Augmented Reality Workshops for Art Students

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Abstract. In this paper, we describe the program of our AR workshops dedicated to art students. Our observations regarding supervising such lab courses and students' works are presented. We would like to present a methodology for AR training when the students are not experienced in computer programming. We hope this will encourage other art and IT teachers to join efforts and incorporate AR into curriculum as a very promising concept of merging technology with visual communication. The potential of AR is very high and, therefore, it is important to introduce students to AR and the process of creating their own working projects.

Keywords: Augmented Reality, education, AR workshops, art projects, mobile AR.

1 Introduction

Augmented Reality (AR) applications and services are becoming very popular nowadays, mainly due to expansion of powerful mobile devices and new concepts such as Project Glass by Google[1]. AR projects are no longer just laboratory concepts but existing solutions supporting a constantly growing number of complex tasks, navigation systems, education, entertainment etc. Therefore AR is very close to becoming a household term and is visible in audio-visual media like games, TV, e-learning etc. According to the 2013 Horizon Report[2], the use of wearable technology will increase which will accelerate the expansion of such technologies as augmented reality in the consumer market and educational sector.

In 2013, we began to hold AR workshops for international groups of art students (Poland – Academy of Fine Arts in Katowice, Belgium – Antwerp Royal Academy of Art[3], Finland – Aalto University). Our experience gained during these classes showed that teaching both IT tools and visual communication design was very beneficial to students. Merging knowledge and passion of lecturers from two different faculties, IT (Marcin Wichrowski, Alicja Wieczorkowska) and New Media Art (Ewa Satalecka), shows that such collaboration can yield very interesting projects.

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[1] http://www.google.com/glass/start/
[2] http://www.nmc.org/publications/2013-horizon-report-higher-ed
[3] http://grafischevormgevers.be/projecten?locale=en_US&wppa-album=1&wppa-photo=1&wppa-cover=0&wppa-occur=1

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2 Related Works

The methodology of teaching AR at universities [1], including previous authors' papers [2], and the attempt to improve the techniques applied so far serves as the motivation for this work. The importance of AR in education is presented in many sources [5], [6], [7]. We propose a methodology based on the findings of [1] and [2], and on our experience from the workshops we conducted for art students.

3 What Is AR?

When we look at the taxonomy of Mixed Reality (Fig. 1) we can observe that AR is a form of Mixed Reality, quite close to Real Environment. In contrast to VR which completely immerses a user in a computer generated world, AR enriches the real world by computer generated content. It could be 2D and 3D objects, audio or video files, textual information, avatar, interactive interfaces etc. The user can interact with these digital virtual objects superimposed upon or seamlessly mixed with the real world. AR supplements reality rather than completely replacing world around the user. It allows real and virtual elements to coexist at the same time and space.

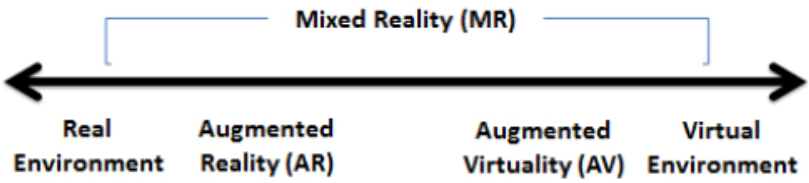

Fig. 1. Mixed Reality [3]

Definition given by Azuma [4] and Kaufmann [5] specifies the implementation of AR by three elements:

- mix of real-world and computer-generated virtual elements,
- interaction is provided in real-time,
- elements are registered in 3D.

We can experience AR using a desktop computer, a mobile device or a special Head-Mounted Display (HMD) (Fig. 2). Because of high availability and rapid development of handheld devices capable of delivering AR content, we decided to focus our workshops only on mobile solutions.

