

# ARTournament: A Mobile Casual Game to Explore Art History

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**Abstract**—Playing is an essential part of human culture, even more so nowadays with computer-based games. Gaming is also regarded as an effective means to transfer knowledge and spark interest in a particular topic. This family of games is referred to as *educational games* and *serious games*. In this paper we describe the design and evaluation of a mobile casual, level-based game called ARTournament conveying basic concepts of art history. Analyzing player performance on various levels we are able to demonstrate that ARTournament successfully transfers knowledge about art history to the players.

**Keywords**—*educational games, casual games, mobile games, art history, digital game-based learning*

## I. INTRODUCTION

The availability of powerful mobile computing devices combined with growing bandwidth in mobile networks enables a variety of new use case scenarios for mobile educational games. The last years brought a lot of changes for consumers but also for researchers. The products and services, which were developed during the last years, are only the tip of the iceberg of what can be done. Having these new tools and instruments available, it is reasonable to carry on reflections on what is possible with these new resources. Especially the field of education should adopt new technologies to offer learners a wide variety of choices. As the concept of educational games is no longer just of scientific interest, the idea of using new available technologies for creating these games is not so far away anymore. From an educational perspective, gaming is regarded as highly effective to transfer knowledge because mastering a game requires highly diversified skills [7].

In the context of art history there are already some projects using modern information technology on the Web like the recently presented *Google Art Project* (<http://www.googleartproject.com/>) where users can take virtual tours through selected museums or the *Web Gallery of Art* (<http://www.wga.hu/>) that contains a large publicly available online collection of artworks. While these projects focus on art presentation, there are others encouraging the users to interactively browse through collections of artworks and also give feedback in form of tags and keywords, like the *explorARTorium* (<http://www.explorARTorium.info/>) [1] and *ARTigo* (<http://www.artigo.org/>) [2] which provide valuable data for researchers.

Art related applications on mobile devices are mostly found within or in the context of museums. Most of them focus on interaction or communication with their visitors and range from simple audio guides to applications running on modern smartphones. These applications are used to enrich the value of the visit of the customer by providing additional information like pre-defined tours, details to the exhibitions but also interactive content like tag clouds or exhibition-related polls. Creating games with educational content using mobile technology is just a further step. Games are effective because the learning is directly related to the environment in which you learn and demonstrate your achievements; thus the learning is not only relevant but also applied and practiced within the context [4]. This is also a way to move a little bit outside of museums and integrate the content into everyday life.

Especially for juveniles and younger people, art history often is associated with the cliché of being boring and uninteresting. Thus, it seemed an exciting challenge to find out whether or not it is possible to transfer knowledge about art history concepts by means of a game. Especially the new opportunities enabled by mobile devices allow games to be played more “casually”, which means that they are used only in small time bursts, for example when having a few spare minutes during the day. This allows addressing a new type of players, the casual gamers. It seemed interesting to reach this new and growing audience, which normally would not be counted among the group of typical gamers to bring them closer to the topic of art history.

In this paper we describe ARTournament, a mobile casual game that provides the user with an enjoyable occupation and at the same time presents him or her art history content in a way that the user will pick up some of the concepts while using it.

The remainder of this paper is structured as follows. In Section II we provide some pointers to related work in museum games and art history games. Section III details the design rationale and game mechanics of ARTournament. The results from a first evaluation round with ARTournament are discussed in Section IV. Finally, Section V contains concluding remarks.

## II. RELATED WORK

Many current research projects dealing with the communication of art history content within games are directly connected to the work of museum institutions.

Museums are always exploring new ways to present cultural heritage materials in an appealing manner on-line and on-site (at the physical museum), particularly in the fine arts. We concentrate here on approaches that focus on increased understanding of artworks instead of approaches that target art production like the one described by Liao and Ho [9].

Koushik et al. [8] present a playful approach that makes use of the surge in social networking games (such as the popular Facebook game *Farmville*) to promote educational learning for the California Academy of Science. Before exploring the physical museum, the visitor creates a profile and an avatar on a social-networking website. On-site, i.e. at the museum, the visitor plays five different iPad-based educational mini-games to accumulate points. Back at home, the players can compare their scores with those of their friends and learn additional facts. Points can be redeemed to upgrade the avatar's attributes.

