When RFIDs meet Artist's painting

Olivier Haberman
Artist
17 rue Casimir
75007 Paris, France
olivier.haberman@orange.fr

Romain Pellerin,
Eric Gressier_Soudan
CNAM-CEDRIC
292 rue St Martin,
75 141 Paris Cedex 03, France
+33 1 40 27 22 96
{firstname.name}@cnam.fr

Ugo Haberman
Hippocad
16 rue du Chateau
77300 Fontainebleau, France
+33 1 60 74 36 09
ugo.haberman@hippocad.com

ABSTRACT
This work challenges the conventional art experience. It brings together the fields of art, science, and software integration. The goal was to create a new kind of painting based on embedded technology, experimenting with a new media: paintings augmented with RFIDs. The aim was to achieve interaction between the artist's paintings and art gallery visitors: RFIDs deliver the living voice and words of the artist. They are artist's prompts for visitors. Tags can be read or written through an NFC enabled mobile handset. RFIDs are easy to use. They can provide audio and text-rich information. They can also carry references to web sites allowing downloads of content. The user receives a rich level of information delivered on their NFC mobile phone. RFID tags and NFC mobile phones are a new flexible communication tool closing the gap between artists and the public. A painting by Olivier Haberman has been used to demonstrate our proposal. The effects of this new kind of painting have been evaluated with a diverse group of people.

Categories and Subject Descriptors
D.3.2 [**Programming Languages**], J.5.1 [**Art and Humanities, Architecture**]

General Terms
Design, Experimentation.

Keywords
RFID, interactivity, art, painting, mobile phone, J2ME.

1. INTRODUCTION
The goal of the work described in this paper is to study how embedded technology could help the artist to create a better interaction between his paintings and art gallery visitors.

RFID (Radio Frequency Identification) tags and mobile phone handsets came out very quickly. The authors of this article are involved in the RFID and J2ME (Java 2 Micro Edition) based research project [PEL08, MER08]. The artist's requirements were

that the painting was free of any visual technology and that the content sent to the visitor could be changed overtime… RFID Tags were an appropriate choice to be the basis of our proposal. RFIDs are easy to use. They can be read or written through an NFC (Near Field Contact) enabled off-the-shelf inexpensive mobile handset. They can be audio and text-rich information providers. They can also carry references to web sites allowing downloads of dynamic content. Users enjoy rich level information delivered on their mobile phone. This information can be altered over time by the artist, an additional dynamic and unprecedented capability. RFIDs and NFC mobile phones are a new flexible communication tool that can deliver the living voice and words of the artist thereby closing the gap between artists and the public. The technical part of the application presented here was developed in a joint project with the Hippocad Company, and the CEDRIC research lab of CNAM Paris. Its purpose was to provide the artist with a quick and sustainable way of direct communication, integrated in the work by the artist himself, readable by the widest possible audience, without limitation by time, space or ability to access technology.

O. Haberman is a Painter. As an artist he has observed both at his own and other artist's exhibitions that it would be an advantage to have a direct link between the artist and the public. A way of achieving this for a wide audience with a simple service is to use the latest generation NFC tag reader mobile phone. It promises the beginning of an enriched interaction with the artist's world. A painting by O. Haberman, described later in the paper illustrates the work done. A study of how the public responds to this interactive painting was part of the work.

The paper is organized as follows. Section 2 details key aspects of the technical platform. Section 3 describes the RFID based painting. Section 4 outlines the way the public perceived the painting and the interaction itself through RFIDs. A brief section discusses of related works. The paper concludes and proposes further studies.

2. TECHNOLOGY USED
As mentioned earlier, the application relies on RFIDs and NFC mobile phone (aka Nokia NFC6131) exchanging information with a server that contains the data that the artist wants to provide.

RFID is a wide spread technology dedicated to identify and to trace consumer goods such as books, DVDs, food… Figure 1 shows a very basic, passive RFID tag as we used in this project.

Passive tags have been chosen because they are cheap and wide spread. They can be read by mobile NFC phones. RFID tags are thin and can be embedded in the painting so that they are invisible

to the public. RFID tags contain their ID. The handset device reads the tag and gets the corresponding ID. The distance between the tag and the phone is very short less than a 2 cm. It sends it to the server and the server responds by sending the associated data that has been provided by the artist: sounds, pictures, and very short videos can be associated. The connection over the air uses the data transfer over 2G, 3G … mobile phone networks. The principles of the architecture are given in figure 2. The communication framework that has been used in the smart painting is part of the uGASP project [PEL07]. uGASP is a middleware for ubiquitous games [PEL08].

Figure 1. The overall communication architecture.