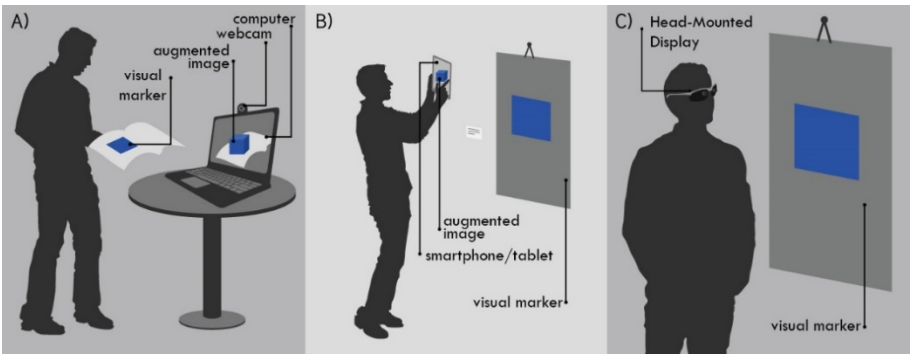

Fig. 2. AR experience on a) a computer, b) a mobile device, c) a Head-Mounted Display

4 Combining Artist's and IT Perspective in Supervising AR Projects

The idea of interdisciplinary workshops combining artistic and IT approaches emerged during joint supervision of final works of students of New Media Art Department at Polish-Japanese Institute of Information Technology. During the cycles of workshops which we held for international groups of students in Poland and later in Belgium and Finland, we tried to observe how the participants use this technology in graphic design. First we gave them a topic – usually quite an open one like "a love poem" or "a message from Finland," then we introduced the processing theory and presented the tools. We began teaching with a group discussion; next we divided responsibilities – an artist lecturer for graphic design quality and an IT specialist lecturer for the quality of engine and ease of perfect delivery. Working as a team of tutors we had the opportunity to discuss parallel design and IT aspects of each project individually. It seemed to be a comfortable situation both for us and for students. The final results were satisfying and made us realize how these workshops triggered inventive and creative works of the participants of our classes. All of the projects presented were done over four–five days of workshops with participants of various levels of technical advancement. Mixed-level groups were even more progressive, well-working and self-supporting classes. We realised that this methodology could be recommended for workshops as a very effective method of skills development and stimulation for the youngest participants. Age differences, various level of abilities and different topics of projects encourage participants to exchange their knowledge and experience.

From the IT point of view, the main challenge behind these workshops was finding a balance between the complexity of tasks given and the level of students' experience in understanding multimedia creation dedicated to AR projects. From our observations most of art students are good at preparing raster/vector graphic and animation forms mainly using Adobe products like Photoshop, Illustrator and After Effects.

Some of them specialize also in 3D computer graphic and 3D modeling. Programming skills are rare. However, our experience shows that aesthetic and well-designed AR project even with basic interaction could be also engaging for most users.

5 Teaching Methodology in Detail

The methodology we propose for AR workshops for art students is based on 5 days training, 7 hours a day, for groups of up to 16 students. The main part is a typical IT workshop, using computers, but students may bring drawings, paper mock-ups etc. Technical requirements for workshops concern installing desktop and mobile applications, providing access to smartphones/tablets (Android/iOS) with Internet connection, webcams, digital photo cameras and a color printer. After completing the workshop, students should acquire the following competences:

- Knowledge of using AR technology, including its pros and cons.
- Understanding technical requirements and available solutions for building AR projects.
- Preparing one's own AR project for mobile devices using automated AR editors.
- Documenting final work in the form of a poster with the description of results.

Having in mind such short time for presenting the main concepts of AR, teaching new applications, preparing final working project and documenting it, it is important to carefully select proper tools and solutions which are adequate to the skill level of usually diverse group of students in terms of technical advancement. Moreover, working with art students differs significantly from teaching IT students. They require much more attention and individual approach, because most of them have little knowledge about concepts behind AR workflow and programming [2].

5.1 Introductory Lecture

The 1st day of the workshop begins with a 2-hour lecture concerning artistic and IT aspects of AR usage.

The artistic part focuses on the observation that we are living in the times of easy access to large amounts of information and sources of knowledge. In the rapid stream of data coming from everywhere we need to survive and safeguard our brains against overload. By designing visual communication we may grade levels of information complexity, and help users make decisions on how much they wish to get in one portion. Visual communications could be used as a form of package for complex information ordered in smaller, graded portions visible with AR.

