Heuristics for the Evaluation of Tabletop Games

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ABSTRACT
Since the late 1990s researchers started to investigate augmented tabletop games that are closing the gap between traditional board games and video games. With this development the necessity to evaluate these tabletop games increases. We identified ten heuristics, all of which have been evaluated with experts playing with four different tabletop games. Our heuristics contain all facets offered by tabletop games, such as game play and game story, virtual interface, and the special properties of augmented tabletop games. In this paper, we will discuss the heuristics and present concrete examples.

Keywords
Tabletop Games, Heuristics, Evaluation

1. INTRODUCTION
Trends have shown efforts to bridge the gap between traditional board games and computer games [2], answering the demand for socially rich gaming experiences, not only including human computer interaction but also allowing for human to human collaboration. This is accomplished by augmenting physical games with digital aspects and digital games with real playing pieces (i.e. tangible objects) [15]. Tabletop games merge the advantages of traditional board games and video games [1][8]. They combine the social interaction and the physical activity of board games with the visual, acoustic and haptic possibilities of video games [5]. Players are able to deduct the other player's intentions by observing their actions [14]. The technical enhancements of the game board allow tasks that are perceived as cumbersome to the players such as shuffling cards or counting the points to be taken over by the computer [8]. Thus, the player is able to fully concentrate on the game itself (e.g. strategies). Another advantage taken from video games is the capability to save the status of the game and resume it later [10].

Due to the wide variety of possible augmented tabletop games, no general guidelines or definitions can be assumed. One of the major problems is still the knowledge of the ideal hardware (tracking, display) for the different tabletop applications [13], e.g. back projection setup vs. front projection setup. This is also the case for tabletop games.

Currently, tabletop games are mostly developed in research laboratories with little attention for user studies. To facilitate the evaluation process, this paper will introduce ten heuristics for the evaluation of tabletop games.

2. RELATED WORK
The development of tabletop games is, as game development in general, an iterative process throughout the development cycle, combining different usability evaluation methods. Therefore heuristic evaluation is suggested in the early design process [4]. Later on, user testing and cognitive walkthrough appear to be promising.

In 2002, the first approach of heuristics for video games was undertaken by Melissa Federoff [4]. She tried to assess the applicability of Nielsen's heuristics to video games. Furthermore, she developed a set of 40 heuristics. Based on Federoff's heuristics, Desurvire et al. [3] released a new set of verified heuristics, the HEP (heuristic evaluation of playability). These heuristics were proven to be effective through further evaluations. Röcker et al. tested the adaptability of the heuristics introduced by Desurvire et al. for pervasive games [11]. The results of the study have shown that the heuristics concerning the game mechanics are the same for all types of games. More heuristics for the evaluation of video games have been developed by Nokia [7] and Noah Schaffer [12].

Scott et al. [13] analyzed state of the art tabletop systems, literature and results of current conferences as well as their own experience in the field of tabletop computing. With the outcome of this analysis they suggest eight specific guidelines when designing tabletop applications.

Our approach is influenced by the previous work, but is different in a number of important ways. Our heuristics benefit from the following features:

- All ten heuristics are mainly designed for tabletop games, including different genres.
- The heuristics form a selective summary of previous developed heuristics.
- Several iterations of our heuristics have been developed, tested, and evaluated by usability and tabletop experts.
- The heuristics are easy to apply and formulated in an understandable way using extensive textual description.

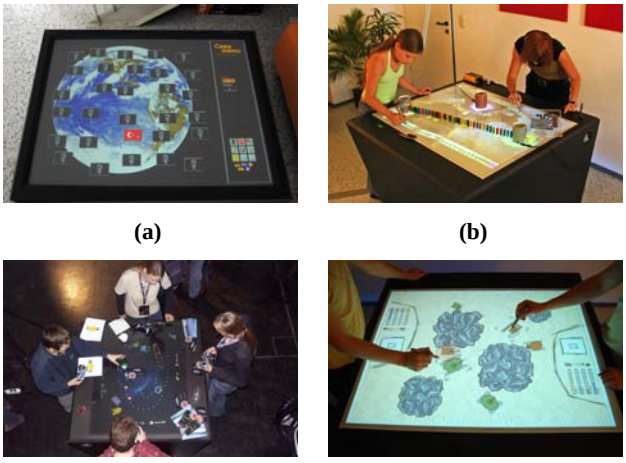
Therefore the novelty value of the present heuristics derives from the special design for tabletop games, the ease of application and the extensive coverage of this area including a profound explanation. Previous works in the field of gaming were concentrated on specific experiences, not including all possible factors and were scarcely described.

