
Playing with the Artworks: Engaging with Art through an Augmented Reality Game

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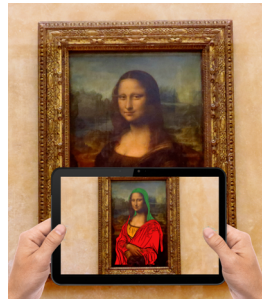


Figure 1: AR game concept — colour a contour and find to which exhibition item does it belong.

Abstract

In the majority of cases our experiences of artworks in galleries and museums is as passive observers. While this is widely accepted practice in terms of preserving the artworks it limits the engagement potential with younger visitors. In this paper we present a way of using augmented reality (AR) technology to create engaging and personal art experience for such an audience. To achieve this, we built a prototype for a treasure hunt style game where players colour a contour drawing not knowing what exactly they are colouring. However, they are told that if this coloured drawing is placed correctly, it should wrap around a 3D object (statue) or overlay a 2D canvas (picture) somewhere in the gallery. In the paper we present an evaluation of the augmented colouring aspect of the proposed game with nine K-6 children.

Author Keywords

Game Design, Augmented Reality, Art, Virtual Colouring;

ACM Classification Keywords

H.5.2 User Interfaces: *Input devices and strategies*

Introduction

The utilization of augmented reality (AR) to display artworks or museum content is a well-established

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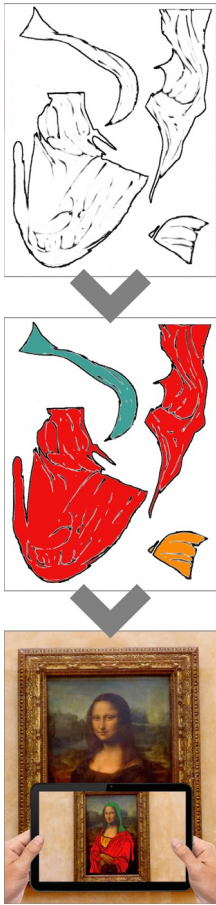


Figure 2: Prototype concept. User colours a given contour. After finding the corresponding artwork the patches from the contour wrap onto it creating a unique personalized version of the artwork.

concept within augmented reality research community. A number of applications aimed at addressing the needs of cultural sector has emerged predominantly as either guides for cultural sites [2, 4, 6, 7], systems that provided alternate representations of museum content, or as novel means of providing additional meta-data [1]. However, the focus of these systems is generally technologically driven and rarely addresses the younger age groups.

In this paper we describe the AR concept we are designing and developing in collaboration with Peter Scott Gallery in Lancaster, UK. The system aims to enhance user experience within the existing physical gallery exhibition of gallery content through an augmented reality treasure hunt style game.

The designed game starts by assigning users a contour drawing which they are asked to colour. Users do not know what exactly object is they are colouring, but are made aware that these segments, if placed correctly, should wrap up on a 3D object (statue) or overlay a 2D canvas (picture) as shown in Figure 2.

Once a contour is coloured, each user embarks on a treasure hunt through the gallery/museum exhibition or city and tries to fit the coloured contour to various artwork (e.g. sculptures, buildings, paintings, etc.) by pointing the handheld device camera at the object. The device identifies the artwork and presents user with the object's information (i.e. audio and/or text) and also notifies them if the contour matches the artwork. If the contour does not match, the user may be given extra information to lead them to the artwork or simply encouraged to keep exploring. If the matching artwork is identified, the coloured patches from the contour

wrap onto the artwork creating a unique personalized version of the artwork (which can be consequently saved, shared online ...)

When the matching object has been found, users will be able to claim another contour drawing and embark on the next mission within the treasure.

The design of the game presented follows Sir Christopher Frayling's definition of research through design in that we are reflecting on the process of its creation [5] using an agile approach with the intended audience. Although, our approach could also be classed as research for design [5] as the end product will be a prototype artefact in that all the thinking that went into producing it is embedded within it, and in the sense that it is not simply finished ready-to-market app, but more an artefact in perpetual beta with implications for designers of such experiences to take further.

A preliminary study has been conducted with K-6 participants in order to better understand their potential experience with the artworks through the game. In particular, we have focused on positive and negative activities and feelings they have undergone when visiting museums, galleries and public art. Additionally, as a part of the study, participants coloured the contour of fictional character's body armour and have tried to guess on which of the three presented characters the armour would fit. The aim was to observe how readily this age group would engage with such an activity before implementation within a full game.

