phases:

- *Wizard-of-OZ* phase: using a standard model to collect data for dialogue systems, i.e., the Wizard-of-OZ (Fraser and Gilbert, 1991), our first phase is to collect possible dialogues using people that simulate the behavior of the system. Dialogues collected in this phase are used to produce a first collection of stimulus-response pairs.
- *Controlled Wizard-of-OZ* phase: the system is deployed with the first collection of stimulus responses. Dialogues are logged in order to analyze failures. The initial collection is then augmented with new stimulus response covering failures.

4 CASE STUDY

In this section we present an initial application of the *living artwork* concept. We describe the target audi-

ence and the target artwork. We then report on the related personality-building phase.

4.1 Target Audience and Target Artwork

Children with an age range 8-12 years are our initial target audience. We want to try if it is possible to capture their attention on artworks for which they do not show a natural interest. We believe that children can be more open to technological communication channels and that a novel way of approaching artwork with entertaining conversational agents will help them in better learning.

Among many artworks, we selected a painting representing a scene with many people having interesting story to tell. Many subjects in the scene give us the possibility of better experimenting with a conversational technology as we can focus the attention in many parts of the painting. We then selected the painting “The Hunt of Diana” (see Figure 1), placed in Rome in the Borghese Gallery and Museum, painted by Domenico Zampieri called Domenichino in 1616/17. In his masterpiece Domenichino revived antique literary and mythological themes such as an archery scene deriving from Virgil’s Aeneid (V,485) and the depiction of nymphs. Many characters in the scene have a story to tell.

We divided the painting in five areas (see Figure 1). Each one connected to a particular subject, according to the general intention to let audience to choice the topic to study in depth.

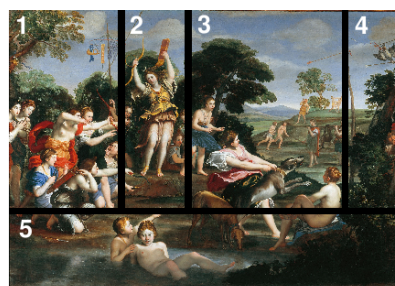


Figure 1: “The Hunt of Diana” painting.

4.2 Building the Conversational Agent Personality for the Case Study

For the construction of the personality, we followed the two-step procedure described in Sec. 3.3: the first phase where the system is simulated, the *Wizard-of-Oz* phase, and the second phase where the system is deployed and its failures detected. Before starting

Table 1: A sample dialogue with the simulated Agent.

Agent:	Hello, do you want to know something about this painting? Play with us and answer to some questions. What is your name?
Child:	asia
Agent:	Hello Asia, do you know the title of the painting ?
Child:	no
Agent:	It's "The Hunt of Diana" and it placed in Rome in the Borghese Gallery and Museum. It was painted by Domenico Zampieri in 1616/17. Do you know why it is called Domenichino (Little sunday)?
Child:	because he works only on sunday.
Agent:	Clever but it is not the right answer. He was short!
	...

we collected a document describing the particular artwork. We organized this document as if it were a collection of stimulus-response. It contains general information about painting and painter's life, information about specific parts of the painting, and particularities of the artwork. We used this document to drive the first phase.

We organized the Wizard-of-Oz phase as follows. We used 3 classes in a primary school as focus group. The Conversational Agent has been simulated with Microsoft MSN. The language used by the simulated system, i.e. the operator, is simple and colloquial. At the end of this phase, we gathered 10 dialogues. An example of these dialogues can be seen in Tab. 1. This set of dialogues has been used to design the real stimulus-response collection. We defined around 130 stimulus-response pairs.

The second phase is currently running. The system has been deployed on a web site and it is accessible over the net².

5 CONCLUSIONS AND FUTURE WORK

This paper presents a novel idea that we called "living artworks". We believe that this paradigm can be useful in two ways: making museums more attractive places and increasing the effectiveness of museums as informal educators. This is a preliminary work and we need to study if the above two claims can be supported with empirical evidence. We then need to deploy our "living artworks" in a museum and measure whether the knowledge retention indicators (as those used in (De Biase, 2008)) have a beneficial effect.

REFERENCES

- Core, M., Traum, D., Lane, H. C., Swartout, W., Gratch, J., Lent, M. V., and Marsella, S. (2006). Teaching negotiation skills through practice and reflection with virtual humans. *Simulation*, 82(11):685–701.
- Damiano, R., Lombardo, V., Nunnari, F., and Pizzo, A. (2006). Dramatization meets narrative presentations. In *Mobile Guide 06*.
- De Biase, F. (2008). La centralita' dello spettatore. In *L'arte dello spettatore, il pubblico della cultura*, Milano. Franco Angeli.
- Dede, C. (1992). Education in the 21st century. In *Annals of the American Academy for Political and Social Science*, pages 104–115.
- Fraser, N. and Gilbert, G. N. (1991). Simulating speech systems. *Computer, Speech and Language*, (5):81–99.
- Jia, J. and Ruan, M. (2008). Use chatbot csiec to facilitate the individual learning in english instruction: A case study. In Woolf, B. P., Ameer, E., Nkambou, R., and Lajoie, S. P., editors, *Intelligent Tutoring Systems*, volume 5091 of *Lecture Notes in Computer Science*, pages 706–708. Springer.
- Moore, M. and Kearsley, G. (2005). *Distance Education: A Systems View*. Thomson/Wadsworth.
- Pilato, G., Vassallo, G., Augello, A., Vasile, M., and Gaglio, S. (2004). Expert chat-bots for cultural heritage. In *IX Convegno della Associazione Italiana Intelligenza Artificiale Proc. of Workshop Interazione e Comunicazione Visuale nei Beni Culturali*, page 15.
- Rickel, J. and Johnson, W. L. (1998). Task-oriented dialogs with animated agents in virtual reality. In *Workshop on Embodied Conversational Characters. In Proceedings of the Workshop on Embodied Conversational Characters*, pages 39–46.
- Severino, F. (2005). *Un marketing per la cultura*. Franco Angeli, Milano.
- Severino, F. (2007). *Comunicare la cultura*. Franco Angeli, Milano.
- Trant, J. and Wyman, B. (2006). Investigating social tagging and folksonomy in art museums with steve.museum. In *WWW 2006*.
- Turing, A. (1950). Computing machinery and intelligence. *Mind*, 59:433–460.
- Wallace, R. (2004). The elements of aiml style. alice ai foundation.
- Watson, J. B. (1928). The ways of behaviorism. *Commun. ACM*.
- Weizenbaum, J. (1966). Eliza—a computer program for the study of natural language communication between man and machine. *Commun. ACM*, 9(1):36–45.

²<http://lirfi.lettere.uniroma2.it/ArtiD>