GamE in action: Using the GamE paradigm as a tool for investigating human emotions

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ABSTRACT
In this paper, we discuss the design and usage of simple but effective games developed under the ‘GamE (Game as a Method for eliciting emotions) paradigm’. Under the GamE paradigm, the objective is to design a number of games to be used as a tool for inducing emotions in a natural and ethical way. We used these games in different studies across cultures and results show that these games are quite useful in inducing positive and negative emotions naturally.

Categories and Subject Descriptors
H5.2. User Interfaces.

General Terms
Measurement, Design, Human Factors

Keywords
emotions, design, game

1. INTRODUCTION
Research on emotions has grown massively in the past few years which resulted in new theories, methodology and interesting findings. This research has been done from different perspectives (evolutionary, psycho-physiological, neurological, psychodynamic, etc) where every perspective took a meticulous approach in understanding and conducting research about emotions. Regardless of the different point of views, a fundamental focus in all perspectives has always been on developing innovative methods for inducing emotions in a natural and ethical way, which is still a challenging task [1]. There are a number of methods used for inducing natural emotions but usually the results gained from these techniques are not easy to generalize because of their artificially controlled settings [2] and dependability on a particular culture. There is always a need of developing innovative techniques, which could not only be used across cultures but also in a natural environment.

2. GamE Paradigm
One technique, which we explore for investigating emotions, is to use games as emotion inducers under the ‘GamE (Game as a Method for eliciting emotions) paradigm’.

It is well known that players from different age groups can become emotional (both negatively and positively) while playing games and games give them a very engaging experience [3]. Based on this general idea, we developed a number of card and computer games to use as a tool for inducing emotions in children.

3. Guessing game
The card game is developed using Microsoft® PowerPoint®, and every game consists of six cards. When the games starts, only the first card is visible (‘3’ in the case of figure 1) and the other five cards are placed upside down so the numbers are hidden. Numbers on all cards are between 1 to 10 and a particular number cannot repeat in a single game (i.e. in the above example the number ‘8’ will not repeat in next 5 cards). Appropriate colorful images are chosen for the game background and different animations are used to turn card around for making the game more attractive for children.

Figure 1: Game winning scenario

When a game starts, the task of the player(s) is to guess whether the upcoming number on the next card will be lower or higher than the number on the previous card. Once players have made their guess, the relevant card is turned around and the number on the card is made visible on the screen. In addition to this, a characteristic non-speech audio sound is also played right after the card is visible which inform players about the correctness or incorrectness of their answer. If players guess correctly then they are asked to guess the next number and they only win the game if...
they guess all the cards in a game correctly. If players predict the number incorrectly at any stage of the game, they immediately lose the game and move to the next game.

![Figure 2: Game loosing scenario](image)

An important design consideration of the game is its deterministic nature. So far, we have used sequences of cards, where players will win half of the time and lose half of the time, if they make “rational choices”. Figure 1 is an example of the winning variant where guessing the sequence of ‘bigger – smaller – bigger…’ will lead to a win. Furthermore in figure 1, at card 5, the rational choice will be a ‘lower’ number because no number can be greater than 10. Similarly for the last card, the choice will be ‘lower’ because the number higher than 9 has already been displayed at card 4. Figure 2 represents a losing variant where the most probable outcome for the final card would be a number higher than 2, but guessing “higher” would make this a losing game. Winning and losing games are typically mixed in the sequence, starting and ending with a variant in which children were likely to win.

### 3.1 Investigating cross-cultural differences

In a series of experiment, we have used this card game to collect emotional responses to winning or losing the game. So far, we collected data from 144 children (half 8 years old and half 12 years old) who played the game either in the Netherlands or in Pakistan, and either individually or in pairs [4]. Figures 3 shows the representative stills of winning and losing of Dutch and Pakistani children belonging to both age groups.

![Figure 3: Representative stills for and Dutch children](image)

Generally, the game worked quite well and as intended. Almost all individual and pairs of participants indeed made the logical choices that were expected in most of the cases, so that each individual child and pair of children lost at least two games and won at least two games. Additionally, not even a single child noticed and reported that the game was in fact a deterministic simulation. Rich data was which so far has been used in number of perception tests where viewers from Pakistan and the Netherlands watched and judged the emotional response of Pakistani and Dutch children when they win or lose a game. From these perception tests we were able see clear cross-cultural differences in the expression of emotions. We were also able to see significant effect of physical (social) presence on the expression of emotions.

