Measuring the Degree of Immersion in Video Games

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In this short report I will describe and discuss how methodologies in studies of immersion in different kinds of media can potentially be used in video game research. It's interesting to investigate this topic since it may contribute to how games can be produced and designed to create a more atmospheric experience for players, and also because video game research is a relatively new field, this specific topic seems to be somewhat scarce.

The Way Films Feel: Aesthetic Features and Mood in Film

I will begin by examining the exploratory paper *"The Way Films Feel: Aesthetic Features and Mood in Film"* by Jussi Tarvainen and Pirkko Oittinen, which studies the immersion-aspect of filmmaking. The study investigates the relation between aesthetics and mood in film. Mood refers to the feeling created by the context and setting of the film. For example a loud sound in a comedy does not evoke the same feeling as a loud sound in a horror movie. This is because their settings and contexts are different. The term mood is also used interchangeably with "atmosphere" and "tone" and also refers to the overall feeling created by the media being used.

In the study they also describe how the evaluation of mood in film is currently lacking and mostly exists for other arts forms such as personal portraits and music. Similarly, I would say that it is also the case that video games in terms of evaluating mood are even more lacking, since it is an even more recent field than movies.

Methodology

The study formulates the following research questions:

- How are the aesthetic features of film related to one another?
- Which aesthetics features contribute to the three dimensions of film mood?

The researchers answered the first question by examining the interplay between low and high level aesthetic features, and for the second research question they examined how these aesthetic features contribute to film mood. They developed a hierarchical model based on aesthetics. Figure 1 illustrates the model.

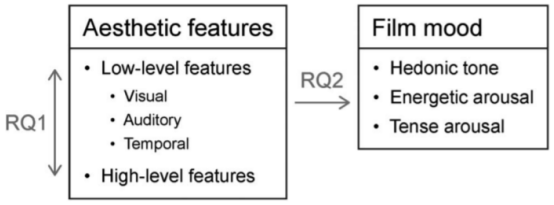

Figure 1. The conceptual framework of the study, including the scope of the two research questions (RQ1 and RQ2).

The researchers conducted a systematic study with 73 participants that were asked to watch clips from various movies. The participants were divided into two groups (A and B) in which each group watched seven clips ranging from 1 to 2.5 minutes long. The movies had different genres and were from varying years ranging from 1955 to 2009. (See Table 1 for more details).

Table 1
The Film Clips Used in the Study

#	Group	Viewing order	Movie title	Year	Timecode [h:mm:ss]	Length [m:ss]
1	A	1/7	Amelie	2001	2:00:35	1:36
2	A	2/7	Children of Men	2006	0:26:00	2:07
3	A	3/7	Before Sunrise	1995	1:31:57	2:33
4	A	4/7	Days of Heaven	1978	0:04:05	1:37
5	A	5/7	The Night of the Hunter	1955	0:56:30	1:58
6	A	6/7	The Good, the Bad, and the Ugly	1966	2:45:49	2:17
7	A	7/7	500 Days of Summer	2009	0:31:20	2:04
8	B	1/7	E.T.: The Extra-Terrestrial	1982	1:47:42	1:10
9	B	2/7	Army of Shadows	1969	0:38:40	1:54
10	B	3/7	Punch-Drunk Love	2002	1:06:30	1:16
11	B	4/7	The Shining	1980	0:34:59	1:56
12	B	5/7	Vertigo	1958	0:26:00	1:45
13	B	6/7	Blue Velvet	1986	1:55:32	2:21
14	B	7/7	Raiders of the Lost Ark	1981	0:07:45	2:09

Note. Timecodes are taken from NTSC DVD releases.

All sessions were conducted in a movie theater for the sake of ecological validity. The participants were asked to fill a background survey before the movie clips began to categorise them into an expert and non-export group in terms of filmmaking knowledge. The participants' personality traits were assessed using the Big Five inventory questionnaire, and initial mood was assessed using the 24-item UWIST mood adjective checklist. For the aesthetics, the participants ranked low-level aesthetics and high-level aesthetics (see Table 2).