3. HEURISTICS FOR TABLETOP GAMES

The heuristics concerning the special properties of tabletop games have been developed through extensive literature review and in collaboration with evaluation and tabletop experts. Altogether in our heuristic process, we developed and reviewed four different iterations of heuristics. The first set of heuristics has been reviewed by usability experts and could be described as important aspects in the development of tabletop games rather than as proper formulated heuristics. Therefore severe changes had to be made. A closed description of these heuristics can be found in [6].

For the second set of heuristics, the heuristics have been re-phrased in order to be more appropriate and understandable. Furthermore, it has been formally proven against available literature on heuristic evaluations (such as [9]) and feedback from usability experts and experts in the field of tabletop gaming has been taken into consideration.

The third set of heuristics has been developed based on the results of the review mentioned before and was tested through a formal heuristic evaluation. Twelve evaluators (two double-experts and three medium experienced volunteers), aged between 22 years and 41 years, were asked to perform a heuristic evaluation of four tabletop games each (see Figure 1). A closer description of the games can be found in [6]. One evaluation session lasted between two and four hours depending on the number of times the evaluators played the games and the amount of feedback obtained. Since all games offered multi-player functionality, the evaluators were arranged in groups of two.



(a) **(b)**

(c) **(d)**

Figure 1. The four evaluated games: (a) CasaMemo, (b) Comino, (c) Neon Racer, and (d) PenWars.

At the beginning of every evaluation session, the teams of participants were quickly introduced to the topic of the evaluation and were asked to sign a consent form. Next, the heuristics were presented and extensively explained to the volunteers. Each participant obtained a sheet of paper which showed the proposed heuristics with a short explanation. The sequence of the games to be evaluated was counterbalanced so that learning effects or other influences would not affect the overall results. Each game was introduced separately to the players and any initial questions were answered. After playing the game, the participants had to examine the game again (up to six times) and verbalize usability problems. When the volunteers were finished playing, they were asked to categorize the usability problems they found into the given heuristics. At the end of each session, they were invited to have a look at the heuristics to find potential other problems that they might have overlooked before.

During the heuristic evaluation 299 usability problems (138 classified problems) have been found e.g. that it is not possible to reach over the table (Casa Memo). Since the quality of heuristics can be distinguished by the ease of assigning problems to them, the failure rate was an important indicator for their efficiency. The results obtained have shown that a total of 74 out of 299 heuristics have been assigned incorrectly, which is a failure rate of 25 % (see Figure 2).

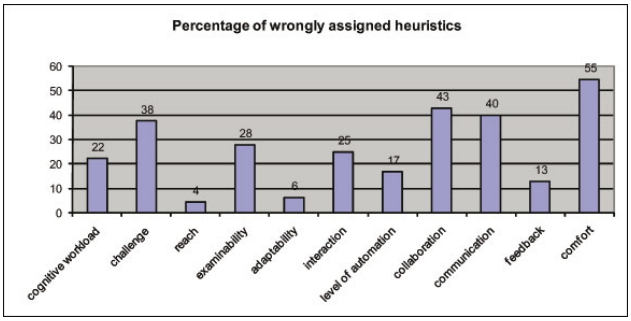


Figure 2. The percentage of incorrectly assigned usability issues per heuristic.

For the final set of heuristics, the third set of heuristics has been modified according to the results obtained throughout the formal heuristics evaluation. Most of the heuristics have undergone drastic changes and in order to clarify the heuristics, sub-categories have been introduced [6].

3.1 Cognitive Workload

The cognitive workload, which is not connected to the game play (i.e. in connection with the acquisition of skills, the view, the screen orientation and the input methods), should be minimized.

The player's cognitive workload should be adapted to the game play so that the player is not overburdened in a way that the challenge of the game is negatively influenced. The learning curve should be kept short and unnecessary overexertion caused by display-connected issues, orientation or input devices should be avoided.

3.2 Challenge

The system should be designed in a way that the challenge satisfies the preconditions of a tabletop setup and the target group.

The extended possibilities of tabletop setups should be used to design an appealing game play. Thus, the challenge should be defined by the tabletop setup. This also includes the challenge produced by input devices. Furthermore, collaborative and competitive tasks can provide additional challenge for a game.

