Emotions and Gambling: Towards a Computational Model of Gambling Experience

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ABSTRACT

Gambling has been on the rise over the past years and understanding different patterns of the human behavior while gambling involves the identification of the emotions experienced while gambling, as well as how these change during a gambling activity. This work attempts to address these components towards the creation of a computational model of gambling experience. Specifically, we created a gambling game (roulette) and evaluated the interaction of participants with the game by assessing their emotional responses using the video modality. This work provides the basis for developing a multimodal interface that can help capturing the gambling experience. Within our research we attempt to answer the following research questions: (a) which are the emotions experienced by someone gambling and (b) how do the emotions detected change before and after an event.

CCS CONCEPTS

• **Human-centered computing** → **User models**.

KEYWORDS

Gambling, Emotion Recognition, User Modeling, Gambling Experience

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1 INTRODUCTION

Gambling has been linked to a variety of emotions, but the specific nature and timing of these emotions remain uncertain. For instance, gambling is believed to be associated with arousal [5] while difficulties in emotional regulation in individuals with gambling disorder may relate importantly to specific factors, such as gambling-related cognitions, attachment styles, comorbidities and impulsivity [8].

Different individuals express and experience emotions in distinct ways during gambling. This has an impact on the intensity of the emotions and their duration. In the meantime, researchers face challenges in the field due to the fact that individuals with a gambling addiction often report high levels of alexithymia, which means they struggle with identifying and expressing their emotions [2, 21]. To address this, studies have started incorporating objective physiological data, such as electrodermal activity, which has proven useful in identifying critical moments and behaviors during gambling [7, 15, 16].

From a psychological perspective, developing objective methods to measure emotions holds significant potential in gaining a better understanding of gambling behaviors. Given the undeniable connection between gambling and emotions, a deeper insight into the types and timing of emotions experienced while gambling could aid individuals with gambling addictions [3]. Creating a multimodal approach for objectively measuring emotions [11, 13] could also be applied to comprehend the role of emotions in other maladaptive behaviors (e.g. eating disorders) where individuals struggle to describe their emotions effectively [10].

Within this work we propose and evaluate a multimodal interface that can help capturing the gambling experience using a roulette as the gambling game and video data to capture the participants' emotions. We use the discrete emotion theory for defining a list of possible emotions and track how these change after wins, losses and near-wins. We attempt to answer the following research questions: (a) which are the emotions experienced by someone gambling and (b) how do the emotions detected change before and after an event.

2 METHODOLOGY

Our framework for understanding the gambling experience is illustrated in Fig. 1 and is structured along the following components:

- Gambling: the stimuli to which a gambler is exposed. In this work a European-style roulette game was implemented and the following events were considered: Wins, Losses, Near-wins.
- Gambling experience: by taking into account the emotions experienced when a gambler is exposed to the gambling

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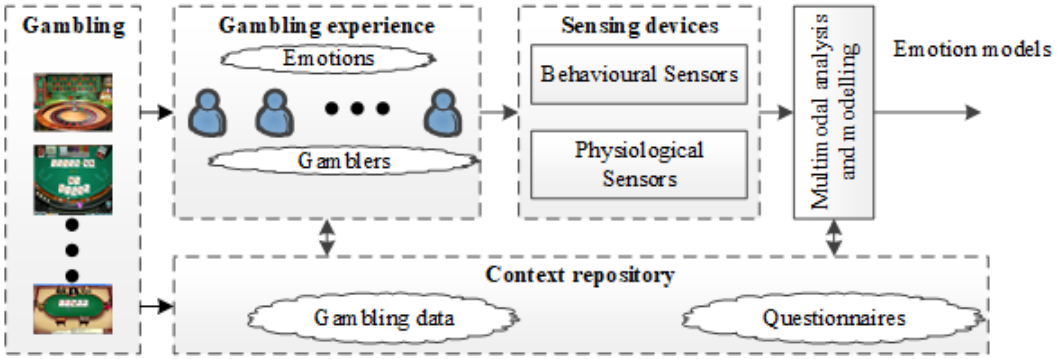

Figure 1: Framework for capturing the gambling experience.

game, we aim at the identification of the optimal representation of the gambling experience. In this work we utilize a limited set of basic emotion categories [4], i.e. angry, disgust, fear, happy, sad, surprise, neutral.

