



UNIVERSITY
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USING PLAYER'S FACIAL EMOTIONAL EXPRESSIONS AS A GAME INPUT

Effects on Narrative Engagement

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Abstract

Even self generated facial expression could hypothetically affect emotional engagement in narrative and with it possibly even other aspects of narrative engagement. This thesis evaluates effects of using player's facial emotional expressions as a game decision input in a social situation on narrative engagement and its dimensions. To evaluate this, players' experiences from each of the versions of for this purpose developed game are collected, compared and analysed. The data collection is conducted through Busselle's and Bilandzic's (2009) narrative engagement scale, additional questions, observations and short interview with focus on characters and goals. Effects on narrative engagement couldn't be statistically proven. However, from the analysis was shown, that using player's facial emotional expressions as a game decision input in a social situation could possibly positively affect empathic engagement with characters and enjoyment.

Keywords: Affective Computing, Emotions, Facial Expressions, Games, Narrative Engagement, Empathy

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1 Introduction

Increasing engagement improves the feeling of being entertained and is sought after in games and narrative. Improving narrative engagement and its aspects can also be useful for achieving additional goals of the game and narrative, like learning (Morgan et al., 2009; Rowe et al., 2010), problem solving (Rowe et al., 2010), memorizing and recognition (Brechman, 2010), motivation (Jennett et al., 2008; Morgan et al., 2009) and persuasion (Busselle & Bilandzic, 2009; Green & Brock, 2000).

Emotion recognition by computers, an area of affective computing (Picard, 1995), have been developing in the recent years. The most common method to recognize emotions by computers is from facial expressions followed by procession of the voice (Koolagudi Koolagudi & Rao, 2012).

Altering and even self generating person's own facial expressions has an effect on their emotional experience (Adelmann & Zajonc, 1989; Kleinke et al., 1998). Emotional experience is connected to empathy and emotional involvement and through it to narrative engagement (Busselle & Bilandzic, 2009; De Graaf et al., 2009). Therefore, even self generated facial expressions should hypothetically affect emotional engagement in narrative and with it possibly even other aspects of narrative engagement.

This thesis study tries to evaluate effects of using player's facial emotional expressions as a game decision input in a social situation on narrative engagement and its dimensions. For this purpose a game with two versions is developed. One version uses an emotional facial expression recognition with use of Clmtrack library (Øygaard, 2013) as a main option selection tool. The other, control version of the game uses a manual selections instead. Players' experiences from these games are collected, compared and analysed. To assess the effects on narrative engagement, Busselle's and Bilandzic's (2009) questionnaire for measuring narrative engagement is used as the main tool. For a further analysis and finding possible dependencies additional data are collected from more questionnaire questions, observations, gameplay log and voice recorded interview focused on empathic engagement with characters.

2 Background

The aim of this thesis is to explore effects of using player's emotional facial expressions as a game input on engagement with game narrative. This chapter firstly describes the concept of emotions and studies that show effects of even self-generated facial expressions on emotional experiences. In the next section, narrative engagement will be closely introduced and examined. Subsequently, the focus will be moved towards concepts that could link the emotional expressions and narrative engagement; emotional involvement and empathy. At the end of this chapter, emotion recognition by computers will be discussed, including projects using emotion reading.

2.1 Emotions

Emotion could be described as any short mental experience with high intensity and high degree of pleasure or displeasure (Cabanac, 2002) and are affects of some stimuli (Boehner et al., 2007). Emotions play an essential role in rational human thinking, decision-making and creativity (Picard, 1995) and give humans the ability to influence others through their displays of emotions (Cote & Hideg, 2011).

Basic emotions are emotions that people can clearly distinguish between. Basic emotions are usually considered the followings: happiness, surprise, fear, sadness, anger, disgust and contempt, or contempt and disgust mixed together (Ekman, 1992).

To not interchange between emotions and moods and better understand them, some important differences and influences will be stated from Ekman (1994). Moods last longer than emotions. Threshold for stirring emotions is moved by moods. It's more difficult to control emotions if they occur during moods. Opposite to emotions, moods do not have their own unique facial expressions.

2.1.1 Effects of Self-generated Facial Expressions on Emotional Experiences

The close relation between facial expressions and emotional experience is already long recognized. For example Adelman and Zajonc (1989) showed, that the emotional experiences are modified when the facial expressions are altered. In their research, they proved, that there is positive association between the intensity of subjective experience of an emotion and facial expression of this specific emotion. Their results also indicates, that facially expressing emotions plays not only modulating function but also an initiating function in the experience of emotion, at least for subjective experience.

Nine years later, Kleinke, Peterson and Rutlege (1998) supported the theory that facial expressions can influence emotions in their research about "Effects of Self-Generated Facial Expressions on Mood¹". They conducted experiments, where participants were showed pictures of facial expressions and asked to either maintain neutral expression for 15 seconds or match their expressions for 15 seconds, with or without the help of a mirror. Their results showed that increased positive emotional experiences were reported when participants engaged in positive facial expressions and decreased when they engaged in negative facial

¹ Kleinke, Peterson and Rutlege (1998) in their research paper freely interchange between the terms "emotional experience" and "moods".

expressions. The effect was even stronger when participants observed themselves in a mirror during the experiment.

2.2 Narrative Engagement

Narrative engagement is the narrative experience as a whole and is seen as a multi-dimensional experience (Brechman, 2010; Busselle & Bilandzic, 2008; De Graaf et al., 2009). These dimensions of narrative engagement may be formed from elements of the conceptualizations of experiencing narrative (De Graaf et al., 2009).

In interacting with an environment, others or objects, people form mental models of themselves and the things they interact with. The purpose of these mental models is to comprehend and predict behaviour of the modelled systems (Norman, 1983). Mental models in narrative can be simply described as realization or representation of narrative in the minds of the individuals (Bower & Morrow, 1990; Busselle & Bilandzic, 2008). To comprehend the narrative, people in their minds construct models of meaning to represent the narrative and its components. The major parts of this internal representation firstly includes description of the characters, their traits and relations and secondly mental map of physical settings of the occurring situation (Bower & Morrow, 1990).

Taking an approach from mental model perspective, Busselle and Bilandzic (2009), explained constructs and measures, which are purposed to describe different aspects of experiencing a narrative. From these constructs and measures, they processed set of sensations that appeared most fundamental and develop a scale for measuring them. These aspects of experiencing narrative will be explained in following paragraphs.

Mental models offer a theoretical explanation for the process through which an audience member constructs meaning from a narrative, as well as the activity in which the audience member is engaged while doing so.

Busselle and Bilandzic (2008, p. 257)

Busselle and Bilandzic (2009) states, that to comprehend narrative individuals are required to locate themselves within the mental model of the story. Thus perspective taking is explained as one of the aspects used to describe narrative engagement. They further define parts of perspective taking as cognitive perspective taking, empathy and sympathy.

Another aspect that is presented as used to describe narrative engagement is flow and presence in narrative. Presence is defined as perceptual illusion of nonmediation (Lombard & Ditton, 1997), that is, when a person don't perceive the existence of a medium and directly responds to the mediated environment, involving real time responses of the human sensory, cognitive, and affective processing systems.

Flow is generally understood as a complete focus and immersion in a specific activity with a loss of awareness of time, self-consciousness and one's surroundings (Nakamura & Csikszentmihalyi, 2014). In narrative a person may experience losing awareness of one's surroundings by transportation or just imagining a fictional setting. Engagement in narrative may also outcome in loss of awareness of oneself. This can be explained as a result of identification or perspective taking. These actions, combined with a creation of an

alternative world, provides an explanation how the sense of narrative presence arises (Busselle & Bilandzic, 2009).

Based on mental models, Busselle and Bilandzic also suggested, that flow or transportation into narrative happens, when a person becomes completely focused on comprehending the story, that is creating and updating the mental models that represent it. One enters the state of flow only when able to maintain intense focus on the activity (Nakamura & Csikszentmihalyi, 2014), meaning one should find it easy to maintain focus on the story.

From their list of constructs and measures for describing aspects of narrative engagement, Busselle and Bilandzic identified ten potential dimensions of engagement; Empathy, Sympathy, Cognitive perspective taking, Loss of time, Loss of self-awareness, Narrative presence, Narrative involvement, Distraction, Ease of cognitive access and Narrative realism. After testing these dimensions while developing a scale for measuring narrative engagement, they identified final four; narrative understanding (ease in constructing models of meaning - lack of difficulty in comprehending), attentional focus, emotional engagement (combination of dimensions of sympathy and empathy) and narrative presence (sensation that one has left the actual world and entered the story). The final scale is presented in chapter 3.1.1.