3.3 Reach

The reach of the players should be adapted to the requirements of the game play.

Not every game requires the players to reach over the entire table. Players can collaborate table-wide, not requiring a private workspace or they could need a certain private workspace in front of them. Furthermore the reach of a person is different depending

on whether the person is sitting or standing (see Figure 3). In our tests, we had both setups. When players are required to share input devices, every player should have access to the device. Moreover the reach should also satisfy the target group.

3.4 Examinability

The players should not be hindered to examine the area required by the game play.

Figure 3. A player's reach is dependent on whether he is standing or sitting.

The examinability is defined as the area of the tabletop surface, which the player is able to examine visually according to the game play. The virtual examinability allows the player the comprehension of information provided by the displayed interface and the real examinability can be understood as the player's possibility to see the displayed objects on the table surface without physical objects hindering the perception (see Figure 4).

Figure 4. The real examinability is affected by the cables on the table surface.

3.5 Adaptability

The system should be adaptable to the player in terms of the setup.

Tabletop systems should be able to meet the player's needs (e.g. different seating positions during a game session). The system should be able to be used by all players represented by the target group. Furthermore, the game should not necessarily be bound to one setup.

3.6 Interaction

The interaction method should satisfy the expectations of the player and follow the game logic.

Most of the players have experience in gaming and consequently some of them are familiar with different input devices. Therefore these interfaces should conform to industry standards (e.g. from video games), if available, and be usable in a very natural, easy and understandable way [9]. The controls employed should be intuitive, consistent and meet the player's expectations. The proportions of the game elements as well as those of the real objects should be realistic and conform to the game play.

3.7 Level of Automation

The player should be able to execute all actions relevant to the game by him/herself.

All actions that are perceived as boring and rather unimportant to the game should be performed by the computer. Nevertheless the actions that are essential to the game play should be accomplished by the player [8].

3.8 Collaboration and Communication

The interpersonal communication and collaboration should be supported by the entirety of the game (such as game play and setup).

The technology is not supposed to interfere with the collaboration; moreover, it should sufficiently support it. The game play should be designed to encourage collaboration or even competitiveness (see Figure 5). The entirety of tabletop games (design, setup, game play) should aim on enhancing collaboration and communication between players. The game play should demand players to talk with each other about different situations which might be either collaborative or competitive.

Figure 5. The game play of Comino encourages close collaboration of the players.

3.9 Feedback

Feedback and feedthrough should be adapted to the possibilities of tabletop games, used adequately and be provided to the players when appropriate.

Feedback is meant for the person executing the current action and helps to understand what users have just done and reassures them that they have done what they have intended to do. Feedback can be purely visual, acoustic or haptic, but most of the time it is

applied in a combined form. Feedthrough helps other players to follow the current player's actions. Each kind of feedback depends on the environment it is used in.

3.10 Comfort of the physical setup

The construction of the setup (including the display) should be comfortable to use and not require the player to take an awkward position.

The heuristic concerning the comfort is only connected to the comfort provided by the physical setup and not the usability of the interface. The comfort is measured by the impressions of the current player. It is only applied to the present system without the possibility of changing it according to the player's needs. Furthermore the players should feel comfortable during the entire duration of the game.

4. CONCLUSION

In this paper we presented ten heuristics for augmented tabletop games. To cover all aspects provided by augmented tabletop games, a framework consisting of heuristics concerning the game play/game story, the virtual interface and the special preconditions of tabletop games has been developed. The heuristics applying to game play/game story as well as to the virtual interface have been collected through literature research of heuristics applicable to video games

During the development of this project, four different sets of heuristics concerning the special conditions of augmented tabletop games have been developed. The third set of heuristics has been tested through a formal heuristic evaluation. The results have proven them to be useful and applicable to the evaluation of tabletop games. Since some obscurities have been discovered through the heuristic evaluation, the heuristics have been improved and sub-categories have been added to the final outcome. The sub-categories are supposed to offer additional support in case of ambiguities.

Because of temporal constraints it was not possible to test the final set of heuristics. Nevertheless, due to the success of the third set of heuristics, the improved final version is supposed to support the evaluation of tabletop games. In case that further evaluations of the heuristics proof them to be helpful, different kinds of tabletop applications can be included into the heuristics.

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