To further explore the possibilities of games and art history, Goins created the Facebook game application *myMuseum* [6]. The player starts with a single virtual gallery room, money and friends. The goal is to set up one's own gallery and attract as many visitors as possible by assembling sophisticated exhibitions. Players who are not familiar with the cultural significance of various objects will have to perform research on their own in order to build high-scoring collections. By integrating educational games into social networks, the authors aim at engaging non-traditional audiences with the field of art history. Another recent example is the Facebook game *Nachts im KHM (Night at the KHM)*; <http://www.facebook.com/KHMWien>) about the Museum of Art History in Vienna, Austria. The player uses a virtual flashlight to illuminate painting details. It is possible to challenge friends, share scores and earn achievements (such as *You played three days in a row*). The museum rewards the best players with free tickets and guided tours.

With ThIATRO (<http://www.ThIATRO.info/>) [5] the players are immersed into a 3D virtual world. Their task is to borrow artworks for their own exhibition according to the requirements set forward by ThIATRO's game mechanics. It is interesting to see that the recognition of artworks changed considerably after playing ThIATRO which is an indication of learning taking place while playing.

The approach followed by the iPhone/iPad app *Famous Art* (<http://mmpapps.com/products/famous-art>) is similar on first sight to our approach with ARTournament. Here, the player has to select the name of the artist for one artwork presented out of a list of four artist names. From an educational point of view, we believe that such an approach leads only to memorizing names of artists without actually dealing with the artwork in detail. In fact it is sufficient to roughly categorize the artwork to the time period of creation and then selecting the name of an artist from the same time period. This will thus never lead to a comparison of artworks based on the visual impression. This observation is obvious; of course, since only one artwork at a time is presented to the player, see Figure 1.

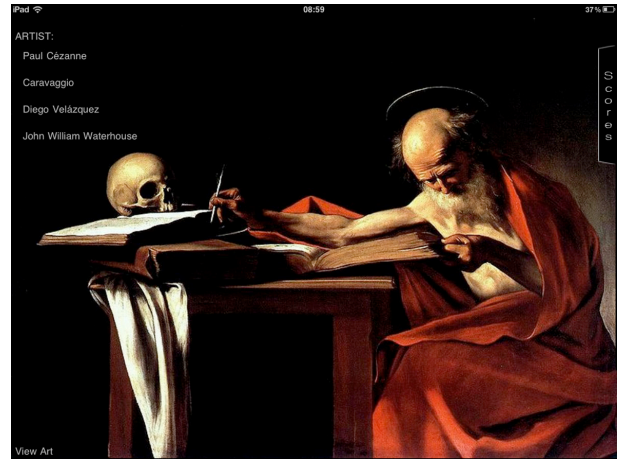


Figure 1. Screenshot of iPad app "Famous Art"

### III. DESIGN AND RULES OF ARTOURNAMENT

#### A. Design Rationale

The overall design of ARTournament follows the philosophy of teaching art history in a compare-and-contrast fashion as proposed by Wölfflin [10]. The general idea is that by seeing a particular artwork in contrast with others the learner might develop an understanding of the particularities of artworks. Art always was and is the product of a particular time, place, and the socio-political situation it was created in [3]. So, to get an understanding of artworks it is essential to see them in contrast to other artworks and not just in isolation. The contrasting dimensions are manifold with respect to the theme of the artwork and its time as well as geographical origin. In addition, the particular artist is important as well, as he or she is the very person to put his or her personal note on the artwork. So, from an educational perspective, we approached the game around five consecutive layers. First, the player is confronted with the prevalent themes in art history. Then with stylistic variations based of time and geographical region. Finally, the player is taken to the level of individual artists in order to identify their very own stylistic expression. We defined game levels according to these educational goals.

From the game platform point of view, we wanted the game to appear native with respect to the system it is running on. In addition, the game should follow the genre of casual games. This means that the player might play the game even if only a short time span for gaming is available, e.g. while being on the move. Thus, the game is targeted to mobile devices. For development we selected the cross-platform development tool *Titanium Mobile* from Appcelerator (<http://www.appcelerator.com/>) because it allows creation of applications for both currently dominant mobile platforms Android and iOS based on a single codebase and uses the platform's native user interface elements. For mere experience reasons in development, the first version of ARTournament was rolled out for the Android platform.