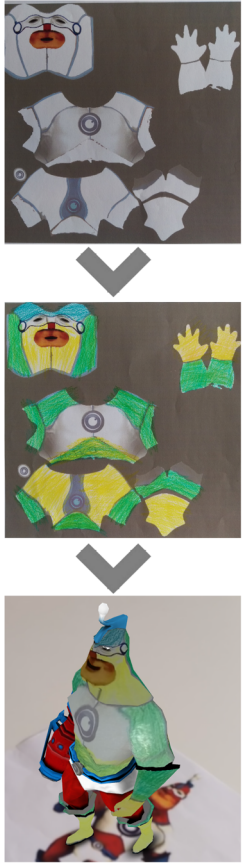


Figure 3: Participants coloured a 2D layout of the armour of a fictional character they later viewed in AR 3D.

Methods

The study was divided into three parts:

1st part:

Colouring a puzzle on an A4 paper (see Figure 5) that represented a fictional character (see Figure 3a). Participants have not been told what they are colouring, although the layout itself posed a clue that it is an armour. The colouring session is visible on Figure 4. Amongst the other, the aim of this part was to create a relaxed atmosphere so that the participants would more readily engage with the more formal focus group activity.

2nd part:

The Second part of the study was a focus group session. Questions focused around: (i) museums, galleries and public art participants have already visited, (ii) type of activities they like and dislike while visiting such venues, (iii) whether and why do we need museums, galleries and art, (iv) why we make art, and (v) around their perfect museum, gallery or public art venue. In order to start the debate, we showed participants pictures of historic sites, sculptures and paintings they are likely to identify.

3rd part:

In this part participants were given tablets — on each tablet one of the three different characters was shown in 3D (see Figure 4)¹. Participants could inspect all three characters in details by rotating them in all directions and guess which character's armour they have coloured. When they decided on the character, they tried to "dress" it by looking through a mobile

phone screen on the character's picture that served as an AR marker (see Figure 4). The character interacted with the participants by revealing information about their origin and fictional abilities. If the coloured armour did not fit it, the character thanked the participant and apologised for not being able to put on the armour. If guessed right, the character put on their newly coloured armour and congratulated the participant.



Figure 4: 3D models of all three fictional characters with 2D markers.

All three parts were filmed, transcribed and coded by the researchers. The codes and observations were then discussed and merged together where these overlapped. Other parts were additionally discussed and clarified with participants before being included in the results.

Participants

We recruited 9 participants aged from 6 to 12 years (average 9.77, SD 2.22) of which 5 girls and 4 boys. Participants were from three different primary schools (two in one city and one in another city). All

¹ One of the 3D models used is part of the Metaio library



Figure 5: Colouring a puzzle on an A4 paper conducted during the study session during the study session.

participants have visited at least three museums or galleries in their lifetime and one in the last year.

Study observations

Visited museums, galleries and public art:

Participants eagerly described their visits of local and national museums, galleries and public art. Moreover, they have expressed enthusiasm after recognising buildings and particular artwork when presented with photos of buildings, statues and paintings. In majority of cases, these visits were organised as school trips.

Types of activities participants like & dislike when visiting museums, galleries and public art:

When describing what they do at museums, participants expressed a strong dislike towards working sheets they are usually given in museums. In order to complete the working sheet participants had to walk around describing the exhibit material or write down answers to questions related to the exhibit. Participants attributed to this task a high notion of seriousness which they generally disliked.

Compared to working sheets participants prefer to explore the gallery whilst listening to a museum or tourist guide, or a teacher, especially when they present art artefacts coupled to an interesting story in relation to its making, author or history. Other more activities mentioned positively were workshops and interactive exhibits. One participant emphasised his positive experience from a national gallery visit that involved playing a game in which children were given parts of exhibited paintings in the form of puzzle pieces and had to go through the gallery finding to which paintings they belong.

Another “chore” identified by almost all participants is the subsequent essay writing about their experience. However, working sheets during the visit and essay writing after the visit seems to be a standard procedure of most of their school trips. Just the notion of these “chores” brands school trips as “boring” and participants often end up chatting and not listening to a guide or teacher. Which, in turn creates a problem when they need to describe what they (should) have learnt.

Do we need art and why?

All participants agreed that there is a need for museums and galleries. From their point of view museums, galleries and public art serve several roles important to our society: to store and conserve historic artefacts, to learn about history and admire other people’s work, and to understand authors thoughts by making art and historical context in which it was created. In their opinion people do art for relaxation, for showing one’s creations to others (besides artwork in formal spaces they have mentioned school newspaper and a web page where their creations can be displayed), for charity purposes (e.g. making and donating art for raising money), for observing one’s artistic progress (achievements), to become famous (and rich by selling art), and for exploring and expand one’s potential.

