The Patterns Experience Evaluation Program

Klaus P. Jantke

Fraunhofer IDMT, Children's Media Dept.,
Hirschlachufer 7, 99084 Erfurt, Germany
e-mail: klaus.jantke@idmt.fraunhofer.de

Abstract. Patterns in the experience of game playing are key to understand the impact of digital games. The author's approach starts from a firmly based pattern concept which is introduced first. Next, the relevance of the concept is exemplified by means of a few digital games studies. Finally, after the concepts has been made clear and the occurrence of the concepts in practice has been demonstrated, the author's evaluation program is shortly layed out. This program shall be implemented in forthcoming experiments.

1 Formal Approaches Meet the Beauty of Media Experience

Understanding digital games comprises an understanding of fun when playing any game. To the design of serious games that work drastically better than what we have today, being in control of fun seems to be crucial. Raph Koster has identified patterns in the experience of game playing as a key to understand fun [1].

But is it realistic to approach the richness and beauty of media experience wielding formal tools? Classical music performance may serve as a truly challenging case (see [2] for a comprehensive treatment).

It is one of the greatest challenges to computer scientists to tell something essential–using their own concepts and terminology–to specialists of the performing or the virtual arts. Questions appear sometimes so easily: What makes the difference between piano play of Daniel Barenboim when compared to Mitsuko Uchida? Good question. But answers . . . ? Imagine computer scientists to be able to give at least some asnwer understandable, at least to some extent. What would be a criterion of success, a measure for the quality and sustainability of their answer?

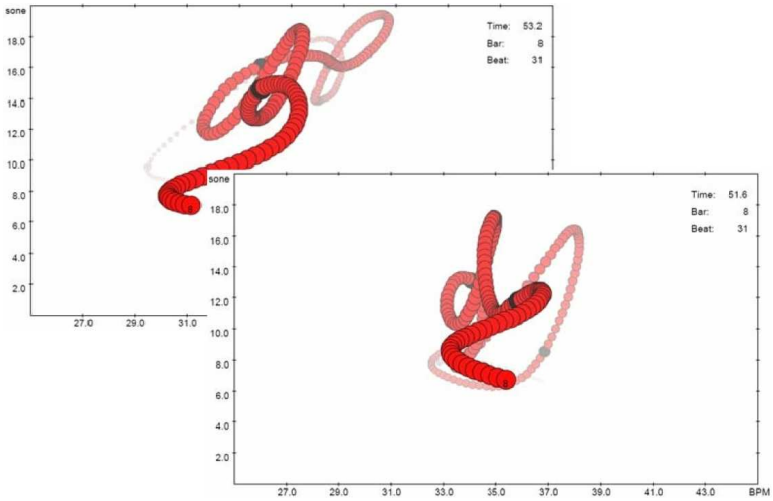

Fig. 1. Representation and Visualization Concepts of [3] – Worms of Performance

Clearly, they should demonstrate that their answer may be exploited somehow operationally. Suppose an answer is given, let's use it for the computerized control of a piano which plays more like Barenboim than like Uchida or vice versa. It works!

There has been found a rather simple descriptional language just using loudness and speed of play (measured in beats per minute) to describe game playing over time [3]. If the two parameters of loudness and speed are recorded and visualized in a 2-dimensional diagram, say by read dots, the progress over time shows as the movement of the dots. If dots stay for a while in the diagram, perhaps, just shrinking in size, the result looks like a worm moving through the 2-dimensional space.

When playing the same piece of music, Uchida's worm (in the left diagramm of figure 1) moves differently from Barenboim's worm (right in the front). Features such as bending and accelerations may be extracted and used for reproducing sound resembling a particular artist's play [2].

Now, that we have seen that it works for music, let's try it for digital game playing as well. In a recent application project with Ubisoft, patterns are investigated.

2 An Intuitive Approach to Patterns in a Study Experiment

The author has developed a particularly simple track game named Gorge which mostly serves as a research tool to study elementary problems of media impact. There are several dozens of slightly verying implementations for different purposes.

In Gorge, although the game is extremely simple, players may choose from a spectrum of tactics varying from an altruistic through a widely ignorant to an aggressive and defecting behavior. Non-player characters (NPCs, for short) may be tuned to the one or the other characteristics. When human players meet those NPCs, they experience quite different developments of stories during game play. In [4] there has been elaborated the hypothesis that setting appropriate characters of NPCs may trigger the emergence of substantially different stories. These authors' central hypothesis is: *Character is crucial to interactive storytelling.*

But how does it happen? Gorge serves as a tool to find answers by example. On the board, all players have to move from the start area close to the top to the end of track at the bottom of the window. There is a target area of 6 subsequent fields on which the score is the higher the closer the players are to the very end of the area. When players have rolled a dice, they may choose among their 4 pawns which one to move. A variety of conflicts may arise. The most interesting problem is to cross a gorge. Gorges can only be passed by one player's pawn, if another pawn stepped down into the gorge before. The precondition for the quite altruistic act of stepping down into a gorge is that two pawns meet immediately before the gorge to form what is called a roped party. One of them may climb down.