## B. Rules of the Game and Game Mechanics

The game ARTournament is based on the idea of consecutive game levels. The player has to achieve the goal of a particular level in order to be able to advance to the next higher level. The levels are structured in a way such that the player gets increasingly familiarized with basic concepts of art history. For example, the entry levels in stage 1 correspond to the identification of traditional topic themes in art history such as genre works, portraits, religious work, mythological works, historical works, still life, and landscape. Stage 2 levels concentrate rather on particular time periods in order to familiarize the player with changes in style due to different epochs. Stage 3 levels concentrate on geographical regions to familiarize the player with typical themes of regions and their respective stylistic realizations. The game levels on stage 4 and 5 concentrate on particular artists. In general, stage 5 levels provide paintings from the same geographical area and the same time period and are thus more difficult to solve.

The player earns points for correct answers and thus advances in the highscore list. In order to keep the motivation up we decided to show only the nicknames of players in the immediate surroundings instead of a complete highscore list. For future versions we plan to show only the score achieved during a particular time period, say, during the last week, to make it easier for newcomers to advance to more prominent places in the highscore list. See Figure 2 for a screenshot of ARTournament's level selection and highscore list.

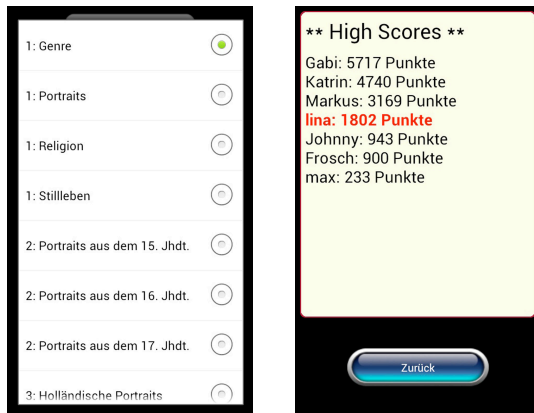


Figure 2. Level selection and Highscore List

During each level at each round, the player is confronted with four artworks. The challenge is to identify the artwork that fulfills the goal of the particular game level. In a nutshell, the game mechanics relies on four consecutive steps to be performed during each round of the game: (1) look and compare the artworks; (2) take a decision based on the player's knowledge; (3) tap and select an artwork; and (4) receive immediate feedback from the game.

The central educational idea is to invite the player to compare the four artworks and decide which one conforms to the goal of a particular level, e.g. identifying the artwork created by a particular artist, say, Caravaggio. No additional

information is presented, so only visual inspection of the examples may lead to mastering the level. In order to complete a particular level and thus being able to advance to more difficult ones, the player has to accumulate a specified number of correct answers, either in total or in a series. The overall level goal is indicated in an introductory text to each level; short reminders are displayed after each answer of the player. See Figure 3 for an example of artwork selection on stage 5 level "Expert Caravaggio". On this level, paintings by Caravaggio are contrasted with those from his contemporaries of the same geographical region.

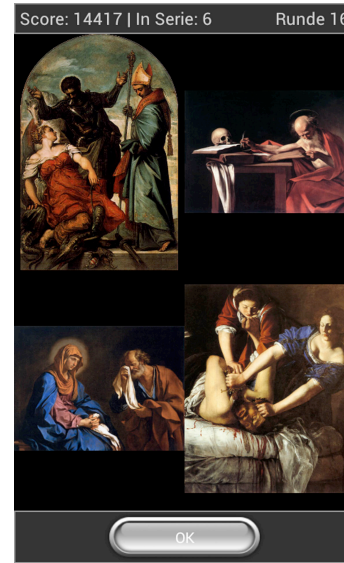


Figure 3. Level "Expert Caravaggio"

## IV. EVALUATION

ARTournament was made publicly available on 19 October 2011 in a non-market Android development version. The rationale for using a non-market development version was that we had at the time of evaluation just a German language version available, which also gave rather limited feedback at wrong choices. So we opted for a limited user base to gain first insights into the usability and into the learning effects when playing a mobile casual game.

We announced the availability via our project homepage (<http://vsem.ec.tuwien.ac.at/?p=590>) and via status updates on social media sites such as Facebook, Google+, and Twitter. In the remainder of this Section we report our findings from the time period between 19 October and 15 November 2011. During this time, 24 people played in total 4235 rounds of ARTournament ( $M = 176.46$ ;  $SD = 289.93$ ). A round is defined as presentation of four artworks and the player selection of one as fulfilling the requirements of the particular level. During the time of evaluation, 16 game levels were available to the players.