The IT part of the lecture presents how AR technically works and shows worldwide examples and demos of successful AR projects. Presented works were chosen carefully to show the broad spectrum of possible applications in various fields of life: advertising, marketing, shopping, entertainment, education, supporting complex tasks, navigation/sightseeing, architecture, military, medical etc. Special attention is paid to usage of AR in the art field by presenting projects of installations, objects, books etc.

enriched by this technology. Many of them are works prepared by students during previous workshops, or AR regular classes held by Marcin Wichrowski at Polish-Japanese Institute of Information Technology [2]. Efforts are made to present the best working examples which could be tested by students even during the lecture. This allows bringing a lot of interest and inspiration, especially among persons who did not have a chance to test this technology personally before or are not convinced about the quality and reliability of modern tracking technologies.

The lecture is followed by a one-hour brainstorming session to stimulate imagination of students and discuss pros and cons of this technology. Students decide what task they wish to undertake and in a small seminar they report the aims, the users and the methodology of their projects. They discuss how much AR could help them in problem-solving during the design process. Decisions result in rough sketches and initial projects to be presented on the class forum, and are again discussed and questioned by all of the participants. It helps improve the weak points and sometimes gives a new perspective and inspires changes. Observations made by students during these discussions are very important also from the IT point of view, and allow better understanding what is technically possible to achieve during 5 working days. Each student is supervised individually and has an opportunity to ask questions regarding artistic and IT scopes of planned AR project.

5.2 Basic AR Tools and First Introductory Task

The rest of the 1st day is dedicated to preparing working environment for developing AR projects based on carefully prepared tutorials and with the help of an IT lecturer. Because of the usually low level of programming experience we decided to use Metaio applications, which serve as simple introduction to build and experience AR scenes in a very short time. Metaio offers an integrated environment which consists of:

- Creator (Windows/MacOS)[4] – an automated AR authoring tool dedicated to creating AR scenes for desktops and mobile devices,
- Junaio AR Browser (Android/iOS)[5] – a free mobile AR browser for loading AR channels created with Metaio tools,
- Metaio Cloud[6] - an online host service for storing users' projects.

Thanks to easy configuration and simple workflow, this solution allows creating first working scenes in a really short time. It gives the possibility to use three tracking technologies: image, object and environment based. Creator allows embedding different types of objects such as images, text, videos/animations with alpha channel, animated 3D models, sounds, calendar events, links to websites, buttons for integrating with social networks and 360° panoramas. Students are also taught how to programme interaction in AR scenes.

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[4] http://www.metaio.com/creator/
[5] http://www.junaio.com/
[6] http://www.metaio.com/Cloud/

Students using image based tutorials develop and test an introductory task "3D photo" in the form of an AR scene under precise supervision of IT lecturer. Standard photograph is divided into several plans that are stored in separate PNG files using Adobe Photoshop. Then the AR scene is created in Metaio Creator by placing these files on the z-axis at varying distances from each other. Background of the photo is recognized as a visual marker and triggers remaining elements on it. This allows creating the impression of 3D look while observing from a different angle using a mobile device (Fig. 3). The presented task guarantees good understanding of proposed AR software and encourage students to test different scenarios.

Fig. 3. Introductory AR scene - "3D photo"

5.3 Experimenting with More Advanced Tools and Basic Programming

During the 2nd day students experiment with various more advanced AR solutions like object and environment tracking, creating 360° panorama or building and placing 3D objects in the surrounding space. We have worked with:

- Metaio Toolbox for object and environment tracking[7],
- Microsoft Photosynth for creating 360° panorama photos[8],
- Autodesk 123D Catch for creating 3D models from photos[9],
- typical applications for image, video and 3D editing, like Adobe Photoshop, Adobe After Effects, and Blender.

These applications were carefully picked from available solutions to guarantee the best compatibility and provide seamless and easy to follow workflow. For programming basic interaction an Augmented Reality Experience Language (AREL) was used. Metaio Creator offers simple built-in code editor for AREL. In most cases interaction involves adding touch events and interfaces to control objects on a screen.

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7 https://dev.metaio.com/sdk/toolbox/
8 http://photosynth.net/
9 http://www.123dapp.com/catch

5.4 Prototyping and Developing Final Project

The 3rd and 4th days are mainly dedicated to individual technical prototyping supervised by the IT lecturer. The work done during days 3 and 4 is essential for acquiring the skills and finishing the projects on time. Students continue working with concepts proposed during the brainstorming session and after having their idea accepted by lecturers they start to prepare working prototypes. It is the most creative and important part of the workshop, which requires a lot of support from both the artistic and the technical supervisor. Problems that arise in projects are solved individually with the lecturers. It often happens that the proposed idea turns out to be impossible to be finished at a specified time or because of restrictions associated with the selected authoring tool. This is a great lesson showing the real issues that may happen during the implementation of AR projects and ways of dealing with them. Experimenting with prototypes also encourages students to look for the optimal solutions that can work in various conditions. The next step after solving the most significant problems in prototypes is the development of the final projects.

