Developing Playability Heuristics for Computer Games from Online Reviews

Miaoqi Zhu and Xiaowen Fang

School of Computing, DePaul University, Chicago, IL, U.S.
miaoqi.zhu@gmail.com,
xfang@cdm.depaul.edu

Abstract. This paper demonstrates a revised lexical approach for developing game playability heuristics by examining a large number of online game reviews. Game usability, which is better labeled as playability, has been receiving attention from researchers in the areas of HCI and Game Studies. Despite some early research efforts on this topic, most studies are generally qualitative in nature and don't cover a wide range of games. Inspired by the lexical approach used in personality psychology, we employed a revised method to investigate playability by analyzing players' languages. In our previous research, 6 factors were extracted about essential characteristic of game play experience [39]. This study aims to develop playability heuristics rules based on adjectives converging on factor perceived as playability, the top factor among the six.

Keywords: usability, playability heuristics, lexical approach.

1 Introduction

Although many studies have been conducted to evaluate productivity software in the area of Human-Computer Interaction (HCI), few of them have be dedicated to developing heuristic rules for hedonic systems such as computer games. In fact, some HCI professionals are still relying on the traditional usability evaluation/inspection techniques to detect potential usability issues of computer games.

Barr, Noble and Biddle ([3]) note that computer games are not made to support user-defined tasks and thereby differentiate themselves from productivity software. It is fair to say that some usability heuristics may not be applicable to computer games. For instance, user control and freedom in games may deviate from its original definition for desktop applications. We also argue that it is imperative to develop new heuristics for computer games because they are a different type of software system. The notion is that playability is a better measure, and it goes above and beyond traditional usability heuristics for computer games.

Previously there are a handful of attempts to define playability and playability heuristics. For instance, Malone ([20]) recommends three basic principles of designing an enjoyable interface for educational games: challenge, fantasy and

A. Marcus (Ed.): DUXU 2014, Part I, LNCS 8517, pp. 496–505, 2014.

curiosity. Federoff ([11]) proposes the first set of playability heuristics in the light of traditional usability heuristics ([27]). More recently, Pinelle, Wong and Stach ([31]) come up with a list of heuristics by analyzing 108 PC game reviews from GameSpot.com. This array of work presents different perspectives and approaches; however, they are typically derived from a small sample of games and do not necessarily reflect what game players truly think.

Motivated by the lexical hypotheses in the field of personality psychology, this paper presents a process of developing playability heuristics via a revised lexical analysis. The premise is that players need to use natural languages to describe play experience and characteristics of computer games. Over an extensive period of time, words are created to encode critical information pertaining to playability. As a result, any important playability issues must be reflected in players' languages.

Six major factors were extracted from 696,801 structured reviews covering thousands of games in a previous study [39]. Based on the same set of reviews and adjectives loading on the factor of playability, we adopt a grounded theory ([21]) approach to consolidate existing heuristics and discover unknown heuristics. In the following sections, we will discuss 1). Usability and computer game playability; 2). A revised lexical approach and prior analysis of adjectives; 3). A new method to explore playability heuristics.

2 Usability and Computer Game Playability

While usability looks familiar to most HCI scholars and practitioners, it may not be the single best measure for computer games considering the basic components of gameplay. We argue that playability is a more accurate term for game evaluation, and it is related to usability. In this section, we will compare them in depth and review existing playability heuristics.

2.1 Usability and Playability

Usability is defined as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified content of use" ([13]). There are a number of usability engineering methods, among which is heuristic evaluation developed by Nielsen ([26]). While usability concerns the pragmatic side of HCI, the term of User Experience (UX) was created to embrace its hedonic property ([9]). Effie et al. ([9]) claim that UX is more about the sensation, subjective feeling, emotional, and satisfaction aspect of user-system interactions.

Evaluation of game usability and/or UX features a new wave of thinking in the intersection of HCI and Game Studies. There has been a heated discussion to differentiate usability from playability. Malone ([20]) maintains that it is important to distinguish toys-systems from tools-systems. Games belong to the former category and typically do not require users to have an external goal. Pagulayan et al. ([30]) indicate that they allow players to seek novelty in the interactive experience. In contrast, the productivity applications are meant to be consistent. Pinelle, Wong and

Stach ([31]) view game usability as "the degree to which a player is able to learn, control, and understand a game," and that it is just a prerequisite to have an outstanding usability. For utility software, Sauro and Kindlund ([34]) conclude that its usability can be measured by effectiveness, efficiency, and satisfaction. However, Federoff ([11]) criticizes that satisfaction is more critical for computer games.