2.3 Effects of Emotional Involvement and its Mechanism

Involvement is understood as a psychological state, which is experienced as a consequence of focusing one's attention and energy on a coherent set of stimuli or meaningfully related activities and events and depends on how much significance or meaning individual attaches to the stimuli, activities or events (Witmer & Singer, 1998).

In their experiments, Morgan, Movius & Cody (2009) have proven a hypothesis, that emotional involvement in narrative significantly influences learning and motivation. Jennett et al. (2008) also describes emotional involvement as one of factors that can influence person's motivation.

Zillmann (1995) states, the more the respondents are emotionally touched and taken in by dramatic events, the more likely they will introspectively appraise the drama experience as positive and enlightening. He explained emotional involvement with drama on the basis of empathic and counter-empathic reactions, which he linked to positive and negative affective dispositions respectively.

Both Zillmann (1995) and Lankoski (2011) link affective dispositions toward characters to empathic engagement and emotional involvement. According to Zillmann (1995), affective dispositions toward characters virtually control whether or not empathy occurs, or in fact, whether an empathic or counter-empathic response occurs. Lankoski (2011) also expressed the importance of affective dispositions in creating empathic engagement. In his study, Lankoski declared three prerequisites for empathic engagement with characters; recognition, alignment and allegiance. Allegiance was explained as how the characters bring out sympathy or antipathy in the observers based on a player's positive or negative evaluation of the characters.

Zillmann (1995) claims, the better the affective dispositions are developed, the stronger the emotional involvement will be. On the other hand, if people feel indifferent towards

characters, drama is bound to be emotionally flat. Empathic or counter-empathic reactions will not materialize and people will be unlikely considering themselves well entertained.

2.4 Empathy and its Importance

As Gerdes, Segal and Lietz (2010) stated, definitions of empathy have been semantically vague or confusing. With a result of greatly varied conceptualisation and measurement techniques from study to study.

In the broadest sense, empathy refers to the reactions of one being to the observed experiences of another, which of course includes variety of such reactions (Davis, 1983).

Later, Zillmann (1991) specified that it would be appropriate to understand empathy as an affective reaction that the reacting individual regards as produced by happenings to another person and/or by this another person's expressive and behavioural responses to these happenings. Here, empathy will be understood according to Zillmann's (1991, 2006) conceptualization of empathy.

Empathy, then, may be defined as any experience that is a response a) to information about circumstances presumed to cause acute emotions in another individual and/or; b) to the facial and bodily expression of emotional experiences of another individual and/or; c) to another individual's behaviour presumed to be precipitated by acute emotional experiences, that d) is associated with appreciable increase in excitation and that; e) the respondents construe feeling with or feeling for another individual.

Zillmann (1991, p. 141)

Part e) of the above stated conceptualization of empathy specifies, that the individuals must comprehend their reaction to emotions of others as an empathic one. Which, as Zillmann states, makes empathy contingent upon being noticeable in introspective evaluation.

Empathy is therefore viewed as a feeling state that is deemed to be brought on by observation of a fellow being in a specific situation. However, not all affective reactions can be considered as empathy. Logically, hedonically opposite affect to the observed one is unlikely to be constructed as "feeling with" or "feeling for" somebody; that is as empathic. Though it is still an affective reaction and, if hedonically opposite, could be described as counter-empathic (Zillmann, 1994).

Immersion is usually used to describe a degree of involvement with a game (Brown & Cairns, 2004; Jennett et al., 2008). Brown and Cairns (2004) additionally divided it into three levels; engagement, engrossment and total immersion. They also explained barriers that separate these levels and needs to be removed before to allow next level of involvement. One of the stated barriers for the last level, total immersion, was empathy.

Gamers who did not feel total immersion talked of lack of empathy and the transfer of consciousness.

Brown and Cairns (2004, p. 3)

Jennett et al. (2008) also suggests that emotional involvement appears to be a key factor in immersion. Qin et al. (2009) identified seven dimensions for measuring immersion in a computer game narrative; Curiosity, Concentration, Challenge and Skills, Control, Comprehension, Empathy, and Familiarity. So also in this study, empathy is chosen as one of the factor for measuring game immersion, as it reflects the influence on players after immersing into the narrative.

Zillmann (2006) considered the empathy pivotal to any interest in, and likely any gratification from, storytelling. He claims, that empathic engagement appear to be what fuels engagement in tales and that the interest in revelation of character's fate would be lost if we were not "lovingly disposed to care for them, or disposed by disdain to wish harm upon them".

Empathy is also considered to be a major component of identification, which is an imaginative process that results in assuming an identity, goals and perspective of a character (Cohen, 2001). Cohen named empathy as the first of four central dimensions of identification; by empathy he means sharing the feelings of the character, that is feeling the emotion not for the character but with the character.

2.5 Emotion Recognition by Computers

Affective computing is defined as a "computing that relates to, arises from, or influences emotions" as stated by (Picard, 1995). Making computers affective should provide better results in assisting humans and also might improve its abilities to make decisions. Some of the usage possibilities are for example in computer-assisted learning, human interaction and health or entertainment (Picard, 1995).

Affective computing have been mostly developing in the past years in the area of emotion recognition by computers. The most common methods for emotion recognition are from facial expressions followed by processing of voice (Koolagudi & Rao, 2012). Other methods are for example recognition from skin temperature variation from thermal image of a face by using an infrared camera (Yoshitomi et al., 2000; Kim, Bang & Kim, 2004), heart rate (Kim, Bang & Kim, 2004) or using EEG² signals (Lokannavar et al., 2015). Best results are usually achieved by using multiple methods together (Bahreini et al., 2016; Yoshitomi et al., 2000).

Even the most common type of emotion recognition, processing facial expressions and voice, is still currently not completely reliable. In the 2015 international emotion recognition challenge (Dhall et al., 2015) the best methods for emotion recognition from videos or images had accuracy around 50 or 60 percent respectively. At present time, emotion recognition is mostly used for collecting feedback for evaluation purposes, however its potential for computer assisted learning is being more and more notable (Bahreini et al., 2016; Sarrafzadeh et al., 2004).

2.5.1 Uses of Emotion Reading in Games

If uses for evaluation purposes are not counted, then the uses of emotion reading in games is mainly situated in the serious games area, more specifically for children education

²The recording of electrical activity on the scalp.

(Sarrafzadeh et al., 2004; Sarrafzadeh et al., 2006; Fourie et. al., 2014), to help children with autism (Cockburn et al., 2008, Schuller et al., 2013; Schuller et al., 2015) and "to make people smile" (Bernhaupt et al., 2007; Lankes et al., 2008). Emotion reading is also used to construct an adaptive gaming (Flying Mollusk, 2015; Sarrafzadeh et al., 2004; Sarrafzadeh et al., 2006; Fourie et. al., 2014) and occasionally as an enhancement in commercial games (Flying Mollusk, 2015; Game Freak, 2013). Short descriptions of these games and studies using facial emotional expressions follows.

Ability to identify and respond to affective cues of the student is an important factor for success of teaching, especially in one to one tutoring. With this in mind, Sarrafzadeh et al. (2004) started designing and developing tutoring system that uses its own facial expression analysis system to adapt to the emotional states of students just as human teachers would and a program for detection of facial expressions. In continuation of their study, Sarrafzadeh et al. (2006) presented fully developed affective tutoring system for primary school mathematics, Easy with Eve, and comprehensive research leading to its development, including an observational study of human tutors. The effectiveness of the affective tutoring system was evaluated in later study (Fourie et. al., 2014). Though, tests with different versions of program were conducted through pre-tests, post-tests and questionnaires, The result presented was only that, there was a significant overall increase in test scores between pre-tests and post-tests, more results will be hopefully presented in future papers.

SmileMaze (Cockburn et al., 2008) is a game with an aim to improve expression production skills of children with autism spectrum disorder. The player controls a pacman-like character with keyboard and uses facial expression of smile to move past obstacles within the maze. Though this study seemed focussed on the capabilities of their in-house expression reading and no evolution of effects was made.

ASC-Inclusion (Schuller et al., 2013; Schuller et al., 2015) is project that aims to help with social inclusion of children with autism spectrum conditions. The platform in development should help the children learn how emotions can be expressed and recognized through playing games in a comprehensive virtual world. In the paper from Schuller et al. (2013) is described progress in the development of the platform with most focus put on the design and development of technologies for analysing facial and vocal expressions and gestures of the players. In the continuation of the reports on the project's progress (Schuller et al., 2015) was furthermore conducted an evaluation of effects, with results indicating that children with autism spectrum conditions improved on emotion recognition and socialization through the use of the platform.