### 3.2 Investigating child-robot interaction

In a recent study we changed the style of this game and designed an experiment where children played this card guessing game with a robot (iCat). The iCat played the game as a game partner. The actual friend was replaced with this robotic cat. We wanted to see how children interact with the robot and how expressive are they while playing the same game with a robot. Based on our previous experience (after looking at the children behaviours and observing most common utterances used during child-child game playing scenario), we designed the most common and realistic utterances for the iCat’s responses. This created a very realistic scenario and children found iCat quite intelligent and attractive. They also reported that iCat understands the game quite well (like humans) and makes many reasonable guesses. We also made sure that the iCat is not always correct.
4. Word matching game
Card guessing game worked quite well in many scenarios but the main limitation of this game is that it does not encourage discussion. Players have to make very basic and to some extend logical choices and this game does not provide much room for discussing logical reasoning in detail. Therefore this is game is not suitable for scenarios where rich data of non-verbal and especially verbal communication is required for investigating a particular research question.

Another game which we designed is a simple word matching game in which the children had to match a given word with another word from a set of words based on some logical reasoning (see Figure 4). We anticipated that such a game would encourage the children to be much more verbally involved with their partner (friend or stranger or a robot) as they would discuss the rationale of their choices and hence provide us with an opportunity to evaluate the verbal and non-verbal response with fairness. The children were only allowed one final guess and they would then be informed about the correctness of their guess.

5. The affective mirror game
The Affective Mirror is a novel interface concept for inducing emotions in users in an ethical way. The AM creates a game-like experience and adapts itself intelligently based on the user’s perceived current affective state [5].

The purpose of the AM is to try and make people laugh and thereby induce positive emotions in them. This is done by creating an interactive ‘production-perception-adaptation’ loop. The basic idea is simple: the AM detects the state of the user (from the physiological data and facial expressions) and then provides audiovisual feedback by distorting the user's face in the mirror, just like a traditional carnival mirror. A crucial difference with such a traditional mirror is that the amount and type of face distortions produced by the AM depend on the detected levels of laughter and smiling. The more participant laugh, the more they progress in different levels of distortions (wins more points), resulting in a truly dynamic and interactive experience.

Although, from the technical point of view the AM concept looks quite high tech but the style of interaction and type of functions performed by the user during this interaction are really minimalistic and basic and can be compared with other games designed under the same GamE paradigm.

5.1 Investigating the role of social presence
In one study we investigated if and to what extent the AM induces positive emotions in participants and how the co-presence of a friend affects the emotion induction.

In general, results revealed that the Affective Mirror as an affective game-like interface worked very well in inducing emotions and that participants indeed felt more positive after their AM session. Interestingly, for both individuals and pairs, the results revealed that the Affective Mirror succeeds in inducing positive emotions in participants. In addition, results showed that the induced effect is stronger for people who participate with the AM with a friend present, suggesting that social factors strengthen the effectiveness the AM.

Furthermore, for the reported emotions it did not matter whether participants were instructed to suppress their laughter or not. The fact that participants cannot suppress
their laughter even when instructed not to do so strongly suggests that participants find the AM truly funny.

Figure 6. Examples of visual distortions created by the AM.

6. The ‘guess who’ game
Another game, which is still under development, is a “Guess Who” game. We are designing a high tech version of this board game where players can interact with each other using audio video communication channel and play this game remotely. In this game we are interested in inducing ‘surprise’ in children. We want to observe children’s reactions when they unexpectedly win or loose a game. We are also interested in investigating their reactions in two different conditions: 1) how do they react when their opponent is sitting in a different room and 2) when the opponent is sitting in the same room.

Figure 7. Board game “Guess Who?”

7. CONCLUSION AND GENERAL DISCUSSION
On the basis of these results, we can conclude that ‘basic’ games can be a useful tool for inducing positive and negative emotions naturally and ethically. Furthermore, this is a kind of emotion induction method that goes beyond traditional experimental settings and gives valuable insights about emotion regulation in natural settings. In the future, we would like to run more experiments with the same game in different cultures and would like to develop more extensive (but still simple) games under the same GamE paradigm for using them as an emotion inducer.

8. REFERENCES