Teaching Serious Games

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Abstract

Game development is a challenging and diverse field. It integrates different disciplines such as computer science, design, art, and psychology. Many different skills are required to create successful games, posing great challenges for education. These challenges also apply to the area of Serious Games with the additional difficulty of adding goals beside entertainment to the design. We report on our experiences with designing and implementing teaching formats to further the development of curricula and formal education in the area of Serious Game development. Our approach combines theoretical as well as practical elements. To reinforce and motivate our students we connect our courses to external events such as game development competitions. Furthermore, we experimented with using meta-games as a way of teaching game design.

1 Introduction

As practitioners and lecturers in the field well know, game development is a diverse and challenging field. It is a focal point of many disciplines and topics from computer science and software engineering to psychology, design and art. Many different skills are typically involved in creating games and of course this translates into according challenges to the education of game design and development (cf. Claypool & Claypool 2005; Gestwicki et al. 2008). These challenges also exist for the area of Serious Gaming but they are further complicated, since the development of Serious Games comes with its own share of additional problems.

In this contribution we report on current teaching in Serious Games development at the *University of Bremen*. More specifically, we elaborate on the structure and actual teaching of a specific project-based approach. We report on our experiences with the course itself and the pros and cons of our approach as we currently see them. In addition to this basic setup, linking the courses to external events in order to foster both motivation and practical experience of our students is a key aspect of our course design and we report on the benefits of this integrated approach. The goal of this paper is to inspire discussion among the community of (serious) game development educators and to initialize exchange about concrete successful syllabi.

2 Approach

We focus on a course that took place in the winter term 2009/2010 and a follow up student project, which took place in the summer term 2010 and in the winter term 2010/2011. However, the design of this course and some of our experiences and suggestions are also based on earlier lectures and courses that took place in the years from 2007 to 2009. Specifically, this included courses on *Mixed Reality Gaming* and *3D Game Programming*. To understand how the course relates to the aforementioned student project it is necessary to shortly explain how project-based studies in general are intended and organized at the *University of Bremen*. Student projects in the *University of Bremen* are a central part of the curricula in computer science as well as in digital media study programs and as such are not specific to game development education, however, we think that such a project-based approach fits game development education very well. The duration of the projects is currently one year for bachelor and master students and usually they take place in groups of approximately ten students, but there have also been projects of 25 or more students in the past.

Both course and student project were on the master level. The course mainly focused on building a common ground for students that would then join the project after the course, although we also allowed other students to participate, who were only interested in the course itself. In our discussion we will however focus on how the course and the project complement each other. Our master program for digital media is geared towards international students, therefore the teaching language is English and accordingly people from very diverse backgrounds and skill levels participate in the same courses and projects. Some may have experience in design but none in programming or the other way round. The teaching goal of the course was to bring the heterogeneous students to common grounds on the bases of game development and the application area of Serious Games.

In the course we assembled necessary components from design, programming and Serious Games theory. As designing games is an art as well as it is craftsmanship (Schell 2008), we consider practical experience with design as one of the most important aspects (cf. Fullerton et al. 2004). Providing these experiences early in a lecture is a challenge because of several reasons: the heterogeneous group of students, the complexity of game design itself, and technically inexperienced participants. These challenges are even more severe when dealing with Serious Games as additional aspects - e.g., conveying learning materials as game content - have to be taken into consideration.

To overcome these issues we started with designing a paper-based Serious Game in the second lecture. We asked the students to design a game: “to help students to recapitulate the content of the previous lecture”. The students formed groups of three to five members. Each group had to design a game until the next lecture. The best design was chosen by vote. The proposed design was afterwards refined within the lecture and the game was played at the beginning of each lecture for the rest of the course. The winners were announced in the last lecture and the rest of the students organized a barbecue inviting them as special guests. Designing a game under the pressure of time and in a competitive manner is an experience considered very interesting and motivating by many students. The game itself was accepted

by the students and really helped to recapitulate content from previous lecture sections. A special component of the game was the inclusion of designing and building physical artifacts for score keeping, which were distributed and collected by the lecturers at the beginning and end of each session.

The outline of the individual topics for each session of the course is given below:

- Introduction
- Focus: Serious Games
- Focus: Human Computation
- Game Design Introduction
- Game Design Continued
- Game Technology Introduction
- Game Loop, Game Object Model, and Graphics
- Graphics Continued
- Animation
- Collision Detection and Physics
- Evaluation Methods
- Guest Speaker on "Serious Games"
- Exercise Presentations / *Global Game Jam* Preparations
- Conclusion / Evaluation / Outlook

In the course itself we used a rather classical approach of complementing theory in the lecture with practical exercises, however, we decided against too fine-grained exercises in favor of group-based practical exercises. In total each group had to do three exercises:

- inventing a game concept
- designing assets for this concept
- finalizing a game mock-up based on the concept

We wanted each participant to have at least a short look at each of the involved disciplines even if they would concentrate on a certain area, e.g. programming, later in the project. We included a special session dedicated to guest speakers in our course plan to relay authentic experiences from real world projects. Regarding the technical platform we tried to not restrict the students too much, but we also needed to keep the number of employed tools/languages manageable. Therefore, the assets could be created in one of the major 3D/2D tools but had to be delivered in a common format such as *obj*, *fbx* or *Collada*. For the programming exercise we recommended *Flex/Flash*[1], *XNA*[2], or *Panda3D*[3].