Emotional flowers (Bernhaupt et al., 2007) is a simple long term background game where players take care of a potted flower. It is meant to be played for example in workplace, where the player's expressions are scanned and evaluated in random time periods using third party facial expression reading program. The players' progress are displayed on ambient screen in some common place. The testing of the game had shown, that the game influenced emotional state of users during the game play but not overall mood. Another game from the same university, that also uses emotional expressions to take care of flowers is EmoFlowers (Lankes et al., 2008). This time a study was conducted in a shopping centre and revealed that interaction with a game through emotional expressions is perceived as natural, easy to learn and results in a positive user experience.

First found commercial use of recognition of facial expressions in games is Pokémon-Amie, part of newer Pokémon games (Game Freak, 2013) for the Nintendo 3DS. Pokémon-Amie let players interact and become friendlier with their pokémons through playing minigames. Sometimes the players can also interact with their pokémon by mirroring the pokémon's facial expression or head movement. Another found usage of emotion recognition in commercial games is Nevermind (Flying Mollusk, 2015). Nevermind is a horror game that uses third party emotion recognition from facial expressions and heart rate to adapt to the player's current emotional state. The game evaluates how stressed the player is and reacts to it as seen on Figure 1. Nevermind also supports eye-tracking to unlock some additional gameplay features. All of these adaptive features are not needed to play the game but can enhance the experience.



Figure 1 Effects of measured stress on the game Nevermind (from <http://nevermindgame.com/biofeedback/>)

3 Research Question

It is obvious that higher engagement is a sought after feature in games or narrative, but it is not only useful to improving the feeling of being entertained but also to improve effects of additional goals of the game or narrative, that is things like learning, motivation or story related beliefs. Increasing engagement positively influences problem solving and learning outcomes (Rowe et al., 2010). A better engagement in narrative improves the probability that a person will remember information from it (Brechman, 2010). Recognition, accessibility of information, is also positively associated with higher engagement, that is, information is more easily retrieved from memory if it is linked to a highly engaging moment (Brechman, 2010). Moreover, engagement positively correlates with agreement to the attitudes presented in the narrative (Busselle & Bilandzic, 2009; Green & Brock, 2000), especially its part, emotional engagement (Busselle & Bilandzic, 2009). It was shown that the emotional involvement in narrative also influences learning (Morgan et al., 2009) and furthermore motivation (Jennett et al., 2008; Morgan et al., 2009).

In the background chapter of this study was explained, that altering and even self generating person's own facial expressions has an effect on their emotional experience and emotional experience is connected to empathy, emotional involvement and with it to narrative engagement. Based on these factors, even self generated facial expression should hypothetically affect emotional engagement in narrative and with it possibly even other aspects of narrative engagement, since they influence each other. As was described here, engagement is important aspect not only influencing entertainment value of a game or narrative but also influencing learning outcomes of serious games and narrative. Therefore, the main research question of this paper is, finding out **if and how will using player's emotional facial expressions as a game decision input in a social situation affect narrative engagement**. The hypothesis is, that "there is difference in narrative engagement between group using their own emotional facial expressions as a game decision input in a social situation and between group that uses manual selection instead".

3.1 Method

To evaluate the effects of using player's emotional facial expressions as a game decision input in a social situation on narrative engagement, two versions of a game will be developed for this purpose. One version will be using an emotional facial expression recognition software as a main option selection tool. The other, control version of the game will use a manual selections instead. For this study, reading facial emotional expression by an using ordinary web camera was chosen. Web cameras are commonly present in majority of notebooks and also quite easily accessible for purchase for table computers, making it a practical technology to use for recognizing emotions and possibly enhancing games.

The games are further explained in chapter 5. Players' experiences from each games will be compared and analysed. To assess the effects on narrative engagement, Busselle's and Bilandzic's (2009) questionnaire for measuring narrative engagement will be used as the main tool. Complementary questionnaire will be assembled to gather more information. Both of the questionnaires will be answered on 7 point Likert scale. For a further analysis and finding possible dependencies additional data will be collected from observations, gameplay log and interview.

3.1.1 The Scale for Measuring Narrative Engagement

Busselle and Bilandzic (2009) developed scale for measuring narrative engagement. The process of development up to the final version of scale progressed through three stages with four different stimuli programs. There were total of 803 participants from two different countries (US and Germany). Four final dimensions of engagement were created from the initial ten and twelve question was left from the initial forty.

The final four dimensions of engagement that were identified are narrative understanding (ease in constructing models of meaning - lack of difficulty in comprehending), attentional focus, emotional engagement (feeling for and with characters) and narrative presence (sensation that one has left the actual world and entered the story).

The whole scale as presented by Busselle and Bilandzic (2009) is shown in Table 1. The Narrative engagement scale as a whole highly correlated with Green and Brock's (2000) transportation scale and Cohen's (2001) identification scale that were used to assess its ability. As was expected, the narrative engagement scale predicted enjoyment and story related attitudes. As the authors state, the scale can measure overall engagement in narrative or, by splitting into subscales, different aspects of narrative engagement can be measured to better understand what different stimuli in an experiment manipulate. This was also one of the main reasons for choosing this scale for this thesis study.

Table 1 Busselle's and Bilandzic's Narrative engagement scale

Narrative understanding (reverse coded)
1) At points, I had a hard time making sense of what was going on in the game.
2) My understanding of the characters is unclear.
3) I had a hard time recognizing the thread of the story.
Attentional focus (reverse coded)
4) I found my mind wandering while the game was on.
5) While the game was on I found myself thinking about other things.
6) I had a hard time keeping my mind on the game.
Narrative presence
7) During the game, my body was in the room, but my mind was inside the world created by the story.
8) The game created a new world, and then that world suddenly disappeared when the game ended.
9) At times during the game, the story world was closer to me than the real world.
Emotional engagement
10) The story affected me emotionally.
11) During the game, when a main character succeeded, I felt happy, and when they suffered in some way, I felt sad.
12) I felt sorry for some of the characters in the game.

3.1.2 Additional Data Collection

The final main questionnaire having only 12 items left practically possibility for adding more additional questions. These question were taken from Qin's et al. (2009), Jennet's et al. (2008) and Cohen's (2001) questionnaires and two other were added. These questions and their origin can be seen in Table 2.

Saved information from playthroughs will include how players progressed in the story, what emotions were scanned and what ending, including in-game stats, they had. These information will be used to find potential dependencies or problems with expression reading if needed.

Observations will be used to note players' reactions, how focused they seemed, how much time they spend on choices selection and to find out any problems or inconsistencies if they arose, either during the game or during the questionnaire. Facial expressions, emotion recognition software's tracking and questionnaire answering will be observed through secondary screen to not disturb the participant. Some follow up questions based on the observations will be asked in the interview if needed.

The short interview will be voice recorded and will focus on empathic engagement and overall emotional involvement with the game characters which, as was stated before, is what is expected to be affected foremost by using player's emotional facial expressions.

Table 2 Additional questionnaire

Question	Taken from
13) Parts of the story are formed by me in the course of playing the game.	Qin et al. (2009)
14) I can control the progress of the game story.	Qin et al. (2009)
15) My emotion often varies with the story's progress.	Qin et al. (2009)
16) I tend to understand the reasons why the Queen does what she does.	Cohen (2001)
17) I tend to understand the reasons why the Advisor does what he does.	Cohen (2001)
18) While playing the game I could feel the emotions the Queen portrayed.	Cohen (2001)
19) While playing the game I could feel the emotions the Messenger portrayed.	Cohen (2001)
20) Do you feel that your game avatar expressed your intended emotions properly?	none
21) Do you feel that your game avatar expressed what you wanted to say?	none
22) How much effort did you put into playing the game?	Jennett et al. (2008)
23) How much did you care what results your actions had during the game?	Jennett et al. (2008)
24) To what extent did you feel that the game was something you were experiencing, rather than something you were just doing?	Jennett et al. (2008)
25) How much would you say you enjoyed playing the game?	Jennett et al. (2008)

3.1.3 Ethical Considerations

Since human subjects are going to be tested, ethical considerations had to be regarded. This research follows recommendations from CODEX (2016), specifically guidelines about human subject research.

The participants will be in detail familiarized with the process of testing, what data will be collected, who is the researcher and that they can cease participation at any time. They will be also assured that all data will be anonymous. They will be given a consent form to sign with all important information.