The overall framework is implemented in Java 2 Micro-Edition (J2ME) on the mobile phone, and, on standard Java on the server side. The server is designed to be a multi-media web service oriented data base. The content of the server can be updated any time by the artist or any administrator to comply artist's requirements.

3. ARTISTIC PAINTING AND ITS SMART PROMPTS

Passive tags are inserted directly inside the painting. Seven RFID tags have been used inside the painting we used for our experiment. Their location is indicated by symbols, elements integrated into the work which are easily discernible, regardless of age, culture or language of the viewer. But the RFID tags remain invisible to the public. Approaching a mobile phone from a RFID tag (less than 2 cm), the phone automatically downloads content, using audio and video programs without the need for user intervention except pushing the "ok" button. Figure 2 at the end of the paper reproduces the various point of interactivity that we have developed to date. The subject of this semi-abstract piece is Communication. The Roman numeral VIII refers to the relationship of men with their universe, the eight planets in our solar system, this allegory is represented by a photograph showing an abstract space environment. The title of the painting: "Infinite Abstraction," which refers to the invisible and infinite dimension of Communication in particular, but also of art in general, inscribed in what evokes the screen of a phone, itself element of communication, enables to send to the viewer a telephone conversation between two children, and addresses the themes of the spoken word among peoples as well as infancy, the future development of our world of Communication. The symbol Ω stamped on the piece, last letter of the Greek alphabet, used here to express the infinite possibilities of correspondence, as opposed to the start of the first communication between men, and

whose graphic resonance includes a stylized bridge, invites the viewer to understand the angled triangle of the piece symbolizing a bridge between people, a physical communication link, an architectural, but also a disembodied though very real link via conversation. The number "8", chosen for the gesture of loops that can be reproduced ad infinitum, and which, overturned, brings back to the title (∞ : infinite), refers to an abstract photo in which the photographer has chosen to serve the timelessness of communication. The handwritten letter, which occupies the central place in the piece, and historical means of communication, speaks directly to the public to connect with the voice of the author the symbolism used in the creation of this painting. At last, the signature is used to display information on the identity of the piece and of the painter. Thus, this semi-abstract and symbolic piece of art offers a new reading through overt gestures towards and the interaction of many additional media that give a concrete meaning to all the elements that have made the creation of the work. In addition, each of the media has been brought to life by an artist or designer using a different mode of expression. A photographer was invited to give his analysis on his own vision of communication, children have chosen their own grid analysis of the topic and suggested a soundtrack of which they themselves have been the creators and actors, the author was given a space for an audio address to the public to attach permanently to the work the motivations which energized his thought. An additional text in the piece itself includes all the information concerning the author and the identity of the work. This approach to art/technology has enabled communication between the artist, other artists and the public.

4. EVALUATION OF USE

The painting was shown to a range of 48 people between the ages of 12 to 56 years old, of different educational levels and socio-professional categories and with varying levels of interest in art. It allowed us to study the impact of the interaction between a painting, photos, audio messages and text on people at a painting exhibition. Before making the experiment, users have been taught for ten minutes on how the mobile phone has to be used. The evaluation is given hereafter.

4.1 Technology Use

1 - Discovery, visibility of tags, signalling of points to be discovered: 90% skimmed through all the points, 10% did not think about pointing at the signature, which was seen as "outside" the creative painting.

2 - Manipulation of the mobile phone: 80% considered the manipulation of the phone easy to very easy. 20% felt that the phone manipulation was moderately easy and would have preferred the animations to load from first contact so that they did not miss out on information and could listen or watch the content whilst looking at the canvas.

3 - Download time: The download time was perceived to be fast and was not an issue for the public.

4 - Readability of photos: In 80% of cases, the photos were found to be very clear and readable. In 20% of cases, the screen size was considered too small for the material.

5 - Quality of audio messages: The test was done by providing headphones. Audio messages were clearly heard by 100% of the

public. However, a second test was carried out without headphones which gave the same result of satisfaction. No experiments were carried out using the mobile's loudspeaker, as it is not appropriate to an exhibition environment.

6 - Willingness to incorporate this technology in personal mobile phones: It was considered very important in 80% of cases. Indeed, this avoids the logistics of a loan audio-phone, and the dislike of using a device that is not clean and not your own. It allows greater control of the medium, and makes the discovery more special and more accessible to everyone. We observed that for these 80% of users, the mobile phone is considered as a personal extension of themselves.

4.2 Artistic Use

1 – Photos contribution to understanding the painting: Only 40% of the people recognised the pictures as symbolic elements to give additional insight into the painting or to show the treatment of a similar issue by different artistic media. In 20% of cases, the relation between some of the photos to the work has been understood, others were not connected with the subject of the painting. For 40% of viewers, the photos were confusing and raised more questions that they provided clues for interpreting the work.