- Sensing devices: this component represents the behavioral and physiological sensors which will be utilized for capturing the heterogeneous responses of the person gambling. Only one behavioural sensor was utilised in this work, i.e., the video from a conventional video camera.
- Multimodal analysis and modeling: this component is responsible for processing and analyzing the signals captured from the corresponding sensors and building the emotion models. The multimodal analysis and modeling component is implemented using Deepface [17–19].
- Context repository: this repository contains several context parameters from the gambling tasks (such as the history of gambling activities and the amounts played in time and money, etc.), as well as all other information gathered from the corresponding questionnaires (e.g. personality tests etc.).

3 DATA COLLECTION

Overall, 29 participants were recruited with age and gender characteristics illustrated in Table 1. The study was approved by the corresponding ethical committee of the University of the Aegean (request 10244/11.05.2022 / approval number 15/03.06.2022). The participants were initially asked to complete a series of questionnaires to measure their personality and gambling behaviors. The PGSI problem gambling evaluation questionnaire was used for evaluating gambling addiction and excluding participants that have any addiction [14]. The twenty-item Toronto Alexithymia Scale (TAS) was used for assessing the degree of Alexithymia of the participants [1]. The PANAS scale was used for measuring positive and negative affect of each participant [20]. After consenting to take part, they were invited to play the gambling task while their video data were recorded using a conventional web camera.

3.1 Gambling Task Description

A customised user interface prototype that simulates a gambling environment and allows to parameterize different aspects of a game of roulette was developed in Unity [6]. An illustration of what

Gender	***n***	**%**
Female	10	34.5
Male	19	65.5
Age (years)		
20-24	3	10.3
25-29	12	41.4
30-34	4	13.8
35-39	4	13.8
40-44	2	6.9
≥45	4	13.8

Table 1: Participants' demographics.

Figure 2: Roulette interface and post-spin result.

the user can observe in a post spin case is shown in Fig. 2. The user is presented with the roulette setup and a "budget", an initial amount of either chips or money to bet ($100), always visible to them throughout a game session on the blackboard. The user is then free to hover over the betting table and click on any number (or combination) which becomes highlighted indicating what they have currently selected. In this work the implementation supports only one number/combination to be selected at a time, but the user can update their choice at any point before the wheel starts spinning. A set of baseline parameters to evaluate the interface were set, which are described in the following subsection.

	Wins	Losses	Near Wins	All Events
n	319	774	295	1093

Table 2: Events occurred across all participants' sessions.

3.2 Gambling Task Parameters

As soon as the betting number/combination is confirmed, the relevant information on the blackboard is updated accordingly (e.g. the "budget" is reduced by a standard $5 bet on the user's selected number/combination), and the wheel begins to spin at a given "speed" for a given interval (5.3 - 6.9 sec.) after which it starts slowing down at a given rate (e.g. 1 "speed"/frame) until it stops on a number pointed to by a marker, accompanied by a sound effect depending on the result (e.g. "Applause" for a victory, "Boo" for a near victory, "Thud" for a loss).

The user cannot interact with the interface from the moment the bet is placed until the wheel stops spinning. The blackboard display updates its information after each play (the updated "budget", the outcome, and payout, if any). A button meant to reset the interface to its original state and move the user on to the next round (e.g. "Reset") replaces the betting button after a 5-sec. interval. A button to end the gaming session ("Exit") is accessible throughout the session.

Each session will end when the user triples their money ($100 starting budget), after they have lost all money, or when they wish to end the game themselves. Of the 29 participants, 5 landed on a single number they had bet on, 1 of which even tripled their starting budget, 9 played until their original budget was out, and most played as long as they felt comfortable for. The least amount of rounds played were 20 and the most 75, on average 37, and most final budgets averaged a little above or below the starting budget.

The amount of events (Wins, Losses, Near-wins) for all participants is illustrated in Table 2. A loss is characterized as a near-win in the following cases (some exclusions apply to avoid having any bet qualified as near-win):

- Board near-wins: when the user has placed a bet in a neighboring area to the result relative to the board. Exclusions include Red & Black, Odds & Evens, and the 2nd column.
- Wheel near-wins: when the user has placed a bet in a neighboring area to the result relative to the wheel. Exclusions include Red & Black, and Odds & Evens.
- Number near-win: when the user has placed a bet in a neighboring number to the result. Exclusions include Red & Black, Odds & Evens, and Columns (except numbers 1 & 36)

4 EXPERIMENTAL SETUP AND RESULTS

4.1 Experimental Setup

The video recorded was formatted in 640x480 at 30 fps. In order to account for the moments prior to and after an event, the facial expression of a user was observed for a period of 2 sec before and after the corresponding event. Due to limited computational resources only 12 out of the 60 frames for the 2-sec. observation window were analyzed and the dominant emotion was selected as a marker for that window.