Web camera will scan expressions of participants but none of this data will stored. Interviews will be voice recorded and participants will be asked for their agreement or disapproval right before the voice recording. They will also be assured that only principal researcher will have access to the recordings.

Though the research is experimenting around people's emotions, only mild natural reactions are expected. Participants will not be forced into any emotional reactions during the game and no drastic or shocking scenes will be included.

4 Recognizing Facial Expressions and Classifying Emotions - the Emotion Recognition Interface

In this research, the emotions will be classified from facial expressions. The facial expressions will be inputted through ordinary web camera and then tracked and evaluated. The chosen facial expression tracking and evaluation software of this research is an open source program, Clmtrackr (Øygard, 2013). Clmtrackr is a JavaScript library for fitting facial models to faces in videos or images, it tracks a face and outputs coordinates of important facial features, making it possible to analyse their shapes and positions. The program Clmtrackr was chosen based on personal recommendations and its type of free distribution. The Clmtrackr is distributed under the MIT License, meaning, it is allowed to use and change the software in any way while leaving a copyright notice inside.

Clmtrackr is primarily a face tracking system but it also includes an emotion evaluation tool. However, the state of its own emotion classification was not assessed as comprehensive and precise enough so it was slightly adjusted and tested before using it in the main games. The adjustment were redefining existing and defining new facial emotional expressions and their classification, including how a specific emotion was evaluated as a most present one in an individual. Best achievement was making “neutral” or “calm” emotion classification plus rough differencing between smile and laugh instead of only classifying as happy. As they are different possible meanings of expressions and they heavily depend on the situation (Boehner et al., 2007), ability to differentiate between smile and laugh should further help to better classify if a person for example has a sad smile or ironic laugh.

4.1 Testing and Evaluating the Emotion Recognition Interface

If an own personal testing in the process of redefining emotion evaluation and classification is not counted, another two tests were conducted before the main test and evaluation of emotion recognition interface. First was a simple emotion expression task game, where people were "communicating" with the program and proceeded only after showing a specific emotion. What was gained from this testing was first results of other people interacting with the emotion recognition system. Second test was more of a data collection where the people were provided helping stimuli and asked to simulate specific emotions and submit them to the program (they pressed any key when thought they were expressing the emotion correctly. This was a mostly failed attempt on finding common traits in specific emotions in the output from expression tracking.

The main testing of the interface consisted primarily of a multiple choice selection game based on emotional expressions, trying out the expression evaluation in real time, questionnaire and an observation. This testing was conducted to find out any problems, practical usability of the interface and opinions and ideas about usage of expression evaluation in games.

The main part of the testing was a very short text game where the players interacted with their fictional boss. The screenshots of this game can be seen in Figure 2. After some time they started reading the game text, their facial expression was scanned for a couple of seconds. They knew when they were scanned thanks to the green notice blinking at the top of the screen. Based on the evaluation of their expression the game wrote out an appropriate

response. This process was repeated four times and at the end resulted in one of the eight possible endings of the game. The final decision of which emotion was the player expressing in the game was decided by evaluation the current emotional expression couple of times during a specific time period and then selecting the most frequent result. This has proven itself as more reliable than only by one time evaluation.

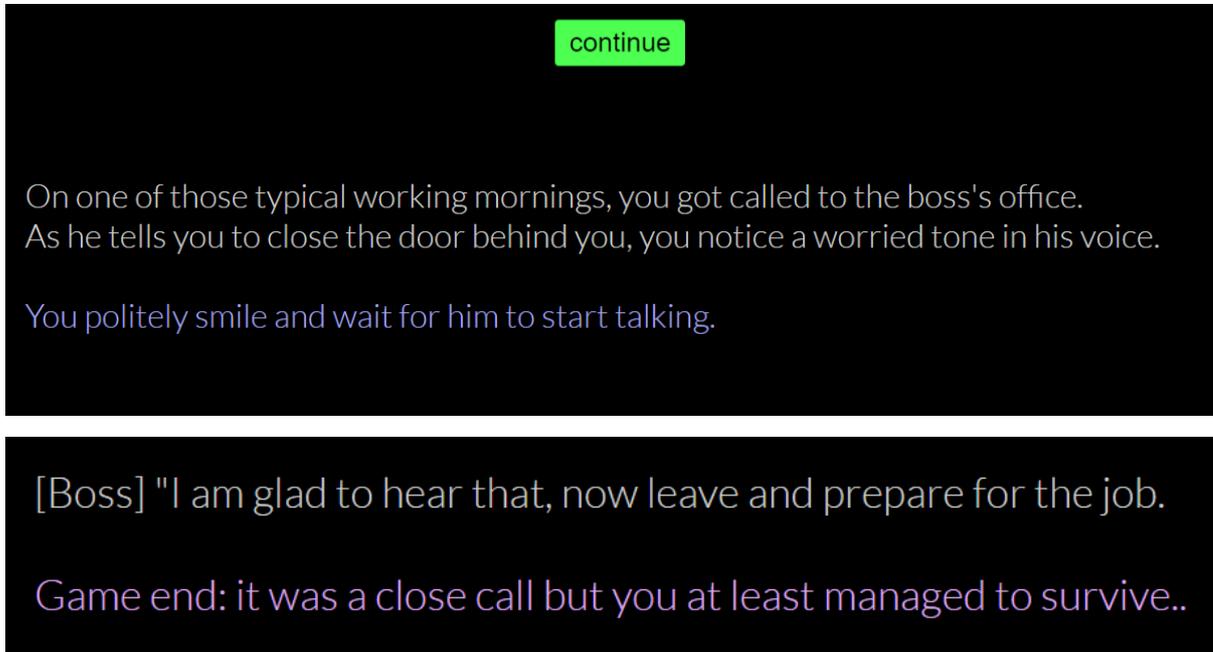


Figure 2 Examples of the tested game

There were 8 participants in the main testing of the interface. The collection of data consisted of saved results from play-throughs, interview, questionnaire and observations. The short interview that was conducted at the end of the testing was mostly for ideas and additional opinions about the expression evaluation. The observation was conducted thanks to being in the same room and also, more importantly, observing people's face tracking and evaluation on an additional screen. The questionnaire was filled in-between and after the experiments and consisted of nine questions, which were answered on a 7 point scale. The questionnaire and its results in form of mean and standard deviation can be seen in Table 3.

Based on the log of the program and the observations, main results for the quality of reading of the specific emotions were that the happy emotion evaluation was really good, even the additional categories of smile and laugh. The "emotional" state calm, which was chosen if levels of other emotions were low enough, worked quite nicely. The angry expression was the most problematic even though sad/worried expression was expected to be more. Based on the observations the problems with angry expression were probably mostly caused by specific shapes of eyebrows, problems with expressing anger and because of the tilt of the head to the screen.

The tests showed that people were interested in using facial emotional expression in games and overall the evaluation method showed itself as useable even in its current state. However, from observations and some answers, quite large differences in the facial expression recognition capability were noticeable between some participants and for some of them the recognition was almost unusable. Therefore, for better capability, some additional

adjustments were made before using the emotion recognition interface in the main game of this research. This includes a further calibration of choosing the most dominant emotion and option to easily change weight of expressions for individual participants.

Table 3 The questionnaire used during the testing of the emotion recognition

Question	Mean	Std.
1) How confusing was using your facial expressions to interact with the game?	3,875	2,416
2) Do you think the program recognized your expression correctly?	5	1,773
Now the participant were shown how the program actually evaluated their expressions.		
3) After you have seen the evaluations, how would you overall rate the programs recognition capability?	5,25	1,909
4) Does using your facial expressions to interact with game seem like a fun to you?	6,75	0,463
5) Would you be interested in playing games that react to your facial expressions?	6,125	1,458
6) Do you think you would enjoy playing a whole game only with facial expressions?	3,625	1,302
7) If there is a possibility that, the expression recognition could be inaccurate, should it still be used to make important decisions in game or only as an additional feature? (For example for only changing character's reactions.)	3,625	1,598
Here the participants tried the evaluation of their expressions in real time.		
8) After you have tried the expression evaluation in real time, wow easy was it to simulate the expressions you wanted to show?	4,375	1,302
9) And how would you overall rate the program's evaluation accuracy?	5,25	1,581

5 The Game

A game, specifically two versions of a game were developed for the purpose of evaluating effects of using emotional expression as a game input on narrative engagement. The game itself is implemented using HTML5 standard with mostly the use of JavaScript language. For the facial expression recognition, Clmtrackr library is used. Based on its testing in previous chapter, adjustments of its emotion classification were made. In the first section of this chapter the game will be further described. The second section will explain reasons behind specific parts of the game.