We deliberately kept the entry barrier for potential players as low as possible, asking them only to select a self-chosen nickname. No demographic information was requested. We might change that strategy in future versions

of ARTournament in order to analyze individual player performance on a finer granular level.

The first observation is related to the number of rounds played on the various levels. The players seem to have fully absorbed the concept of leveling-up to the then final level “Expert Caravaggio” where they have spent most of their playing time, see Figure 4. Note, the number in front of a level's title indicates its stage within ARTournament. This behavior ensured that the players achieved the highest possible rewards for correct answers with regard to the highscore list. Such a behavior is quite natural because the only visible feedback for the players is ARTournament’s highscore list. At the same time, this level was also the hardest, as artworks of the Italian baroque painter Caravaggio were presented together with those of other Italian painters of the same time and covering the same thematic topic. So, the goal was the identification of Caravaggio’s personal style in contrast to his contemporaries.

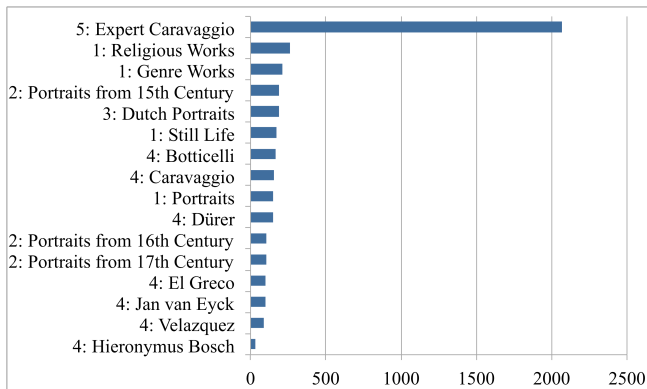


Figure 4. Number of Played Rounds per Level

Looking more closely on the overall results for the various levels, we found it striking, that not only the highest number of rounds was played on “Expert Caravaggio” but this level also achieved a very high percentage of correct answers. Only the stage 1 levels "Portraits" and "Still Life" scored better with respect to the percentage of correct answers. See Figure 5 for a plot that shows the percentage of correct answers together with the number of rounds played on the particular level. Note, this Figure shows aggregated results for all players. This finding strongly indicates that the players immersed in the oeuvre of Caravaggio and learned to identify his artworks amongst the oeuvre of his contemporaries. In a nutshell, the players might have targeted the highscore list with their leveling-up behavior, yet at the same time they demonstrated high recognition skills of Caravaggio’s oeuvre. We may thus conclude, that collateral learning takes place in the genre of casual games.

Taking a closer look on individual player performance on the various levels discloses interesting insights into the relative difficulties of ARTournament’s game levels.

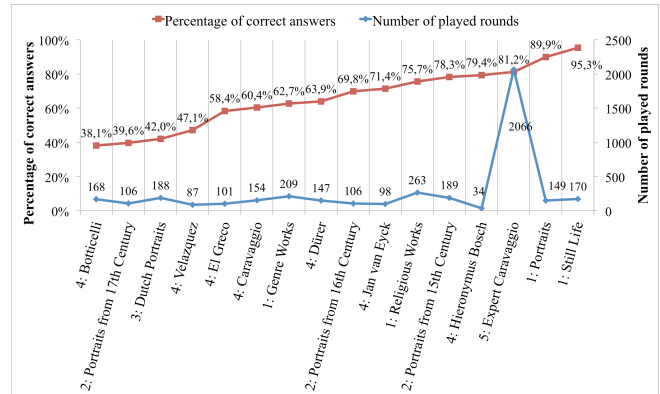


Figure 5. Correct Answers vs. Played Rounds

In general, if learning had taken place, we would expect that the percentage of correct answers increases during playing ARTournament on a particular level. In order to verify our expectation, we analyze individual player performance on the various levels of the game. The performance of individual players is measured as the percentage of correct answers during the playing time spent on the respective game level. We focus in this analysis on players that spent at least 20 rounds on a particular level. To capture the potential increase in performance during game play, the total number of rounds played is partitioned into five equally long playing periods. For each playing period, the percentage of correct answers is calculated.