Table 2
Internal Consistency Estimates of the Aesthetics and Mood Ratings

Rating	ICC	Rating	ICC
Low-level aesthetic features		High-level aesthetic features	
Visual		*Beautiful*	.36**
Bright	**.46****	*Ugly*	**.45****
Dark	**.60****	*Complex*	.28**
Colorful	**.44****	*Simple*	.31**
Colorless	.26**	*Familiar*	**.42****
Auditory		*Unfamiliar*	.32**
Loud	**.56****	*Interesting*	.12*
Quiet	**.46****	*Tiresome*	.10*
Dialogue-based	**.53****	*Pleasant*	.37**
Music-based	**.76****	*Unpleasant*	**.54****
Temporal		*Predictable*	.38**
Fast	**.64****	*Unpredictable*	.25**
Slow	**.53****	*Understandable*	.36**
Smooth	.08*	*Unclear*	.22**
Fitful		Film mood	
Rhythmic	.28**	Hedonic tone	**.78****
		Energetic arousal	**.60****
		Tense arousal	**.65****

Note. ICC = Intraclass Correlation Coefficient. Only correlations significant at $p < .01$ are listed. Correlations $\geq .40$ are in boldface.
* $p < .01$. ** $p < .001$.

The low-level features rated were:

- Brightness
- Colorfulness
- Loudness
- Fastness
- Smoothness

The high-level features rated were:

- Beauty
- Complexity
- Familiarity
- Interest
- Pleasantness
- Predictability
- Understandability

The ratings were done using a 1-5 scale. Finally, the analysis consisted of converting the ratings to a three-dimensional mood-rating scale. The three modes were hedonic tone (corresponds to valence), energetic arousal and tense arousal. Statistical tests were then used to produce the final results.

Discussion

It's important to note that the aesthetic features rated are mainly relevant for film but also other artforms in general. One could argue whether video games qualify as the "other artforms" mentioned, but considering how much more similar movies and games are in comparison to, for example, a painting and a movie, it is not inappropriate to make the assumption that these features could also be used in video games research. Alternatively, there may be other similar rating systems to determine mood for video games. Or, perhaps not, and it could be essential to develop such a system.

From a personal perspective, I see the possibility of using a similar methodology or approach to evaluate immersion in video games. Taking a similar approach to evaluate the mood in video-games could produce some interesting results. The methodology described seems applicable for the video-game medium.

More specifically, could the UWIST-approach be used for examining the degree of immersion in video games? To answer this question I briefly read through the original paper *"Refining the measurement of mood: The UWIST Mood Adjective Checklist"* from 1990. Firstly, I discovered that the UWIST framework was not specifically designed for films. The participants of that study were exposed to many different forms of stimuli such as medications and sleep deprivation, and seemed to have been conducted from a background in psychology. The only occurrence that film took part of the experiment was showing a film clip containing violence. Secondly, the study was conducted 1990, in which video games barely existed as a consumed form of media. In my opinion it would therefore be worth looking into alternative, more modern, frameworks for determining mood if the study was to be conducted for video games. Or, examine the UWIST framework in more detail to ensure its applicability.

The Impact of Visual Style on User Experience in Games

Secondly, I examined the paper *"The Impact of Visual Style on User Experience in Games"* by Nicoletta Adami. In the study, Adami examined memory-based experience from user-evaluated enjoyment, and moment-based experience from user-evaluated engagement (presence, immersion and flow).

Methodology

The following hypotheses were formulated:

- H01: The visual style of a video-game does not have an impact on player engagement.
- Ha1: The visual style of a video game does have an impact on player engagement.
- H02: The visual style of a video-game does not have an impact on player enjoyment.
- Ha2: The visual style of a video game does have an impact on player enjoyment.