5.1 The Gameplay

The type of the game is a simple RPG (Role-playing game), a game where player takes on role of a character inside a narrative universe. The game has a "theatre" dialog like story progress, where player interacts with the game by selecting how and what is his character going to say from multiple choice options. The game consists of five short chapters and three graphically expressed characters. The story itself is set in a fictional medieval world best described with the game's prologue:

"This story is set in a royal castle of a small Kingdom.

This Kingdom is in horrible state after a recent lost war to an enemy Empire, that now demands war tributes.

However, the royal castle is in even worse state, the Prince was killed in a battle, the Princess was taken as a trophy and the King was executed as the tradition of the conqueror dictates.

Now, only the Queen remains as the ruler. The hopeless Queen full of sadness and hate."

"You play as a royal messenger and as one of the last people who the Queen don't refuse to talk with.

Your current most important task is to pass information between the Queen and old royal Advisor, who is in contact with the enemy Empire."

The game has three specific characters; the Messenger - the player's character, the Queen - with whom can the player interact through the messenger and the Advisor - who doesn't have any game changing interaction and is included for other purposes. A short summary of the story's gameplay can be read in the Appendix A -

The chapters with the Queen have the interactive parts that decide the progress. There the player is given a choice of what emotion does he want to express his next sentences with. In the control version of the game, this is done by clicking on chosen description of emotion as seen in Figure 3. In the expression using group chosen emotion is decided by scanning the player's facial expression after clicking on option "Face the Queen. After a specific emotion is chosen, a player will be in most cases given a selection of options to say based on the chosen emotion, as seen in Figure 3. Couple of time a corresponding response will be displayed right away, in these cases the game explains beforehand what is the character going to say and only how is it delivered changes is changes. Furthermore, even expression using group knows the possible emotional choices.

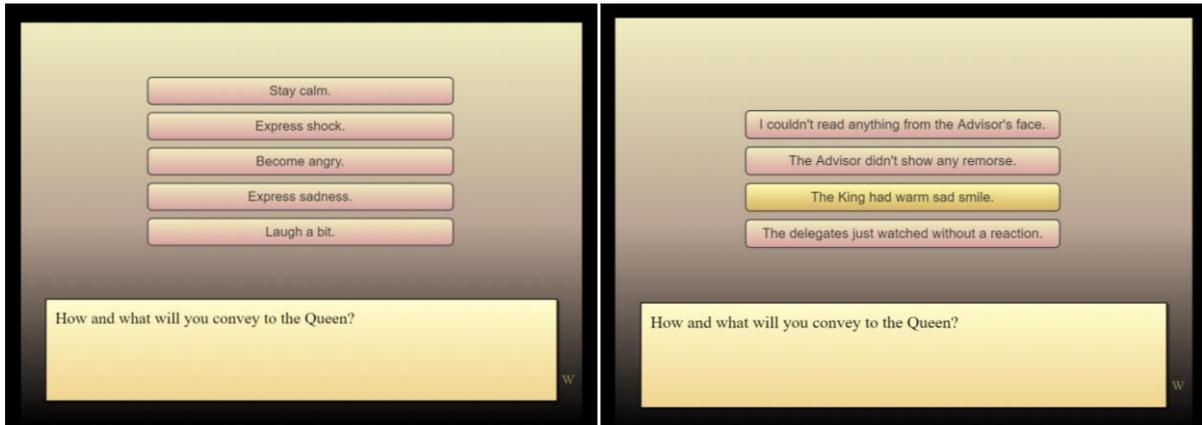


Figure 3 Manual selection of emotions and given options based on chosen expression

The chapters with the Advisor play a descriptive role only and not alter the game progress. In the version with emotion reading, the player's emotions will be sometimes secretly scanned and the Advisor will shortly react to their specific emotions. This however does not change anything else in the game. In the version without the emotion reading, these parts are completely un-interactive but with same length and content, since an originally prepared Advisor's reaction is displayed instead.

All of the characters have different facial emotional expressions which are displayed based on the current situation. The Queen and the Advisor have around ten expressions. The player's character, the Messenger can use more than twenty and their use depends on both the emotional choice and the actual chosen and written text. Examples of these expressions can be seen in Figure 4, Figure 5 and Figure 6.