5.5 Final Presentation

The last day is devoted to polishing projects and documenting them in the form of posters, presented later in a dedicated university public space (Fig. 4). Prepared projects may be used to load AR scenes by viewers using free Junaio AR Browser. The final exhibitions got a positive reception from the visitors, and many participants were interested in taking part in the AR experience. This contributes to the popularization of the AR technology among both students and other teachers, who are often interested in the technical details and the possibility of using AR in their projects.

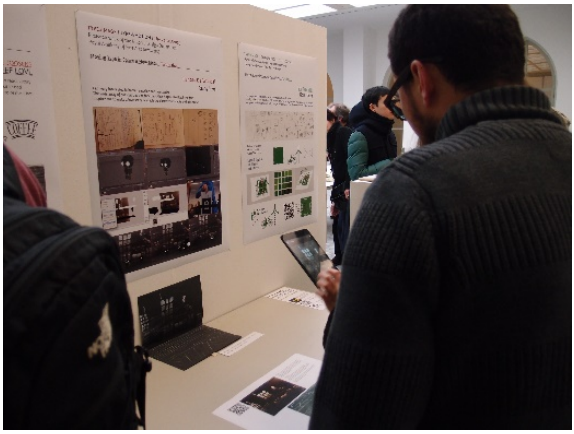

Fig. 4. The final exhibition (The Royal Academy of Fine Arts, Antwerp)

6 Students' Works

Students quickly recognize the potential of AR and they use it in a smart way, usually for adding hidden messages and actions enriching visual communication. Thanks to the technology they were able to use a regular coffee cup (Fig. 5), a spread of a book, a post card, a toy (Fig. 6), a cinema ticket or even a facade of a building as markers – which play the role of keys to get the hidden information or encourage users to interact with image/object using mobile devices. This can evolve into different scenarios - one can read a moving poem even while waiting for a friend in a café, as the poem is visible on a lid of a coffee cup. When reading a picture book for kids, one is able to bring the main characters to life, and have them act their roles on the screens of tablets or phones for educational purposes. A simple stamp on a postcard could be turned into a 3D object presenting architecture, a short video commercial, or any other information we wish to send from our holidays.

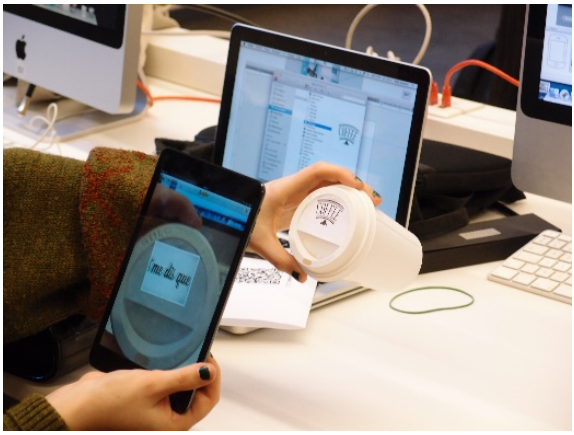

Fig. 5. Coffee cup with video projection

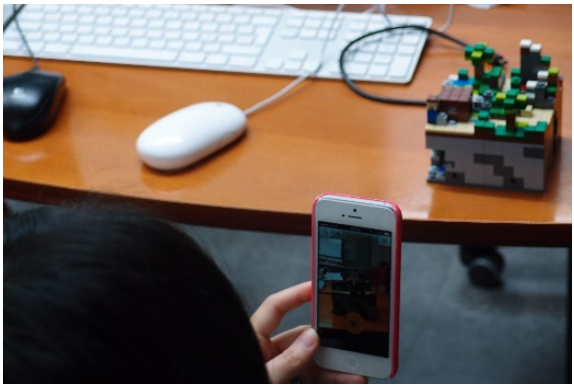

Fig. 6. Toy with animated 3D objects

Also a building's facade (Fig. 7) may be read as a marker and deliver a short or long story about itself – the history of the building or some info-graphic which gives us additional visual or verbal information.