Color and form were used as independent variables to determine the effect the visual style has on the player's experience (see Figure 1). Style A is perspective color, style B perspective monochrome, style C isometric color, and style D isometric monochrome. The game used was created by the authors for the purpose of this specific study.

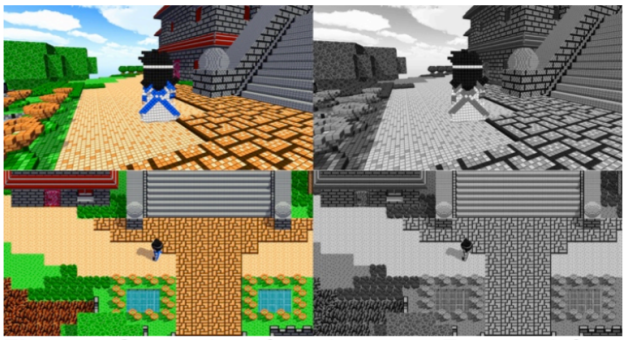

Figure 1. Screenshots from the game. From top left clockwise: Style A, Style B, Style C, and Style D

The study grouped the participants, who were informed of a game demo they would be playing and then asked them to fill out one survey for engagement and one for enjoyment. Three surveys were used as testing instruments.

- The first survey was designed to ensure the participant qualified (For example participants with visual hindrances, certain age, or lack of experience with video games were removed).
- The second survey was designed to evaluate engagement (moment-based experience), and used the Game Engagement Questionnaire (GEQ), which was used directly following the play session.
- The third survey was designed to evaluate the enjoyment of the whole experience (memory-based experience).
- Finally, statistical tests were used to test the hypotheses.

Discussion

The study focuses exclusively on investigating the impact of color and form on the players' user experience. For this report, the most interesting part to look into is the GEQ framework, since the first survey was simply a way to filter participant data, and the third survey did not use a specific framework to measure the enjoyment.

Engagement and immersion are in my opinion closely related, and arguably in some cases even refers to the same thing. It would thus be interesting to look at how the GEQ could be used in video game research to rate the degree of immersion.

I attempted to obtain the original paper *"The development of the Game Engagement Questionnaire: A measure of engagement in video-game playing"* in order to read about the GEQ framework in more detail, but was unable to get access to it. However, based on it's publicly available abstract session, it seems to be a very suitable candidate for reuse in future work.

It would be interesting to use the same methodology or a similar approach to investigate other visual aspects of games and measure engagement and enjoyment to determine a degree of immersion. For example, one area that I personally would like to investigate, using the methodology presented in this paper, is rigged versus hand drawn animation. The results from such a study could indicate if there is a difference in the degree of immersion players feel when playing a game that relies on rigged animations compared to a game that relies on hand drawn animations. In my opinion, I´ve always felt that rigged animations have a more "robotic" feel, while hand drawn animations have more "soul" behind them, thus the latter one creates a more immersive experience. A game, just like in this study, could be developed with different versions in which one uses rigged animations and one uses hand drawn animations. Surveys, the GEQ methodology and statistical tests could then be used in a similar manner. However, conducting such a study would require time and resources considering the amount of development required, but it is still certainly possible. If it ever was conducted, maybe I would find that rigged animations generate more immersion, and that my experience that hand-drawn animations create a more immersive experience is personal.

Even more possibilities exist. Allowing players to play an existing game with and without music and then using appropriate surveys and statistical tests, could indicate how much music contributes to the feeling of immersion in video games.

Out of the two papers that I explored, I think the GEQ-approach seems like a more attractive methodology because it is designed for video games, and because it can have it's independent variables easily swapped with other independent variables, as described above.

Use in existing GUX work

Both GEQ and UWIST could be potential candidates for the structuring of interview questions for our work in the Applied Games User Experience course. For our group, it is not the main objective to evaluate mood specifically. However, we are evaluating user experience in a more broad sense, and could benefit from drawing inspiration from GEQ and UWIST.

References

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