Strong evidence of our expectation can be observed, for instance, on stage 2 level “Portraits from 15th Century”, see Figure 6. For this particular level, we got 189 rounds played in total. The plot shows the performance of four individual players during five equally long playing periods (x-axis). The performance is measured as the percentage of correct answers during each fifth of the individual playing time (y-axis). Overall, the performance of the players is well above the baseline for pure guessing which would result in about 25% correct answers per playing period. The occasional drop in the final fifth of playing time is negligible, as each of the players has already reached the overall goal of this particular level, enabling her or him to advance to a higher level, before they actually quit this level. We might guess that a drop in performance during the final fifth of playing time is just an indication of player's fatigue and loss of concentration.

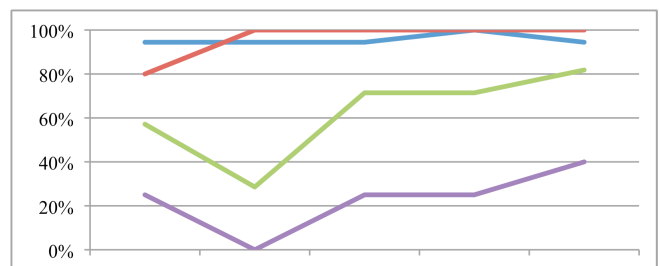


Figure 6. Player Performance: Portraits from 15th Century

In Figure 7 we show an example for a level that clearly did not achieve positive impact on learning for the players. This figure shows the player performance on stage 4 level “Botticelli” where players had to identify artworks of Sandro Botticelli compared to his contemporaries not necessarily of the same geographical region. This level was played for a total of 168 rounds. The player’s performance is largely around the baseline for pure guessing, i.e. 25%, and the performance does not increase dramatically over playing time, at least for most of the highly engaged players on that level. For future work on ARTournament, a plot like this clearly suggests that additional preparation levels are needed in order to put the players in a position to better identify the artworks of Sandro Botticelli.

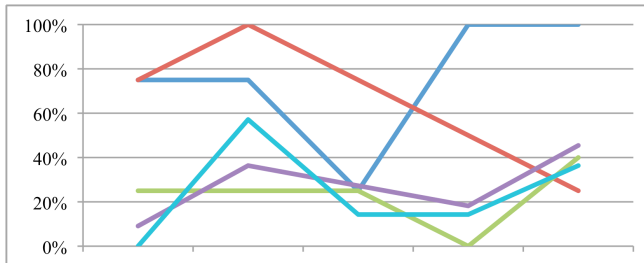


Figure 7. Player Performance: Botticelli

Finally, we also show the player’s performance on stage 5 level “Expert Caravaggio” that received most attention amongst our heavy players during the evaluation period with 2,066 rounds played in total, see Figure 8. This plot is again a very encouraging indication that learning has occurred amongst the heavily engaged players of that particular level. The percentage of correct answers over the playing time clearly increases and it’s well above the baseline for mere guessing. Again, the drops in the final fifth of playing time might rather be attributed to fatigue since each of the players has reached the goal of this level well before she or he has quit the level.

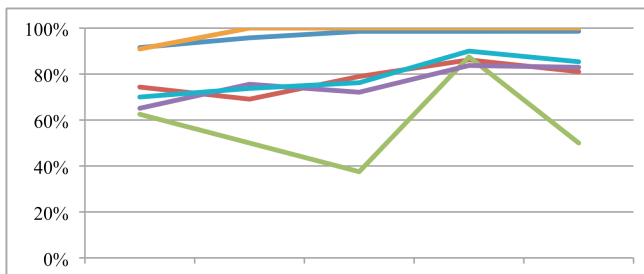


Figure 8. Player Performance: Expert Caravaggio

## V. CONCLUSIONS

In this paper we have described design and evaluation of the mobile casual, level-based game ARTournament on the Android platform. The educational goal of this game is to transfer knowledge about basic concepts of art history to the players. The various levels of ARTournament are structured

consecutively starting with providing knowledge about art themes, influence of time periods and geographical regions on artworks, and finally, the particular styles of individual artists. The governing principle is visual comparison of artworks. So, the player has to select the correct answer from four artworks presented in every round of the game. By analyzing the performance increase of individual players we have demonstrated that knowledge was transferred successfully to the players.

Future work will include more elaborate in-game feedback especially in case of wrong answers. We will also redesign the rewarding scheme of the game levels to work against the observed behavior of many players to level-up and stay at the level providing the most points for correct answers. Furthermore, we plan to provide iOS and browser-based versions of ARTournament.

## ACKNOWLEDGMENT

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