Fig. 7. Building's facade with additional typography

One of the projects presents how the same landscape changes with the seasons. Another use of AR is to present a possible interactive game based on a real-life 3D object, whose interior is filled with interactive virtual characters. Traditional drawings set on a cube surface can deliver a nice animation, kind of a moving comic (Fig. 8). Even the real space of a corridor may be mapped to an AR project and changed into a battlefield against an interactive, virtual monster. An ordinary corner or a selected part of the wall is able to produce a sound composed by a student. A traditional art print illustrating a national saga changes into a funny animation, not hurting the book at all.

Users do not need any heavy, big objects to read or watch in order to participate in multimedia artistic experience. The mobile phone is enough to get a really complex message. And this additional information is realized only on request. We are not attacked by its obsessive presence.

7 Summary and Conclusions

Our experience shows that students without any prior knowledge of AR can prepare working projects in less than a week. The most important issue is to select proper AR solutions which are easy enough to encourage students to think about functionality they want to achieve. AR supports delivering complex information ordered and packaged in visual "containers", which could give completely new opportunities for art projects. It helps to organize and to deliver information visually and verbally, and students use it in dynamic and static context, as part of their visual communication projects. They apply AR to books or objects, as "real artefacts": additional messages like instructions, info-graphics, oral or visual information, motion images, translations, etc. They put effort to

build visual aspects of their works and it sometimes takes even the form of installations and specially crafted objects which are triggers for AR experience. Students are very inventive in using these forms – for example they create board games based on real or mocked objects mixed with AR characters, add voice messages to objects designed for the visually impaired, use it in children education design, and for entertainment, as part of music and video performances, and many more.

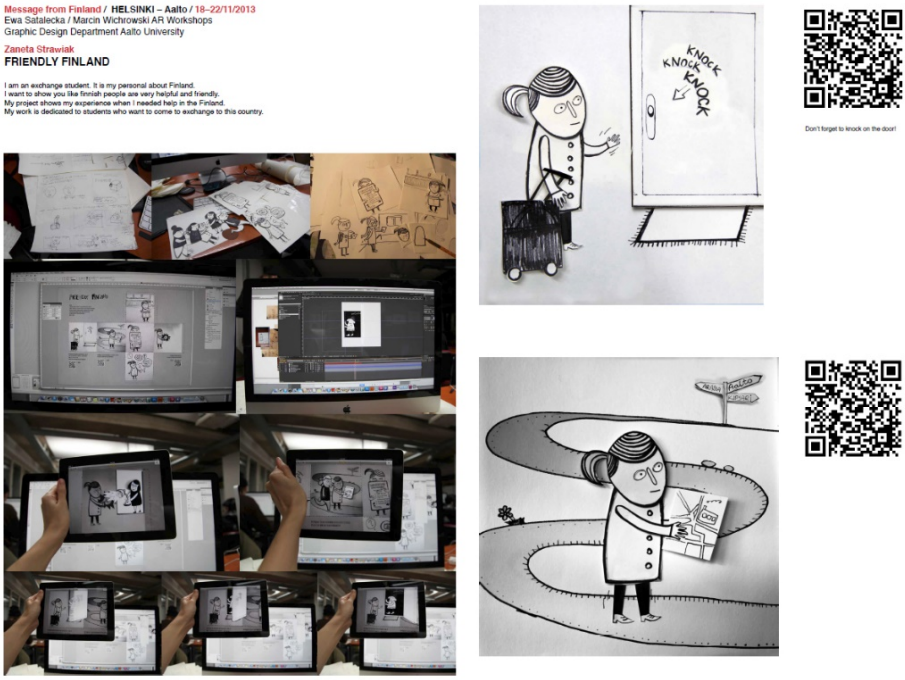

Fig. 8. Poster documenting final work with QR codes for testing AR scene in Junaio

These prototypes herald the development of AR in visual communication design, and show that the possibilities are endless and depend only on creativity of designers and the software used. The popularity of new mobile devices and truly user-friendly AR creation tools continues to grow. For these reasons it pays to join efforts of art and IT teachers, and try to incorporate AR into curriculum as a very promising concept of merging technology with visual communication.

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