The game Gorge is currently in use within a series of qualitative research experiments[1] with subjects of an age ranging from 13 to 18. It was a first surprise that even 18 years old young male subjects used to play Counterstrike: Source found it interesting to play Gorge and to set up NPC characters to drive game playing experience.

The subjects implicitly identified patterns in game playing experiences and found it exciting to adjust NPC characters such that instances of patterns occur repeatedly.

These subjects have been slightly later introduced to the point & click adventure Secret Files: Tunguska (see below) in which they found instances of patterns self-reliantly.

The author's approach has been motivated by Bruce Philips call for concepts describing game playing experience [7].

[1] The author's experiments have been supported by his colleagues Swen Gaudl, Denise Lengyel, Melanie Meder, Alexandra Neumann, and Claudia Staats. The social-sciences grounding (see [5, 6], e.g.) of the experiments has been supervised by Imke Hoppe.

3 Introduction to Pattern Concepts of a Varying Generality

When you, in playing a digital game such as GORGE, repeatedly experience instances of a behavior such as [building a roped party] – [stepping into the gorge] – [passing the gorge], e.g., this results in a certain atmosphere of cooperation. Continuously struggling and fighting results in a different atmosphere. There are paramount cases in which the atmosphere perceived by a human player strongly correlates with the repeated appearance of some structural regularities of game play.

These structural regularities shall be called *patterns* and whatever we recognize of such a pattern is called an instance of this pattern. Note that you never see a pattern, you only see instances. And when you see an instance, it might be an instance of several different patterns.

There is a large variety of approaches to patterns in science and engineering [8, 9, 10, 1]. Very roughly speaking, patterns represent generalities of structures which may show in different instances differently. Therefore, scientific usage of the pattern idea requires structural representations [11].

What humans experience throughout media reception is highly individual, rarely explicit and typically not formal. Science always means abstraction [12]. The author's present research is based on hierarchically structured abstractions of the activities that take place when playing a digital game. There has been developed an original approach to patterns in game playing expressed in logical terms [13].

For more clarity, a few simple notions and notation will be introduced.

Assume we have a particular game under consideration. Whenever a reference is necessary, this game will be named G. In the most simple cases, there is a clearly distinguished set of actions that may be performed when playing the games. Those actions may be performed by a single player, by several players, or by the digital game, i.e. by a computer system. What is taken into account depends on the scientific interest driving our investigations. When a decision is made, M is used to denote the set of all considered actions-M is chosen as reference to the term "move"-in the game.

Playing a game means interacting intensively and extensively. One action follows the other. Abstracting from many details, one may represent game playing by sequences of actions from M. In theoretical computer science, it is common to denote the set of all possible finite sequences of elements from some set M by M^*. For theoretical reasons, the empty word ε is enclosed.

Given a game G and the actions M of interest, M^* is completely specified. But what is the game play we are interested in?

To keep it short and simple in the present publication, the concepts introduced focus mostly those games in which it makes sense to speak about a completed game play. This applies to most simulation and sports games, to all jump 'n' run games, to all point & click adventures, and to all games that tell a story. Some sequences of actions establish a completed game play whereas others do not.

Given a game G and the actions M of interest, the term $\Pi(G)$ denotes the subset of M^* of all those sequences that represent some completed game play, $\Pi(G) \subseteq M^*$.

$\Pi(G)$ consists of sequences of symbols from M. Every sequence $\pi \in \Pi(G)$ describes what happens during a particular game play. The choice of M reflects our decision about the granularity of game play descriptions. Two different sequences $\pi_1, \pi_2 \in \Pi(G)$ of game playing experience may describe game plays of different players or of one game player at different occasions. For interesting digital games, $\Pi(G)$ is usually infinite.

The conceptualization of this section provides a firm background of the present investigations in formal language theory [14]. The stage is set to see *patterns* as *properties of substrings* of a given string. Any string that has the corresponding property is called an *instance* of the pattern under consideration [13].

4 Patterns of Game Playing Experience – Search for Impact

Following Raph Koster's outline [1] based in his own game design practice, playability–surely a key issue of digital game design and development–depends on the player's ability to get the game mechanics under control. This means learning.

In the quite conventional, but rather fascinating point 'n' click adventure named Shadow of Destiny, your avatar is frequently stabbed to death or murdered in a different way. Successful game play includes learning of how to overcome these problems. There is a general pattern of problem solving: Travel back in time and remove necessary preconditions of your murder.