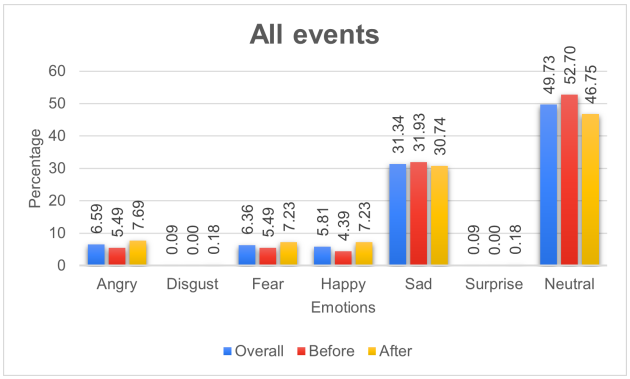

Figure 3: Percentage of emotions before and after any event.

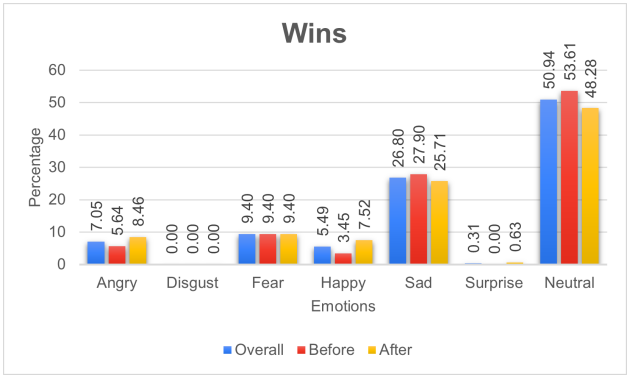

Figure 4: Percentage of emotions before and after a Win.

4.2 Experimental Results

In Fig. 3 we observe the average percentage of emotions detected before and after any win or loss during the games of all participants. Overall the dominant emotions appear to be Sad and Neutral, while there are noticeable changes in emotional expressions from the "Before" to the "After" states of gambling. Specifically, there are relative increases in expressions of Angry (39.90 %), Fear (31.60 %), and Happy (64.65 %), indicating that gambling has a notable impact on these emotions. Specifically, after an event there is a decrease in the Neutral state, suggesting that we can observe a deviation from neutral during any gambling event.

For Wins (Fig. 4), there are relative increases in expressions of Anger (49.82 %) and Happiness (117.39 %) after a win. The expressions of Disgust and Fear remain unchanged from the "Before" state, but it appears that, overall, there is no significant instances recognized for these emotions. After a win, there are relative decreases in Sadness (-7.84 %) and Neutral expressions (-9.92 %).

For Losses (Fig. 5), apart from the Neutral expression Sadness is the most prevalent emotion overall, before, and after a loss. Neutral expressions are also predominant overall and after the loss. Further, there seems to be a relative increase in Angry (35.54%), Fear (63.04%), and Happy (48.53%) expressions compared to before the event.

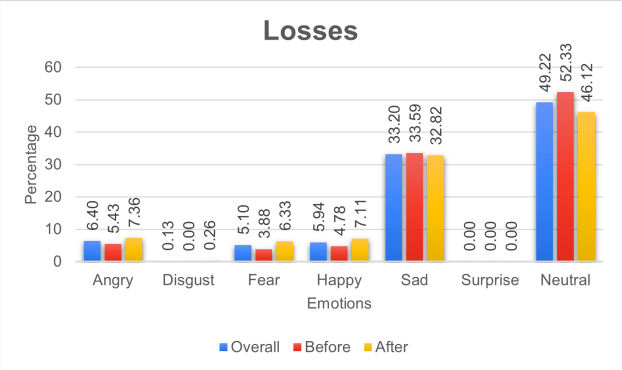

Figure 5: Percentage of emotions before and after a Loss.