There currently exist many definitions for game playability. A commonly referenced one is "the degree to which a game is fun to play and is usable, with an emphasis on the interaction style and plot-quality of the game; the quality of gameplay" ([36]). Fabricatore, Nussbaum and Rosas ([10]) suggest that "playability is the instantiation of the general concept of usability determined by understanding and controlling gameplay." Sánchez et al. ([33]) view playability as the UX in videogames and define it as "a set of properties that describe the Player Experience using a specific game system whose main objective is to provide enjoyment and entertainment, by being credible and satisfying, when the play plays alone or in company." But Nacke et al. ([25]) separate the concept of playability from player experience, as they believe that the former comes from an evaluation process on game designs. Paavilainen, Korhonen and Saarenpää ([29]) consider playability as the combination of gameplay and user interface, which links to concepts of intuitiveness, unobtrusiveness, fun, and challenge.

Research activities are witnessed in the intersection of usability and playability. For instance, the playability model proposed by Järvinen, Heliö and Mäyrä ([14]) show that the functional dimension actually corresponds to efficiency in the standard definition of usability. Moreover, the structural dimension is tantamount to heuristic evaluation for games. Christensen, Jørgensen and Jørgensen ([6]) invent a hybrid method of usability and participatory design, which has assisted in detecting potential gameplay issues in a self-developed game called "Takkar". Caroux and Vibert ([4]) recommend game designers to review display design standards from human factors research, particularly the proximity-compatibility principle ([38]). In the meantime, traditional usability techniques are also applied in game user research. For example, the play-testing group, founded by Microsoft Game Studios, provides positive feedback regarding the application of software usability methods in computer games. Medlock et al. ([22]) justify the value of software usability principles for games, and Cornett ([7]) confirms it by carrying out usability test on three massively multiplayer online role-playing game (MMORPGs) and one single-player role-playing game (RPG).

2.2 Playability Heuristics

To introduce major playability heuristics, Malone ([20]) mentions three motivational factors for designing enjoyable interfaces: 1). challenge, 2). fantasy, and 3). curiosity. He designed a series of experiments by controlling each game element at one time. The subsequent analysis resulted in a practical design framework. Although the study was based on an educational game, it has a far-reaching significance for ensuing game studies.

Federoff ([11]) establishes the first set of playability heuristics for games of entertainment purposes. Her work is worth attention in that it was presented in comparison to traditional usability heuristics. Moreover, she conducted the study inside a game company, which makes the results more applicable to industrial practice. Nevertheless, no formal validation process is found in the end.

Desurvire, Caplan and Toth ([8]) compile a collection of heuristic rules from literature review and expert review. To validate their Heuristic Evaluation for Playability (HEP), they deploy a 2-hour playability evaluation session through 4 user studies. The outcome demonstrates the heuristics' effectiveness in identifying playability issues. Korhonen and Koivisto ([17], [18]) develop the first playability heuristics for mobile games. To address the concern on their evaluation model, Korhonen, Paavilainen and Saarenpää ([19]) claim it to be platform-independent hence the heuristics can be applied to examine other genres of games.

Pinelle, Wong and Stach ([31]) propose their heuristics principles through analyzing 108 PC game reviews from GameSpot.com. They categorized problems identified from the reviews, which they then translated into principles that described them at a higher level. Their study, however, focuses primarily on game interface at the expense of pinpointing issues relevant to other gameplay components. Further, the sampled games are not enough to cover all the classes. Given the trend of social networking games, Paavilainen ([28]) introduces an initial set of social game heuristics based on two existing design frameworks ([15], [37]). The heading-level heuristics contain 10 items (e.g., spontaneity, interruptability, narrativity), and they will become more concrete as the projects continue.

On the other hand, the game industries also find dedicated professionals sharing the same interest. A game design veteran - Rouse, outlines a list of design expectations from the perspective of players ([32]). Those expectations in fact can be translated into playability heuristics.

3 The Lexical Approach and Prior Analysis of Adjectives

According to the essential steps of the original lexical approach, we have implemented a revised method to inspect game-descriptive adjectives in the reviews contributed by various stakeholders (e.g. developer and player). The results suggest the success of our approach. It also produces a cluster of adjectives highly relevant to playability from which we will explore playability heuristics. This section will briefly discuss the core concept of the lexical approach and our analysis of game adjectives.

3.1 The Lexical Approach

The lexical approach is originally proposed to understand human personality. Since the characteristics of personality are not directly observable, there have been many ideas of developing personality taxonomies ([16]). However, a common weakness among them is the lack of an inclusive source that provides sufficient instances for each attribute. This problem was finally addressed when researchers resort to a readily accessible resource – natural languages such as English.