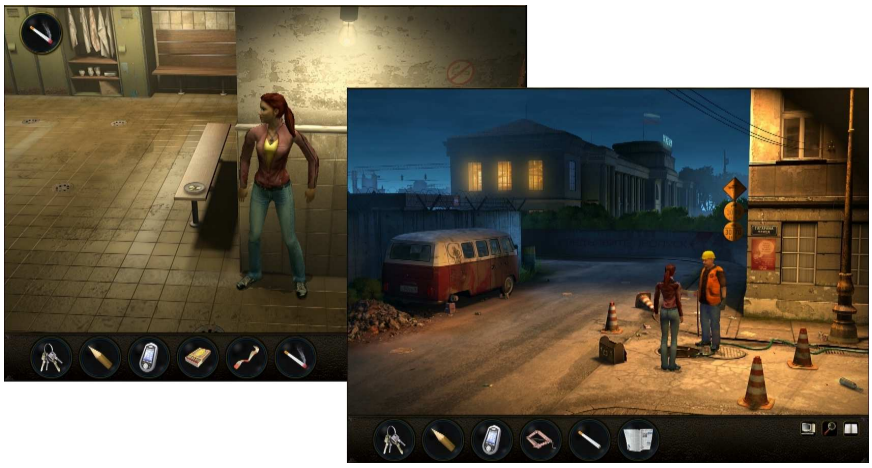

Fig. 2. Secret Files: Tunguska – Two Instances of a Game Play Dominating Pattern

In the game Secret Files: Tunguska you play the female avatar Nina seen in both screenshots of figure 2 above. Nina wants to find her father who somehow mysteriously disappeared. There are several obstacles on Nina's way. It turns out that there is a general pattern of overcoming these difficulties.

A first instance shows as follows. You have to go to some railway station which is heavily guarded. There is no way to get in. Next to the railway station you find a worker at a manhole (right screenshot in figure 2). Successful game play proceeds as follows: (i) You need to understand that you have to lure away this particular person. (ii) You need to gather some information that might be useful. (iii) You need to set a trap based on the information you could acquire. (iv) If you did well, the person is somehow brought out of your way. (v) You can proceed in game playing. In the particular case under consideration, you send Nina into the manhole.

Instances of this pattern show about a dozen times in Secret Files: Tunguska.

Anno 1404 is the newest game of the quite successful Anno series. It is highly complex and seems to rely on almost uncountably many patterns. A closer look reveals that there are already a few quite elementary patterns that may be crucial to the acceptance resp. rejection of the game by particular recipients.

In this strategic game your core activities are setting up and developing settlements as well as fighting battles; many of these activities are triggered by requests from persons who ask you for help. Everyone playing the game has to respond to those requirements, i.e. to get engaged in quests to solve them.

How do the quests, their occurence and their relative mutual positions influence the experience of game play? What about nesting vs. sequentiality? Is there an optimal or a maximal depth of nesting relevant to fun of playing the game? What about overlapping quests? Does overlapping confuse the players? Or is overlapping an indication of freedom to decide which of the problems to solve first?

Being in control of a game means, somehow, being able to answer those questions.

5 The Patterns Evaluation Problem in Playing Experience

Given any digital game, the study of the experience and perception of patterns in game playing is just one approach among many others.

Here is the core approach to the *evaluation of experiencing patterns*. We assume that a particular game G is given.

When we succeed in a process like the one on display on figure 3, we have–according to our notations and, in particular, according to the chosen level of granularity–found the occurrence of patterns in human game playing. Furthermore, we may have recorded game play (videos, e.g.) documenting the players' reaction to what happened in the game play itself. So, we are ready for an evaluation. The pre-evaluation process does provide the data.

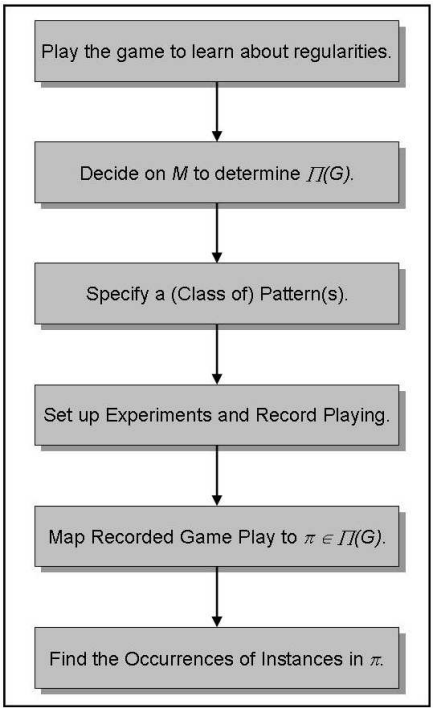

Fig. 3. Pre-Evaluation Process Model

Did the players recognize what we have considered to be the instance of a pattern? Did they perceive the pattern instances consciously? Did the players react to the occurrence? How did they react?