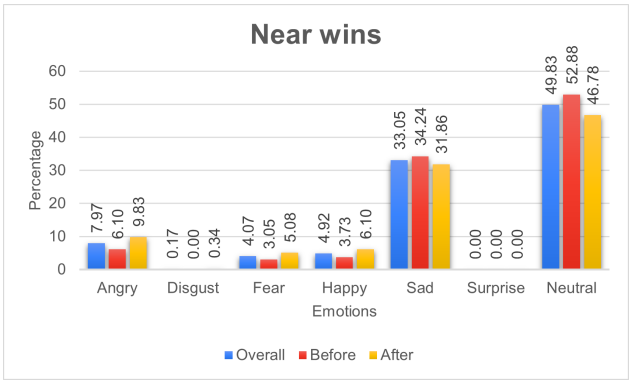

Figure 6: Percentage of emotions before and after a Near-win.

Near-wins (Fig. 6) can trigger significant emotional responses, with notable increases in Anger (61.15 %), Fear (66.56 %), and Happiness (63.57 %), at a larger scale when compared to to Losses. This indicates that near-wins may lead to heightened emotional arousal and intensity.

5 DISCUSSION

Engaging in gambling activities, irrespective of the outcome, appears to influence emotional expressions. Winning in gambling significantly affects emotional expressions. In the "After" column for winning scenarios, there are notable relative increases in Anger, Happiness, and Fear, while Sadness and Neutral expressions decrease slightly. This suggests that winning can trigger strong emotional reactions, including increased happiness and possibly heightened arousal. Notably, the expressions of Disgust and Surprise remain relatively stable and unchanged across all scenarios since they are underrepresented.

However, there are several limitations in the current study. First of all, participants that were gambling addicts were not included in this work, thus the findings may not be fully representative of all gambling populations. Moreover, the absence of financial implications due to the use of virtual money may impact the emotional responses, compared to real-life gambling scenarios. In addition, there were no physiological or other sensors, aside from the camera, used for analyzing the participants' emotions.

Going forward, including additional measures (e.g. heart rate, skin conductance) and the utilization of a variety of gambling data (e.g. resting period among bets, spinning speed of the roulette) might provide deeper insights into the gambling experience. Additionally, since gaming sessions are composed of more than one event analyzing the overall emotional experience of a game session could help understanding the temporal nature of a gambling experience [9, 12], (e.g. how do the emotions associated with previous events affect emotional states connected with the current and next event). Furthermore, the utilisation of participants' information that can be retrieved from the questionnaires can provide further insight into their reactions, provided that a larger sample size would be available. Finally, since understanding gambling involves experimenting with a variety of gambling games, future work would include utilizing different gambling games.

As far as the first research question is concerned, i.e. which are the emotions experienced by someone gambling, it seems that sadness and neutral are the dominant emotions in the scenario utilized in this work. On the other hand, emotions such as disgust or surprise are not expected to be observed in this scenario. With respect to the neutral state, its dominance could be attributed to the fact that the participants were gambling with "fake" money, thus there is no cost associated with any action. With respect to sadness, its dominance could be attributed to the fact that due to the nature of the game the participants were losing most of the time in the short-term, and overall in the long-term, thus independently of the specific outcome sadness was a dominant emotion.

As far as the second research question is concerned, i.e how do the emotions detected change before and after an event, it would be fair to concentrate on all emotions but surprise and disgust since they are under-represented in the specific dataset. Overall, we observed that there is a relative increase in the presence of emotions other than neutral and sadness in all cases. In other words, it seems that participants deviate from their baseline towards any other emotion after a win, loss, or near-win, with increased change within near-wins compared to losses. The latter can be of particular importance since near-wins might have greater effect on individuals' behaviors and decision-making processes.

6 CONCLUSIONS

This study contributes to understanding the human behavior while engaging in gambling, focusing on identifying the emotions experienced and how these emotions change for different gambling events. By creating an interface prototype that simulates a gambling environment the study successfully assessed emotional responses using the video modality. This work lays the groundwork for the development of a multimodal interface that can effectively capture the gambling experience. While acknowledging the limitations of the current study, an important step towards developing a computational model of the gambling experience is made by shedding light on the emotional aspects of gambling behavior. The insights gained from this research can aid in designing effective interventions and responsible gambling practices, ultimately contributing to the well-being of individuals engaging in gambling activities.

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