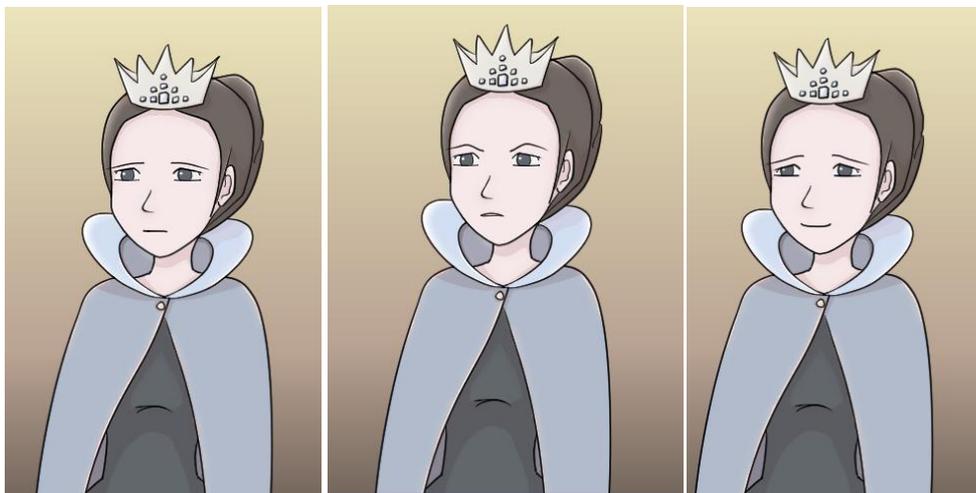


Figure 4 Examples of the Queen's expressions

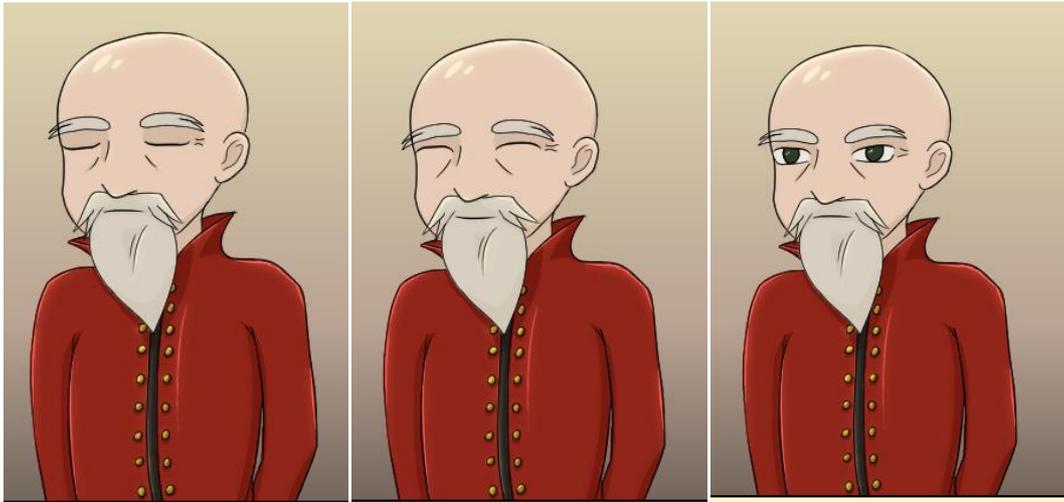


Figure 5 Examples of the Advisor's expressions

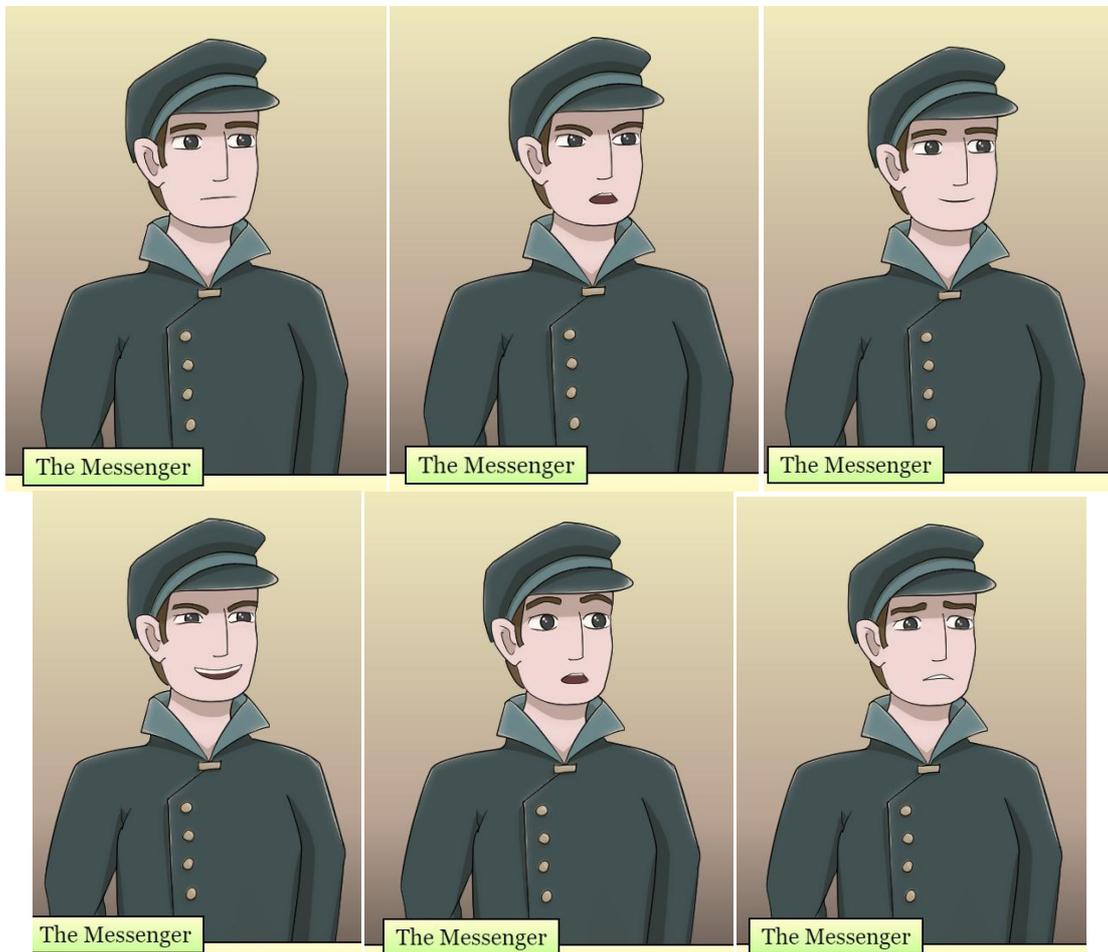


Figure 6 Examples of the Messenger's expressions

5.2 Design of the Game for the Evaluation Purpose

Same as some of the other uses of emotional expressions for game interaction (Game Freak, 2013; Flying Mollusk, 2015; Sarrafzadeh et al., 2004; Sarrafzadeh et al., 2006; Fourie et. al., 2014), this thesis's game lets the player use their emotional expressions to interact with the

game in a natural way, simulating real uses of emotional expressions. Specifically this thesis study assume, that using emotional expression in natural way should have largest effects on player's emotional involvement and since the focus here is on predicted effects on engagement with narrative and characters, the emotional expressions are used for communication in social situations.

This study hypothesizes, that using player's own facial expression in social situation will have an effect on empathy and with it to narrative engagement. To evaluate this, RPG type of game was chosen. As this study, RPG focuses on characters and narrative, furthermore the player, in a role of one of the characters, can usually communicate with other characters and often make decisions through it. So, since for this study is needed to use the emotional facial expressions in a natural situation, using it to influence communication in a social situation, a frequent feature of RPGs, was chosen together with this game gender.

There is a lot of possibilities of using emotional facial expressions as a narrative input. For example choices in a story made only by expressions, unlocking paths by specific expressions, different behaviour of NPCs based on player's expression or probability of success based on player's emotional state. However, since another version of the game had to be made, where emotional facial expressions won't be used as an input, usage of the emotional input that would be easily convertible to a normal version without limiting the playability of the game had to be decided upon. Additionally, abilities and competence of the emotion recognition software also influenced the game possibilities and its implementation.

With these limitations in mind, player's facial emotional expressions were used to decide, which choices will be given rather than using the expressions as an only input. In both versions of the game, the players don't know what results will their chosen emotion have, they are just choosing an emotion, that are they are going to convey their next opinion or information with. Additionally, in the main gameplay, the player decides upon what emotions to express rather than computer secretly scanning his naturally expressed emotions, this was also to make it be easily convertible to the additional, non-emotion reading, version of the game and also because the expression recognition software would be even less efficient with evaluation of small changes in natural expressions.

Since the testing is mainly oriented towards the characters and narrative, the game also revolves around its story and characters and focuses on social interactions with them. Focus on social interactions and expressions of the characters could also help to prime empathic engagement with them (Lankoski, 2011).

The player's choices in the game have effect on the immediate responses, overall game progress and ending, however it was tried to make the experiences as similar as possible and the epilogues should end in the same way, not leaving fundamental differences in character comprehension.

To make the players perceive the characters as same as possible the characters are graphically expressed. Otherwise a long description of the characters would be needed so the imagination of the players wouldn't create excessively different images of the characters, which could have a large effect on their evaluation of them. Furthermore, to be perceived as same as possible by all of the players, the characters and story were chosen and drawn to be ordinary and simple to understand. For this purpose also, the characters were made not to

be controversial or romantically interesting. Also no names were included, which made the orientation in the story simple.

Displaying the characters has also allowed changing and showing their emotional expressions accordingly. This in turn not only could make perception of characters' emotions more similar but also improve chances of empathic engagement.

Different possible meanings of expressions, as talked about by Boehner et al. (2007), were as well taken in consideration. Specifically in having the option of choosing from given responses/opinions and showing different expressions of the player's character, depending on what the corresponding chosen text is. That is, for example a scanned smile can express happiness, politeness or irony depending on situation or an angry expression can mean either rage or just imply seriousness. Descriptions of the manual versions of emotion choices also depended on the occasion.

6 Results and Analysis

The aim of this study was to find out how using player's emotional facial expressions as a game decision input in a social situation affects narrative engagement. To evaluate this, players' experiences from each of the versions of for this purpose developed game were collected, compared and analysed. This chapter firstly describes the participants and the process of the testing. In the second section, results from the standardized narrative engagement questionnaire are presented and quantitatively assed. The last section presents the results from additional data collection and its content analysis.

6.1 Participants and the Testing Process

Around 20 people positively responded to the request for participating in the testing, however only total of 16 actually participated. The average age of the 16 participants was 27, with almost all of them between 22-36 years old. Most of the participants were from different parts of Europe, with the biggest group from Czech (4), there was also a fairly large percentage of participants from South Korea (4). The participants were divided into two groups of eight to test one of the game versions each. The expression using group had three males and five females testers and the control version had even distribution of genders. The distribution of participants into the testing group was done with the aim to balance genders in both groups but was largely influenced by the expression recognition software's capability to recognize facial features of the individual participants. This capability was only dependant on external facial features such as beards or unusual eyebrows' shapes or needed thick rimmed glasses. This means, that this influence was not in any way related to the participants ability to display emotions which could influence the results.

The testing procedure of an individual participant took place as follows. Firstly he/she was given the consent form to read and sign with additional verbal explanation of the game and data collection. Then the subject was seated in the well lit room in front of the laptop with the game's emotional recognition preparation screen. There they tried to simulate some expressions with possible recognition adjustments. After that, the participant was assigned to a specific game version based on the program's recognition capability and need for balance of subjects. The game itself was started once a brief explanation of the gameplay was given. Throughout the process of playing, the subject's behaviour and verbal reactions were observed in person. Additionally participant's facial reactions and program's expression evaluation and tracking capability were observed on the secondary screen as described in chapter 4.1. After the game, participant was given a computer based questionnaire to answer and the testing ended with a short voice recorded interview.

The data collected from the testing therefore consisted of two filled questionnaires, records of interviews, notes from observations and gameplay log.

6.2 Narrative Engagement

To evaluate if using player's emotional facial expressions as a game decision input in a social situation have significant effect on narrative engagement, players' experiences of two versions of the developed game were compared using Busselle's and Bilandzic's (2009) questionnaire for measuring narrative engagement. First of the compared versions of the game used an emotional facial expression recognition software as a main option selection tool and the other, the control version of the game, used a manual option selections instead. The narrative engagement questionnaire was answered by participants right after finishing the game and thus wasn't affected by other questions or interview.