Ideal museum or gallery:

When asked what would be included in their ideal museum or gallery participants mentioned they would add music, food, sofas to sit down and relax, and greenery to brighten up the space. They would lend costumes and clothes from the exhibited historic era for visitors to wear, put on display also creations of the

visitors, introduce live performances (e.g. showing the way people lived in history), offer board games for people to play and learn about museum's theme, playing games from the era exhibited at the museum, and making toys from the exhibited era (e.g. fabric dolls.). Participants linked these activities to experiences that would, in their own words, "function as a time machine."

Games and Play:

After mentioning board and historic games, the researchers asked if participants would play a treasure hunt game where they would have to search for clues to solve a puzzle. The participants were very excited about it; however, when asked if they would like to expand a current artwork (e.g. a painting or a statue) with their own creations the idea was not greeted positively. Participants worried that they might destroy the original work in which authors invested their time and effort. Although, when told that the original artwork would be preserved whatever they would do to it, participants (cautiously) embraced the idea while still questioning if that would be respectful towards the author. The idea was acceptable only if working on a copy of the artwork (e.g. colouring the Mona Lisa's replica or contour vs. painting over the original painting). Such respect for artwork and artists came as a surprise.

During the last part of the study participants were invited to try dressing fictional characters with their coloured armours. While colouring was engaging, inspecting these characters and dressing them presented a whole new level of interaction and excitement. At the end we asked if they would like to do the same to a Mona Lisa dress (as presented in

Figure 2). The proposal was accepted with great enthusiasm and in such scenario involving the use of AR they would not perceive their personal enhancements as disrespectful to the artwork and/or the artist.

Discussion and Future work

There are three main ideas that the focus group session with K-6 children has brought forward: (i) the importance of museums and art, (ii) information gathering working sheets contribute to making school trips to art venues unpopular, and (iii) the importance of making activities fun when experiencing art.

The importance of museums and art:

Creating, contemplating, and possessing art in all forms sparks users' exploration of their imagination (which in turn takes a tangible form), playfulness and enhances entertainment. Nevertheless, art is what makes us human. While the role of art in humans' development is well known [10] the fact that children perceive museums, galleries and public art as important for our society for a variety of reasons (such as the preservation of historic artefacts and education) poses a positive stance towards creating a game like experience aimed at educational purposes.

Working sheets & Games:

Working sheets (a common part of school trips to art venues) were unanimously disliked by all participants rendering trips to art venues generally unpopular among our participants. Contrary to these, game like activities in art education contribute to a richer, educational and entertaining experience. The idea of mixing learning with play and technology is not new [3]. In 1837, Friedrich Froebel came up with an idea to

teach children the concepts of numbers, size, shapes and colours with toys developed specifically for this purpose.

Recently, studies have shown that children quickly learn how to express themselves creatively with new technologies [8]. And there are several examples on how technology enhances creativity through playful explorations instead of serving just as consumption tool – a too often perceived role of technology [9].

Concept & Prototype:

Our idea and prototype have been built on the concept of playful learning - engaging users in active participation rather than passive consumption [2]. The aim of our prototype is to give children the opportunity to actively explore and design expanded art forms rather than being passive observers. There are several ways in which the prototype can achieve this. With colouring contours children explore their creativity and try to figure out the appropriating object that would fit their creation as has been observed in our study. Moreover, the presented 2D representations of 3D objects and the goal to dress a statue helps children think about geometry, shapes, and space which is a part of K-6 math curriculum in most countries. With the paintings, an interest could be drawn to particular elementary shapes or elements that form the basis of the artwork. Learning about underlying shapes and forms of a painting through their own exploration could help children understand how these concepts build up the artwork. Moreover, when attempting to map contours to incorrectly identified exhibition items, an audio/video feedback is provided about the item followed by a short context aware quiz they need to

complete in order to proceed in the game and/or gain additional points.

The starting point and the path children undertake through a museum, gallery, or a city can differ from child to child or groups of children to avoid crowds and to tailor learning to different needs such as time of creation of exhibited artworks. In addition, when searching for the fitting object, users are likely to study elements of other artworks in the process.

While the prototype presented to children in the study required manual capture of coloured puzzle in order to exhibit the concept a prototype that is currently being built uses scanned meshes of statues and monuments for building 2D contours. Additionally, our future version aims to track 3D objects, instead of 2D planes as in the current prototype. In the future we aim to explore tangible (paper, chalk on sidewalk) and digital colouring (mobile devices), as well as individual (paper) and collaborative treasure hunting. Overall we believe this research is a positive first step in developing more engaging experience of gallery content with a young audience.

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