The lexical hypothesis states that when salient individual differences are socially relevant to life, these distinctive attributes will be encoded into a nature language. If more people agree to the same difference, it is more likely to be described by similar terms. To exercise the lexical approach, a researcher must first locate personality-descriptive adjectives in a dictionary ([1]). As an initial list is ready, it must be consolidated by removing rarely-used personality-descriptors. A final list is then sent to a large sample of subjects, and they will be asked to provide ratings on the extent to which each adjective describes their own personalities.

Based on the personal trait groups created by Allport and Odbert ([2]), Cattell ([5]) became the first researcher to obtain 12 personality factors via oblique factor analysis. However, when other scholars re-examined the correlation matrixes from Cattell's experiments, they found that only five personality factors stayed consistent ([35]). It is now the well respected Big-Five personality model ([35]).

3.2 Prior Analysis of Adjectives

A revised lexical approach was proposed and implemented in our prior study[39]. To summarize, seven stages were involved: 1). Collecting a large body of game reviews from mainstream game websites. We downloaded 30,252,536 review documents (e.g., user comments, expert reviews, etc.) from three sites (i.e., Gamespot.com, Gamestop.com, IGN.com); 2). Building an initial dictionary of game-descriptive terms. Approximately 11,000 unique adjectives were found by referencing the lexicon library of WordNet ([12], [23], [24]); 3). Extracting adjectives' ratings from players. Due to the size of the adjective list (n = 11,000), it would be difficult to conduct a large-scale survey study. An alternative and arguably better solution was then proposed and employed to convert structured reviews into a binary matrix. For each review document, "1" indicates the presence of an adjective in the document, and "0" implies its absence; 4). Running the first factor analysis. We carried out an exploratory factor analysis with varimax rotation, and this step discovered 70 factors; 5). Consolidating the list by grouping each adjective's synonyms and antonyms into one feature space if their correlations were also significant. A new rating table was constructed in the similar manner as the third step. However, instead of registering binary data, the absolute number of distinct adjectives was used as the value of each feature; 6). Running the second factor analysis. This round of analysis resulted in 6 distinct factors, which allows us to define the factors more precisely; 7). Exploring the traits of computer games. Two researchers independently labeled each factor by interpreting its adjectives in the context of gameplay.

These six traits are conceptualized as: playability, creativity, usability, action, sensation, and strategy. Playability, ranked as the top trait, seems to be the most important factor among all based on the variance it accounted for. We argue that the adjectives converging on this factor will likely reveal different aspects of playability. Therefore, playability heuristics can be established from them because they no doubt represent subjective perceptions of a large number of game players.

4 A New Method for Exploring Playability Heuristics

The general approach we take is to match playability related adjectives with any existent heuristics identified by prior research and any adjectives that are left alone become potential candidates for new heuristics. To obtain a list of existent playability heuristics, we first revisited the literatures of game designs and playability. The goal is to match the adjectives with potential design and/or heuristics principles. If an adjective is not clearly associate with a known heuristic or the context of its use is not clear, actual game reviews containing this adjective were examined to determine whether a new heuristic rule is warranted..

Similar to the grounded theory approach, for each group of terms, sufficient raw materials were examined until no additional new information was present. It was also observed that many of the heuristics may cross-reference adjectives of different groups. Below we are presenting a portion of the initial list.

Table 1. Selected playability heuristics and associated adjectives

Playability-related Adjectives	Playability Heuristics
Pretty, beautiful, nice, nasty, pleasant, respectable	• The game characters look adorable (e.g., beautiful, intelligent, interesting) to players; • Impressive setting designs can facilitate presence.
Hard, solid, challenging, strong, tough, serious, tricky, rough, soft, stale, severe, punishing, troublesome, grueling, easy, difficult, available, smooth, comfortable, user-friendly, abundant, simple, plain, complex, mere, bare	• The game should be easy to learn but hard to master; • The players should not be given severe punishment and/or penalty if failing difficult tasks; • The level of challenges is well-balanced; • The interface is user-friendly and easy to navigate to locate available features; • The Artificial Intelligence (AI) needs to assist players when they have difficulty dealing with tricky tasks; • Players should be able to overcome challenges eventually and feel a sense of accomplishment.