The main hypothesis of this study is that there is a difference in narrative engagement between group using their own emotional facial expressions as a game decision input in a social situation and group that uses manual selection instead. The Null hypothesis that this research will try to quantitatively reject by using Busselle's and Bilandzic's (2009) narrative engagement scale therefore is:

"There is no difference in narrative engagement between group using their own emotional facial expressions as a game decision input in a social situation and group that uses manual selection instead."

Since most of the data are not normally distributed, Mann-Whitney U test, which doesn't presume any assumptions related to the distribution, was chosen to test of significance. Chosen significance level is 5%, which means the p-value from testing the samples needs to be less than 0.05 to reject the null hypothesis.

In the Table 4 are results from the Narrative engagement scale. The questionnaire was answered on 7 point Likert scale, with 7 being the strongest form of agreement and 1 disagreement. Presented are Mean and standard deviation for both groups independently and how statistically significant are the differences between them in the overall narrative engagement and its dimensions. Higher means between the two groups are highlighted in bold. Answers from the first two dimensions were reverse coded before the calculations.

As seen in the Table 4, the p-value for comparing the levels of narrative engagement is circa 0.87 which is far from the chosen level of significance of 5% ($p < 0.05$), therefore the null hypothesis could not be rejected. Moreover, no statistically significant difference could be found in any of the subscales or in the questions themselves. However, it is worth mentioning, that narrative understanding and attentional focus are slightly higher for the control group and opposite to that, narrative presence and emotional engagement are even bit more higher for the expressions using group. This was more explored and explained thanks to the analysis of the observations and interview.

Table 4 Results from the Narrative engagement scale

Narrative engagement	Control group		Expression using group		Test of significance
	mean	std	mean	std	p-value
Narrative understanding (reverse coded)	6	1.584	5.708	1.201	0.497
1) At points, I had a hard time making sense of what was going on in the game.	6	1.773	5.625	1.685	
2) My understanding of the characters is unclear.	6	1.414	5.875	1.356	
3) I had a hard time recognizing the thread of the story.	6	1.690	5.625	1.061	
Attentional focus (reverse coded)	6.125	0.775	5.792	1.023	0.711
4) I found my mind wandering while the game was on.	6.25	0.886	4.875	1.727	
5) While the game was on I found myself thinking about other things.	6.125	0.835	6	1.414	
6) I had a hard time keeping my mind on the game.	6	1.309	6.5	0.535	
Narrative presence	3.375	1.713	4.167	1.309	0.373
7) During the game, my body was in the room, but my mind was inside the world created by the story.	4	1.927	3.625	2.134	
8) The game created a new world, and then that world suddenly disappeared when the game ended.	3.375	2.066	4.75	1.669	
9) At times during the game, the story world was closer to me than the real world.	2.75	1.832	4.125	1.126	
Emotional engagement	4	1.902	4.625	1.578	0.472
10) The story affected me emotionally.	4.125	1.959	4.5	1.604	
11) During the game, when a main character succeeded, I felt happy, and when they suffered in some way, I felt sad.	4.25	1.982	4.875	1.642	
12) I felt sorry for some of the characters in the game.	3.625	2.669	4.5	2.204	
Narrative engagement	4.875	1.150	5.073	0.767	0.873

6.3 Analysis

Data for additional analysis were collected in a form of answers from the second questionnaire, notes from observations and voice recorded interview. Some data were also collected from the game's log, but no interesting dependencies concerning the area of research were found from it. Out of the four possible endings, almost all of the people got the same one. This, based on observations and interviews, was probably being caused by people wanting to convey information without any prettifying it to ease relations between Queen and other entities in the game. However, almost people getting the same ending means, different endings didn't have effect on evaluation. Other information gotten from the game's log was frequently was specific emotional expressions scanned. Calm state was the most used expression and sad expression was the second. The majority of people also expressed anger or disgust at some point, but not frequently. Surprised expression was used couple of times but happy only by one person. Unfortunately, it was accidentally forgotten to output in the game's log, what expressions the control group choose, which could be interesting to compare for differences.

Table 5 Results from the additional questions

Question	Control group		Expression using group		Test of significance
	mean	std	mean	std	p-value
13) Parts of the story are formed by me in the course of playing the game.	4.75	1.282	5	1.414	0.529
14) I can control the progress of the game story.	4.5	1.309	5.25	1.165	0.208
15) My emotion often varies with the story's progress.	3.75	2.252	4.375	1.408	0.711
16) I tend to understand the reasons why the Queen does what she does.	5.25	2.188	5.25	1.488	0.795
17) I tend to understand the reasons why the Advisor does what he does.	3.875	2.357	4.75	1.581	0.497
18) While playing the game I could feel the emotions the Queen portrayed.	3.875	2.167	5.25	1.165	0.226
19) While playing the game I could feel the emotions the Messenger portrayed.	3.625	1.685	5.375	1.302	0.093
20) Do you feel that your game avatar expressed your intended emotions properly?	4.75	2.053	4.625	1.188	0.749
21) Do you feel that your game avatar expressed what you wanted to say?	4.5	1.927	4.75	1.035	0.960
22) How much effort did you put into playing the game?	4.625	1.302	5.25	1.488	0.430
23) How much did you care what results your actions had during the game?	4.429	1.718	5	0.756	0.772
24) To what extent did you feel that the game was something you were experiencing, rather than something you were just doing?	4.125	1.727	5.25	0.707	0.208
25) How much would you say you enjoyed playing the game?	4.875	0.641	6.125	0.991	0.032

The results from the questionnaire were processed in the same as the results from the Narrative engagement scale and are shown in the Table 5. The questionnaire was again answered on 7 point Likert scale, with 7 being the strongest form of agreement and 1 disagreement. The results significantly differ only in the last question about enjoyment; the difference of self reported enjoyment between the groups was statistically significant and higher for the expression using group. This shows a possibility that enjoyment is positively affected by using facial emotional expressions as a game input. However the enjoyment could also be influenced from the novelty of the experience or other, though minimal, differences between the game versions or groups.

The difference in the question 19 about being able to feel Messenger's portrayed emotion was not proven statistically significant by this testing, nevertheless the difference is fairly substantial, especially since the difference is visible even in such small amount of samples and more importantly corresponds with the analysis from the interview.

Qualitative data were gathered from observations and interviews. The observations were used to note players' reactions and behaviour during the testing process. The short interview, which concluded the testing, consisted of prepared open questions and complimentary follow up questions. The interview was voice recorded and thus allowed for more precise evaluation, including the emotional voice intonation. The participants were firstly asked how they would describe the Queen and how they felt about her and her behaviour, which was followed by the same questions about the Advisor. Then they were asked what they thought about the character they played as, the Messenger. Last question was their goal was, if they had any, what they wanted to achieve and based on what did they select the choices they selected.

The interview was processed into notes and combined with notes from the observations and the content analysis was made through them. First part of the analysis was inductive, looking for emerging patterns and themes, during this part the notes were repeatedly updated to help confirm or rejects the findings. Second part of the analysis was deductive, hypothesizing relations between the found concepts and possible explanation for them. In the following paragraphs are presented the findings from the content analysis.

People in the control group questioned the behaviour of the characters considerably more that people in the expression using group. By questioning is meant, rather than having just positive or negative opinion about the character, evaluating them and mentioning any inconsistencies. For example with the Advisor some people expressed with annoyance and confusion that he should have told the truth sooner. With the Queen people were pointing out that she is childish or "absolutely stupid" and should have cooperated rather than always saying no. One person also said about her: "Maybe I am a little bit confused about her behaviour, because I couldn't really see what she was trying to reach." And regarding the Messenger some people didn't understand why he was there, that he had too much power for a messenger or pointed out that his behaviour seemed incoherent with what they had in mind for him. Most of these actions could be considered as counterarguing with attitudes presented in the story and this counterarguing should have been minimised if the subjects were highly absorbed in the narrative (Green and Brock, 2000; Slater & Rouner, 2002) or if identification with the characters happened (Slater & Rouner, 2002).

The questioning of the characters could also be related to the finding, that the people in the control group were overall more goal oriented during their gameplay. All but one person in the control group had a clear goal they based their decisions on the other hand half of the expression using group didn't set up their goal at all and either decided based on how they felt at the moment or just delivered the messages as neutrally as they could.

Concerning the attachment and empathic engagement with the characters, overall the people in expression using group seemed to have visibly more emotionally colored voice when answering the interview questions about the characters. Based on what they said and how emotionally they said it, three people from the expression using group and one person from the control group seemed to have formed a strong empathic connection with the Queen. They conveyed that they felt with her situation and understood her and her actions. The opinions about the Advisor were generally negative, but somewhat understood at the end with some negative extremes like "I still don't believe him" or "I wanted him executed before" on both sides. Though some rather positive opinion about him could be found from a few people in the expression using group like "he did his job very well" or "I believed in him".