For particular classes of patterns and their instances, concerning violence, e.g., one may ask more specific questions.

Last but not least, there will be surely a need for feedback in the process of figure 3. In dependence on some outcomes of experiments, there may become explicit a need of changing the expressive tools such as M or the modification of the pattern(s) under consideration. It is an exciting problem in its own rights to find an appropriate level of abstraction supporting the current research interest in an optimal way.

To which of the problems under consideration are qualitative or quantitative methods appropriate? In which cases (in dependence on the game or independence on varying patterns for a fixed digital game) do we need a particular combination of qualitative and quantitative methods?

The author's *pattern experience evaluation program* is an attempt to systematize all the issues sketched above.

6 The Perspective of Learning and Knowledge Discovery

The few words in this closing chapter are surely going beyond the limits of the present publication. However, the author is finding it worth to widen the horizon and pointing to the quite enormous potentials of interdisciplinary communication and, perhaps, even cooperation.

Let us turn the perspective outlined above and let us drop the pre-evaluation process model on display in figure 3. Let us take, instead, a player-centered stand.

We are observing human game playing behavior, we are recording it in different forms such as log files or videos, e.g. From this source we extract effects and affects of interest–moments when the playing subjects are frightened or periods of playing time when they appeared particularly excited, concentrated or obviously bored, e.g.

Now we map the recorded game playing experience or, at least the parts of interest, to formal language representations over some alphabet M as done before. For certain effects of interest, we have–formally speaking–some recorded game play $\pi \in \Pi(G)$ in which we can mark certain substrings $\pi_1, \pi_2, \ldots \pi_n$ which are of potential interest. $\pi_1, \pi_2, \ldots \pi_n$ are hypothesized of being instances of a currently unknown pattern φ. It arises a pattern inference problem as studied in [9]. However, our underlying data are a bit more vague than in the cases studied by Dana Angluin. iven any of the instancesπ_i, we are not definitely sure about the begin and the end of π_i in π.

This difficult constellation does clearly call for the exploitation of knowledge discovery experience or, even better, for an in-depth cooperation with experts in the field of knowledge discovery.

7 Acknowledgement

The first version of the present manuscript has been submitted when the author has been visiting the Meme Media Lab. at the Hokkaido University Sapporo, Japan.

The present research and development has been partially supported by the Thuringian Ministry for Culture within the project iCycle under contract PE-004-2-1.

References

1. Koster, R.: A Theory of Fun for Game Design. Scottsdale, AZ, USA: Paraglyph Press, Inc. (2005)
2. Widmer, G.: In search of the Horowitz factor. In Lange, S., Satoh, K., Smith, C.H., eds.: Proceedings of the 5th International Conference on Discovery Science. Number 2534 in LNCS, Springer Verlag (2002) 13–21
3. Dix, S.: On the analysis of musical expression in audio signals. In Yeung, M.M.Y., Lienhart, R.W., Li, C.S., eds.: Storage and Retrieval for Media Databases 2003, SPIE - International Society for Optical Engine. (2003)
4. Gaudl, S., Jantke, K.P., Woelfert, C.: The good, the bad and the ugly: Short stories in short game play. In: Proceedings of the 2nd International Conference on Digital Storytelling. (2009)
5. Bosshart, L., Macconi, I.: Media entertainment. Communication Research & Trends **18** (1998) 3–8
6. Burkart, R.: Kommunikationswissenschaft: Grundlagen und Problemfelder; Umrisse einer interdisziplinären Sozialwissenschaft. Böhlau (2002)
7. Philips, B.: Talking about games experience – A view from the trenches. interactions (2006) 22
8. Alexander, C.: A The Timeless Way of Building. New York: Oxford University Press (1979)
9. Angluin, D.: Finding patterns common to a set of strings. J. Computer and Systems Science **21** (1980) 46–62
10. Björk, S., Holopainen, J.: Patterns in Game Design. Hingham, MA, USA: Charles River Media (2004)
11. Grünvogel, S.M.: Formal models and game design. Game Studies **5** (2005)
12. Popper, K.: Logik der Forschung. Tübingen (1934)
13. Jantke, K.P.: Patterns in Digital Game Playing Experience Revisited: Beiträge zum tieferen Verständnis des Begriffs Pattern. Diskussionsbeiträge 33, TU Ilmenau, Inst. Media & Comm.-Sci. (2008)
14. Hopcroft, J.E., Ullman, J.D.: Introduction to Automata Theory, Languages, and Computation. Addison-Wesley (1979)