Table 1. (*continued*)

Sound, complete, intelligent, substantial, stable, sensible	• Players are instructed to make intelligent decisions and carry out sensible actions; • The outcomes of players' actions must make sense to them; • Players understand the story line as a consistent and/or stable vision; • Non-player characters behave in a manner that is sensible in context of the story and setting.
Different, various, diverse, opposite, unusual, contrary, variant, polar, mean, normal, average, typical, natural	• There should be various tasks for each stage of playing in order to create an enduring gameplay; • The controls are mapped in a natural way, and the game's default settings must follow typical ones from games of similar kind; • The game can be manipulated in a number of ways or explored through various modalities.
Boring, tedious, dull, tiresome	• The tediousness during game-play can be solved by adding different tasks and adjusting the pacing of gameplay; • Customizations (e.g., control, sound, color) can help minimize possible tediousness. • Game mechanics are not mundane.
Repetitive, repetitious	• The tasks in the games should not be perceived to repeat themselves; • When the same mistakes are made again, there should not assistance instead of the same penalties; • Repetitive activities can be reduced by simplifying controls.

5 Next Step

We are in the process of consolidating the list by removing repetitive and ambiguous rules. The next step is to substantiate playability heuristics drafted from above stage. Since the objective is to create a set of player-centered playability heuristics, finding

empirical support for each rule is crucial. We are planning to adhere to three procedures for this task: 1). All the reviews will be retrieved and ordered according to the frequencies of involving adjectives (e.g. emotional) in the rule; 2). For each proposed heuristics, certain adjective patterns (e.g. emotional impact, emotionally connected) and pertinent subjects (e.g., character, story) will be gleaned from highly-ranked reviews; 3). Queries will then be constructed using the information obtained from previous step. 4). Essential statistics will be reported and compared such as how many times the targeted rules are mentioned by players or how many games contains this rule. Given the unprecedentedly large-volume reviews, only important playability issue can survive this step, as they are supposed to apply to a wide range of computer games and they should be mentioned by a considerably large number of players.

References

1. Ashton, M.C.: Individual Differences and Personality. Academic Press, San Diego (2007)
2. Allport, G.W., Odbert, H.S.: Trait-names: A psycho-lexical study. Psychological Monographs 47, 1 (1936)
3. Barr, P., Noble, J., Biddle, R.: Videogame values: Human–computer interaction and games. Interacting with Computers 19(2), 180–195 (2007)
4. Caroux, L., Le, B.L., Vibert, N.: Maximizing players' anticipation by applying the proximity-compatibility principle to the design of video games. Human Factors 53(2), 103–117 (2011)
5. Cattell, R.B.: Confirmation and clarification of primary personality factors. Psychometrika 12(3), 197–220 (1947)
6. Christensen, L.J., Jørgensen, T.T.Y., Jørgensen, A.H.: Developing a hybrid of MMORPG and LARP using usability methods: The case of Takkar. In: DIGRA Conference "Level Up", Utrecht (2003)
7. Cornett, S.: The usability of massively multiplayer online roleplaying games: Designing for new users. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, pp. 703–710. ACM Press, New York (2004)
8. Desurvire, H., Caplan, M., Toth, J.A.: Using heuristics to evaluate the playability of games. In: CHI 2004 Extended Abstracts on Human Factors in Computing Systems, pp. 1509–1512. ACM Press, New York (2004)
9. Law, E.L.-C., Roto, V., Hassenzahl, M., Vermeeren, A.P.O.S., Kort, J.: Understanding, scoping and defining user experience: a survey approach. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI 2009, pp. 719–728. ACM Press, New York (2009)
10. Fabricatore, C., Nussbaum, M., Rosas, R.: Playability in Video Games: A Qualitative Design Model. Human-Computer Interaction 17(4), 311–368 (2002)
11. Federoff, M.: Heuristic and Usability Guidelines for the Creation and Evaluation of Fun Videogames. Unpublished Master Thesis, Department of Telecommunications, Indiana University (2002)
12. Fellbaum, C.: WordNet: An Electronic Lexical Database. MIT Press, Cambridge (1998)
13. International Organization for Standardization. ISO 9241-11: 1998: Ergonomic requirements for office work with visual display terminals (VDTs) - part 11: Guidance on usability. International Organization for Standardization, Geneva (1998)