2 – Benefits of the audio messages: It is necessary to distinguish between two types of messages, the voice recording of the artist and audio non-figurative works. Voice recording of the author: constructive, allowing the public to get closer to the thoughts of the painter. This created a stronger link between the painting, the artist and the viewers, allowing the public to go beyond the painting and learn more about the wider works of the artist and to understand the artist's intent and symbolic references. We concluded that the voice of the painter gives more intensity to the message and the meaning of the piece which was appreciated by all the spectators. It is surprising to note that for the entire group, the act of visiting a painting exhibition is not an aesthetic choice, but is conceptual one. Audio non-figurative work: here we found the same responses as for photographic works. Following the same pattern, the non-figurative audio message was well, little or not at all understood.

3 – Benefits of the factual information: For 70% of respondents, the information including the title, format, type of pigments used, date of creation and the author's name were deemed sufficient and satisfactory. 30% of the viewers would have liked more information about the artist and / or the painting.

4.3 Extension of the Experiment

All the spectators would have liked to keep part of the content on their mobile phone, in the same way that they like to buy a catalogue or a postcard from the exhibition as a memento. The fact that it is the artist himself who provides the content is regarded as a much more personal record of the work and truer to the voice of the artist. This "souvenir" is considered as an extension of their visit, that they will enjoy to look at later, to show to others to share their experience and to keep a reminder of the message of the artist. The popular form of this "souvenir" is a reproduction of one of the pieces along with a short message from the artist himself.

4.4 Conclusion of the Use Analysis, Patches and Proposed Enhancements

1 - Technology use: Generally, people have not been embarrassed by RFID. Also, the technical use confirms that the personal mobile phone is appropriate and popular for this type of use. The speed of the communication link was not enough and made downloads sometimes longer than needed. We used a 2.5G access, it can be easily upgraded.

2 – Artistic use: Interactivity has strengthened the link between the artist and the audience, and given a new dimension to the encounter and discovery of a work of art. It helped everyone to appreciate the piece of art more. Because of this new relationship, the public is now ready for information which had never been expected before. To fulfil this new expectation, some messages will be reinforced, and a copy of the piece with a short audio message from the artist will be loaded automatically into the message-box of the spectator's mobile phone. We thought that the understanding of complementary non-figurative creations to the piece was moderately satisfying, while the message from the artist was understood with everyone and, in the opinion of all, has allowed greater ownership of the work and generated greater interest in the painting and the painter's work. In order to avoid any misunderstanding or confusion to the viewer, non figurative media will be accompanied by an audio message highlighting the relationship with the main work.

3 – Future Developments: One of the viewers thought that interactivity meant that the public would be able to directly influence the work. This kind of interactivity will be a subject of future technological and artistic investigations.

5. RELATED WORKS

The main comparison that can be made with our work is related to RFID based visits or access contents to museum [HSI05][PER05][HEU07][MER08]. In the context of museums, the curator/staff handles which artwork is underlined with an RFID tag and what content is associated to it. The museum has its own strategy to explain and to link artworks. The relationship between the visitors and an artwork is strictly driven by the educational goals of the museum. There is no place for the artist except what the museum is ready to give or "to allow". In our proposal, it is the contrary, there is a close relationship between the artwork and the public (we do not talk about visitors). Remember, the viewer has to read the RFID tags on the painting no far from 2cm. When he uses the reader of the mobile phone, he watches through an RFID tag directly what the artist decided. As far as we know, currently, there is no equivalent relationship between the artwork and the viewer, and no equivalent proposal. We expect that it brings a new way to interact between artists and public.

Also, the use of RFID tags as invisible markers is important. In our experiment, it was necessary to teach the public a new mean to interact inside the painting, so they were allowed to go, across artist's signs, to the smart invisible markers and to learn his feelings. But we could have make the painting without explicit signs, then a viewer would have to parse the painting to get artist's hints or references. We though this other way was too difficult to handle for a first experiment, but we expect that it could bring some mystery in the relationship.

Despite the fact that RFIDs are used differently in our work and in museums, our solution in terms of ability to support dynamic contents is more flexible. Museums decide when the information related to an artwork evolves, and then downloads interactive devices or audio-guides with new contents during maintenance whilst we are able to change information associated to tags in the painting when the artist wishes.

Finally, RIFDs are more interesting than barcodes, 2D barcodes or equivalents. Barcodes based markers are completely explicit visible hints. Worst, they are technological extensions that the artist has to take into account in his artwork, painting here. Except for creating a specific barcode based art piece, barcodes or equivalent cannot be used because they interfere or transform the artist's result. RFIDs, as we showed in this paper do not have this disadvantage they are totally invisible.