Quite large difference between the groups was in the speech about the Messenger, the character they played as. The messenger's evaluation by the control group was overall fairly distant without assigning him any personality or feelings. Opposite to the control group, most of the expression using group projected their play-style and their own feelings on the player's character which influenced the perceived personality of the character. They described him for example with words; "he felt worthless", "he was kind of objective", "he was neutral" or "he did everything for the Queen". Overall, the expression using group perceived the Messenger positively and even indicated some degree of identification. Their description of the Messenger's goals and feeling towards other characters usually corresponded with the players' description of their own goals and feeling towards other characters. This correlates with Cohen's (2011) definition of identification; "adopting the goals, feelings, or thoughts imagined to be those of the target of our identification". These results corresponds with the answers to question 19: "While playing the game I could feel the emotions the Messenger portrayed." and together with the control group's counterarguing with attitudes presented in the story points out at the possibility, that using player's emotional facial expressions could indeed positively influence empathy and moreover even identification.

7 Conclusions

Based on the hypothesis derived from the background research, that even self generated facial expression should affect emotional engagement in narrative and with it possibly even other aspects of narrative engagement, this thesis study tried to evaluate effects of using player's facial emotional expression as a game decision input in a social situation on narrative engagement and its dimensions. The evaluation was conducted by collecting, comparing and analysing players' experiences from two versions of for this purpose developed game. The developed game was a simple RPG focused on characters and narrative. The player interacted with the game by choosing what to say in conversation from multiple given choices. In one version of the game, player also manually choose with what emotion does he/she want to express his next chosen sentence with. In the other version, player made this selection through his/her own facial emotional expression. Players' experiences from these game versions were collected through two questionnaires, observations, gameplay log and voice recorded interview. The questionnaires were assessed through Mann-Whitney U test and content analysis were made upon the rest of the collected data.

The main evaluated hypothesis of this study was that there is a difference in narrative engagement between group using their own emotional facial expressions as a game decision input in a social situation and group that uses manual selection instead. This hypothesis was tested using the Busselle's and Bilandzic's (2009) narrative engagement scale however wasn't statistically proven. Nevertheless some findings were made from the additionally collected data.

In the complementary questionnaire, the difference of self reported enjoyment between the groups was statistically significant and higher for the facial expression using group. From the content analysis of observations and voice recorded interview were noticeable that people in the control group were more goal oriented and people in expression using group were more oriented towards characters and more emotionally involved with them. Furthermore, the findings revealed, that using player's emotional facial expressions as a game decision input in a social situation may possibly positively influence empathy and maybe even identification.

7.1 Discussion

Based on the results from content analysis, including visibly more emotionally colored voices of people in the expression using group, the findings from Adelman and Zajonc (1989) and Kleinke, Peterson and Rutledge (1998) that even self-generated facial emotional expressions have an effect on emotional experience seemed to be supported.

Furthermore this seemed to lead in non-deliberate self-induced emotional involvement with the narrative and/or empathic engagement with the characters. Since empathic engagement is so closely connected with emotional involvement (Busselle & Bilandzic, 2009; Lankoski, 2011; Zillmann, 1995), it is difficult to clearly state which concept were induced from the facial expression using. The empathic engagement could be affected since the players are actually affectively mimicking the player's character, which is an important factor of empathy.

The game includes couple of secret expression scannings followed by small change in the Advisor's reaction, refer to page 20. This was done because of too much enthusiasm to try to use the emotion reading in a different way and makes an unnecessary difference in game versions. It is debatable if this also didn't influence the results in some way. For example, if the participants in the expression using group actually noticed that the game reacted to them in this way, it could potentially enhance their self reported enjoyment.

The significantly higher self-reported enjoyment in the facial expression using group could have been caused by a lot different reasons. This could be of course by randomness but also caused by an interest in the novelty of the process, by more types of interaction with the game, by more intuitive way of choosing than from description of emotions, directly by making facial expressions or from caused higher empathic engagement with characters. As Zillmann (1995; 2006) stated, empathy is fundamental for interest in and gratification from narrative and if empathic engagement won't materialize, people are unlikely to consider themselves well entertained.

Even though the usage of emotional facial expression as a game input seemed to positively affect empathic engagement and maybe even enjoyment, it is questionable if using facial emotional expression couldn't have negative rather than positive influence on learning and problem solving. Too much of entertainment could potentially pose as a distraction in education value of games (Ritterfeld & Weber, 2006) and in this study, we see that the group which wasn't using facial emotional expression was more goal oriented and critically evaluating. However, if the usage of emotional facial expression truly positively affect empathic engagement and enjoyment, it should positively reinforce the persuasive effect of the narrative (Busselle & Bilandzic, 2009; Green & Brock, 2000; Slater & Rouner, 2002) and motivation (Jennett et al., 2008; Morgan et al., 2009).

Only couple of other studies were evaluating effects of using facial emotional expressions for game interaction so far (Bernhaupt et al., 2007; Fourie et. al., 2014; Lankes et al., 2008). From these, paper from Fourie et. al. (2014) indicates that research of effects was made but no results were presented in this study. Bernhaupt et al. (2007) and Lankes et al. (2008) researched effects of using facial emotional expressions for game interaction only on surface level, with a results that it influences immediate emotional state and has positive effect on player's experience. On the other hand this thesis study evaluated the effects of using facial emotional expressions for game interaction in a more specific setting and in more detail. It is questionable why the research in this direction is scarce, the reason could perhaps be, that most focus is still put on development and reliability of emotion reading programs.

Reliability of the emotion reading program in this study largely influenced the design of the developed game and selection of the participants for testing. Through these, the reliability of evaluation of expressions during the experiment was enhanced, however incorrectly tracked or evaluated expressions were still present and sometimes also noticed by participants. This could have of course affected the results of the experiment, but logically thinking, the founded hypothesis about enjoyment, empathic engagement and presence should not be weakened if the all expressions were evaluated correctly.

7.2 Future Work

Thanks to the small sample of participants, the quantitative part of the evaluation should be rather considered as a pilot study and further testing with adequate sample size should be made to gain more practical results.

Based on the findings from the concept analysis, some suggestions for future research can be made. Promising direction of research seems to be to focus on effects of using facial emotional expressions in social situations inside games on empathic engagement and identification with game characters. It could be also interesting to try to find out, if there are effects on identification with a player's character when they use facial expressions that were intended for the character to convey.

In this study, some people scarcely used other than calm expression with the reasons like "I felt like I cannot show a lot of my emotion, I should keep calm and just deliver what I have to." So unless specific emotional experiences are sought after, it should be taken into consideration to make a story which would sufficiently encourage players to express different kinds of emotions.

In a further study facial emotional expression could be used for different types of interactions than multiple choice selection with foremost notification. However, the face tracking and emotion evaluation system was still unreliable for a lot of people and as the results from annual competitions of emotion recognizing software also indicates (Dhall et al., 2015) further development and research in this area is needed before the emotion recognition will be practical enough to use as an important not additional feature of games.

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Appendix A - Summary of the Story's Gameplay

The game's story was situated in a fictional Kingdom after lost war to an enemy Empire. The players played as royal Messenger, whose most important task was to mediate conversation between the Queen and royal Advisor. However it could be quite complicated because of the state of the events and the players even did not have a specific goal to achieve and needed to decide on it themselves.

The Queen was still saddened and in rage by the events of losing war, losing her son in the war, her daughter being taken and her husband being executed by the custom of the Empire after the Advisor sold him out. The Advisor, now serving as a connection between the Kingdom and the Empire, pleaded to the Messenger to persuade the Queen to send the promised war tributes to the Empire to appease them.

The players had to decide how and what they said to the Queen, influencing through it her behaviour, hate towards the Empire, lack of trust towards to Advisor and her own feel of responsibility. At the end of the game the Queen finally decides if she will send the war tributes and for what reasons, though even if she declines, the tributes will be send later to make the endings similar.

In the second part of epilogue, it is stated that the Empire and the Kingdom came to sing a peace treaty after couple of years and all the truth about the events comes to the light. When it became obvious, the war will be lost, the late King set in motion his secret plan. He feigned his son's death and let himself be sold out by the Advisor. Thanks to his sacrifice, the Empire didn't try to take more lives, the Advisor had a power to secretly protect the Kingdom and the royal family. And the Queen could see her children once again.