14. Järvinen, A., Heliö, S., Mäyrä, F.: Communication and community in digital entertainment services. Prestudy Research Report. Tampere University Press, Tampere (2002)
15. Järvinen, A.: Game design for social networks: Interaction design for playful dispositions. In: Spencer, S.N. (ed.) Proceedings of the 2009 ACM SIGGRAPH Symposium on Video Games, pp. 95–102. ACM Press, New York (2009)
16. John, O.P., Angleitner, A., Ostendorf, F.: The lexical approach to personality: A historical review of trait taxonomic research. European Journal of Personality 2, 171–203 (1988)
17. Korhonen, H., Koivisto, E.M.: Playability heuristics for mobile Games. In: Proceedings of the 8th Conference on Human-Computer Interaction with Mobile Devices and Services, MobileHCI 2006, pp. 9–16. ACM Press, New York (2006)
18. Korhonen, H., Koivisto, E.M.: Playability heuristics for mobile multi-player games. In: Proceedings of the 2nd International Conference on Digital Interactive Media in Entertainment and Arts, pp. 28–35. ACM Press, New York (2007)
19. Korhonen, H., Paavilainen, J., Saarenpää, H.: Expert review method in game evaluations: Comparison of two playability heuristic sets. In: Proceedings of the 13th International MindTrek Conference: Everyday Life in the Ubiquitous Era, pp. 74–81. ACM Press, New York (2009)
20. Malone, T.W.: Heuristics for designing enjoyable user interfaces: Lessons from computer games. In: Proceedings of the 1982 Conference on Human Factors in Computing Systems, pp. 63–68. ACM Press, New York (1982)
21. Martin, P.Y., Turner, B.A.: Grounded theory and organizational research. The Journal of Applied Behavioral Science 22(2), 141–157 (1986)
22. Medlock, M.C., Wixon, D., Terrano, M., Romero, R., Fulton, B.: Using the RITE method to improve products: A definition and a case study. Usability Professionals Association (2002), http://www.microsoft.com/playtest/publications.htm
23. Miller, G.A.: WordNet: A lexical database for English. Communications of the ACM 38(11), 39–41 (1995)
24. Miller, G.A., Beckwith, R., Fellbaum, C., Gross, D., Miller, K.J.: Introduction to WordNet: An on-line lexical database'. Journal of Lexicography 3(4), 235–244 (1990)
25. Nacke, L.E., Drachen, A., Kuikkaniemi, K., Niesenhaus, J., Korhonen, H.J., Hoogen, V.D.W., Kort, Y.: Playability and player experience research. Paper presented at DiGRA 2009: Breaking new ground: Innovation in games, play, practice and theory, London (2009)
26. Nielsen, J.: Usability engineering. Academic Press, Boston (1993)
27. Nielsen, J., Molich, R.: Heuristic evaluation of user interfaces. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems: Empowering People, pp. 249–256. ACM Press, New York (1990)
28. Paavilainen, J.: Critical review on video game evaluation heuristics: Social games perspective. In: Proceedings of the International Academic Conference on the Future of Game Design and Technology, pp. 56–65. ACM Press, New York (2010)
29. Paavilainen, J., Korhonen, H., Saarenpää, H.: Comparing two playability heuristic sets with expert review method: A case study of mobile game evaluation. In: Media in the Ubiquitous Era: Ambient, Social and Gaming Media, pp. 29–52. Information Science Reference, Hershey (2012)
30. Pagulayan, R.J., Steury, K., Fulton, B., Romero, R.L.: Designing for fun: User-testing case studies. In: Funology: From Usability to Enjoyment, pp. 137–150. Kluwer Academic Publishers, Dordrecht (2003)

31. Pinelle, D., Wong, N., Stach, T.: Heuristic evaluation for games: Usability principles for video game design. In: Proceeding of the 26th Annual SIGCHI Conference on Human Factors in Computing Systems, pp. 1453–1462. ACM Press, New York (2008)
32. Rouse III, R.: Game design: Theory and practice. Jones & Bartlett Learning, Boston (2010)
33. Sánchez, J.L.G., Simarro, F.M., Zea, N.P., Vela, F.L.G.: Playability as extension of quality in use in computer games. In: Proceedings of 2nd International Workshop on the Interplay Between Usability Evaluation and Software Development, I-USED, Uppsala (2009)
34. Sauro, J., Kindlund, E.: A method to standardize usability metrics into a single score. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, pp. 401–409. ACM Press, New York (2005)
35. Tupes, E.C., Christal, R.C.: Recurrent personality factors based on trait ratings. Journal of Personality 60, 225–251 (1992)
36. Usability-First, http://www.usabilityfirst.com/glossary/playability/
37. Ventrice, T.: Building the foundation of a social future, http://www.gamasutra.com/view/feature/4210/building_the_foundation_of_a_.php
38. Wickens, C.D., Carswell, C.M.: The proximity compatibility principle: Its psychological foundation and relevance to display design. Journal of the Human Factors and Ergonomics Society 37(3), 473–494 (1995)
39. Zhu, M., Fang, X., Chan, S., Brzezinski, J.: Building A Dictionary Of Game-Descriptive Words To Study Playability. In: CHI 2013 Extended Abstracts, Paris, France, April 27-May 2. ACM, New York (2013); ACM 978-1-4503-1952-2/13/04