6. CONCLUSION AND FUTURE WORKS

The study presented here is the result of a joint work between the Hippocad Company, the CEDRIC research laboratory from CNAM, and a painter. The mix of different cultures, skills and knowledge was an advantage. It was also the juxtaposition of two approaches: platforms for ubiquitous games on mobile phones and artworks. It has inspired the entire team with new questions about possible interactions between the fields of art and embedded/smart technology, to enrich the relationship with the public and to open new horizons of cooperation.

Finally, one of the evaluators suggested the ability to modify the painting during its realization as in a performance. This opens a new area of investigations about the relationship between the artist and its public. This aspect is going to be explored more deeply in future works.

7. REFERENCES

[HEU07] Heumer, G., Gommlich, F., Jung, B., Muller, A., 2007, Via Mineralia – a pervasive museum exploration game, In Proceedings of the 4th International Symposium on Pervasive Gaming Applications, PerGames 2007, Salzbourg, Autriche.

[HSI05] S. Hsi and H. Fait, RFID enhances visitors' museum experience at the Exploratorium, Communications of the ACM, Vol. 48, No. 9, pp60-65, September 2005.

[MER08] S. Merdassi, R. Yahia-Aissa, R. Pellerin, I. Réchiniac-Astic, E. Gressier_Soudan, Vers une intégration du RFID et de la cartographie pour une visite autonome du Musée des Arts et Métiers, Ubimob 2008. St Malo. June 2008.

[PEL07] R. Pellerin. The MooDS protocol: a J2ME object-oriented communication protocol . Mobility Conference 2007 - 10-12th September, pp. 8-15, 2007.

[PEL08] R. Pellerin, E. Gressier-Soudan, M. Simatic. uGASP: an OSGi based middleware enabling multiplayer ubiquitous gaming. Submitted to Int. Conf on Pervasive Services, ICPS 2008 Demonstration Workshop. July 6-10th 2008. Sorento. Italy.

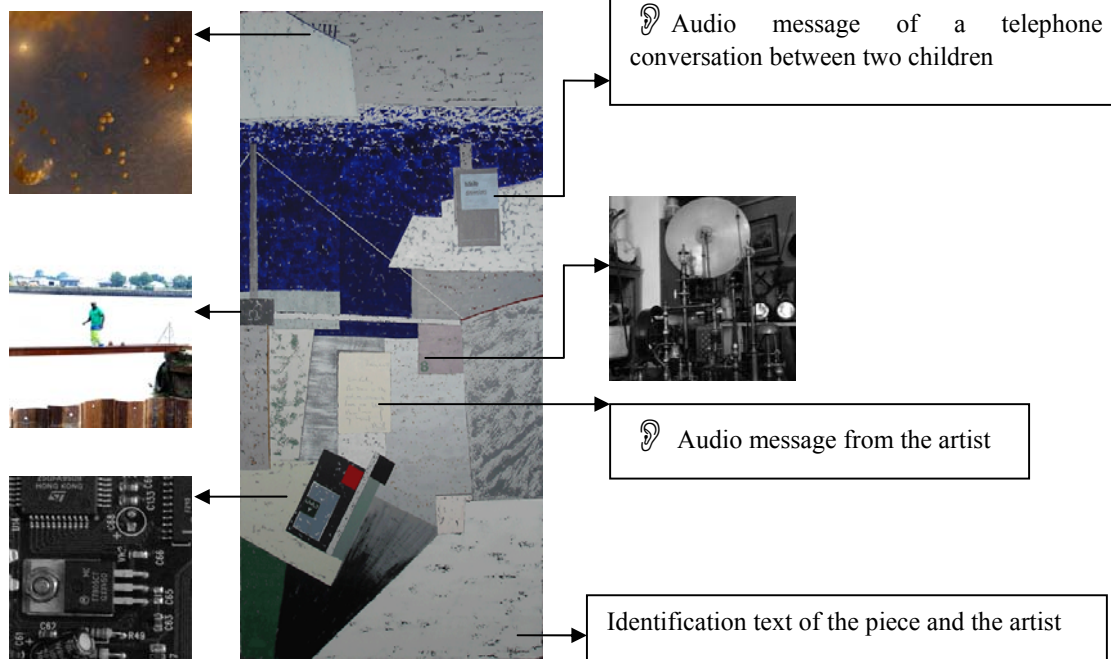[PER05] C. Perrot, 2005, L'apport de la technologie RFID en muséographie, In La lettre de l'OCIM n°99, mai-juin 2005, 21-25.

Figure 2. The RFID augmented painting.