As most students in the course participated with the goal of joining the project, they were highly motivated to learn the tools and to think ahead of the time after the project. To provide additional motivation (also to the students who would not join the project), we intro-

[1] Adobe Inc. (2011). Adobe Flex. http://www.adobe.com/products/flex/

[2] Microsoft (2011). XNA. http://msdn.microsoft.com

[3] Carnegie Mellon University (2010). Panda 3D. http://www.panda3d.org/

duced and advertised the *Global Game Jam* during the course. The Game Jam is a 48 hours event, basically one weekend, over which teams from all around the world get together in various locations and try to design and program a complete game. It takes place every year at the end of January. The time schedule fits very well to our semester terms. The event itself, with its strong emphasis on valuing participation and bold attempts much more than competition amongst the participating groups, provides great motivation to apply the knowledge and experiences from the course to a concrete project. Thus, while challenging, it is also manageable as it takes only one weekend and the participants quickly run through all stages of game development. Of course one could also organize a local event of a similar type to accommodate for different time constraints.

After the course finished we dived directly into the subsequent project, even taking the last session of the lecture for brainstorming about project ideas. While the general theme/area of such projects is defined by faculty (in our case *Entertainment Computing / Serious Games*), the concrete goal is always developed together with the students. To find this goal, we took a lesson from the games industry, i.e. the act of pitching a proposal. After collective brainstorming sessions, students had to pitch their ideas to the plenum in order to gain support and form a group. In this first stage, we limited the number of projects to three to four that would be developed further into mock-ups. At this point the project ideas we still rather diverse, although all of them were in the area of Serious Games, they ranged from so-called Exergames (Sinclair et al. 2007), games that support or involve physical exercise, over general educational games, to games about saving the environment. The students then had a couple of weeks to build their mock-ups. At a special weekend event we do regularly to kick-off our projects, the four remaining groups presented their ideas and their mock-ups to the whole audience and, based on the following discussion, the whole group decided for a single topic (in our case an Exergame).

During the main phase of the project we used different teaching tools. In our opinion, peer teaching is key to knowledge transfer in such projects and therefore was highly encouraged and even included in the grading. Furthermore, we encouraged students to include outside focus group testing and to present at external events (for example local games industry networking meetings), to apply for prizes and to keep regular contact with their target group (in this case Parkinson's patients) for feedback and testing both of concepts and implementations. Another aspect was to submit to scientific conferences and workshops. Two papers were accepted on national (Assad et al. 2011a) and international (Assad et al. 2011b) conferences. In short: to treat their project as a "real" project not "just" as a learning experience. The management of such project is also the responsibility of the students with the advisors taking a supportive role and only intervening in case things get really out of control.

To choose a technical game development platform the students also conducted a research process based on recommendations from their advisors, in the end they decided for XNA, which we had used successfully for other lectures in the past. Even for lectures without a follow up project we always try to have external connections. For example in a lecture on 3D game programming, we made it mandatory to submit something to the *Imagine Cup*, which worked quite well as a motivating factor. Of course the grading was not based on how well students performed in the competition; we just required them to submit something on time.

3 Experiences

In general, our experiences with the described approach are very good with some room for improvements. The exercise meta-game mentioned above worked extremely well (better than anticipated). Students plunged into the contents of the course early on, trying to beat their fellow students. Even though some participants took it highly competitive, the overall atmosphere stayed friendly and constructive. The physical score keeping was both fun and interesting during the course and also provided a nice learning experience regarding paper prototyping, same as with the design of the general game rules. Calling on external lecturers provided an illustrative diversification to our own teaching and complemented it quite well.

Regarding the overall design there were pros and cons. In general putting everything in one lecture provided a sort of "one stop shop" for the students and overall, considering the performance of the students, we achieved our goal of leveling out some of the heterogeneous background. Naturally, it was not possible to go into much detail on the entire topic and some students expressed that they would have liked to dig deeper on some areas. However, we feel that the accompanying exercises and especially the Game Jam and the project itself posed a range of interesting follow-up opportunities in this regard. The resulting games from the project as depicted in Figure 1 were accepted very well by the actual target group.

Figure 1: Photographs of a student testing a range of small Exergames designed to support active exercise therapy for Parkinson's patients. These games were the outcomes of the follow-up project on serious games.

The exercises also went pretty well, although we have to admit that the asset exercise was slightly redundant and we consider going for just two exercises (concept and prototype) in the future as people will have to create assets for their prototypes anyway. We did it that way in order to structure the process for the students but we found the students perceived the distinction as rather artificial, whereas game concept and prototype present natural choices as they are present in the games industry.

4 Conclusion

In this paper we presented our design and experiences with teaching Serious Games development at the *University of Bremen*. We presented the outline of a course and how lectures and practical projects combined with external events can reinforce and motivate theoretical knowledge. The project accompanied with the lecture and new teaching methods turned out to be efficient and motivating. A measure therefore is the feedback from our students as well as the resulting publications from the project (Assad et al. 2011a; 2011b).

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