Indian Virtual reality affective database with self-report measures and EDA

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Indian Virtual reality affective database with self-report measures and EDA

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ABSTRACT

The current work assesses the physiological and psychological responses to the Stanford virtual reality (VR) affective database [1] of 360° emotional videos presented using head-mounted display (HMD). Participants were asked to rate the videos on arousal and valence using SAM scale after every video. The electro-dermal activity(EDA) was recorded while watching the videos. The current pilot study shows highest skin conductance response (SCR) for high arousal, and moderate arousal and moderate valence videos., and lowest SCR for high valence videos. Self-report on valence and arousal shows a difference between Stanford VR affective database and corresponding Indian population psychological responses, suggesting a role of social context in emotion perception and experience.

CCS CONCEPTS

Human-centered computing~Virtual reality • Social and professional topics~Cultural characteristics

KEYWORDS

Virtual Reality, 360 videos, Valence, Arousal, EDA

1 Introduction

Virtual reality (VR) is blurring the gaps between direct and indirect access to the perceived reality. Feeling of being present and the ability to interact with the environment is changing the way human behaviour can be studied under controlled experimental settings. The advent of VR technology has made possible to study a few psychological processes, which were once unimaginable, especially in case of emotion experiences. It is assumed that VR 360° view and the dynamic nature of stimuli gives an extended degree of immersion and hence a better experience with emotional stimuli as compared to when emotional stimuli are presented using other modalities ranging from reading literature to seeing pictures to watching movies on desktop/ cinemas[2; 3].

Emotion is a complex psychological process and it is difficult to describe them using a single parameter. Studies have shown that a two-dimensional circumplex model best describes affective experience. Valence and arousal [4] is one set of the dimensions which is widely accepted. Valence is a measure of how attractive or repulsive participant feels about a given stimulus, while arousal is a measure of how awoke or activated the participant feels in response to the given stimulus. Both valence and arousal are measured on 1 to 9 scale, with 1 being low and 9 being high. Different emotions fall in different areas of this 2D circumplex model [4].

Though self-report arousal and valence are one of the most indispensable measures of emotion

perception and feeling, they are still not sufficient measurements to assess one's emotional experiences. Studies have shown relation between electrodermal activity (EDA), and valence and arousal state of one's emotional experience [5] and hence, gives a better understanding of the emotional perception of a given stimulus.

Studies have shown cultural differences in psychological responses to the emotional stimuli [6]. Western population compared to Eastern population showed high value to high arousal emotions, whereas the Eastern population showed preference to the low arousal emotions [6], suggesting the role of social context in experiencing emotion. Currently, we have Stanford's publicly available VR database [1] for VR effective research. This database reports valence and arousal ratings for 73 stimuli which lack the responses from the Indian population. Therefore, validation of Stanford database becomes essential for future research related to the Indian population.

We conducted this study to collect the Indian population response for a sample of Stanford VR stimuli database. We collected psychological and physiological data to measure the response to the presented emotional stimuli. For psychological data, the valence and arousal ratings for each stimulus were marked on the SAM scales (Figure 1) by the participant [7]. For physiological data, EDA (Electrodermal activity) data was collected.

2 Method

10 naïve university students(M = 5; F = 5; age range: 18-30 yrs), were recruited for this study. 10 videos were selected from the Stanford database based on their valence and arousal ratings. We had three categories: 2 videos each from high(rated>5.5) and low(rated<4.5) valence, 2 videos each from high (rated>5.5) and low (rated<4.5) arousal, 2 videos from moderate arousal and moderate valence (between 4.5 and 5.5 respectively). The stimuli were presented randomly to participants using Oculus Rift CV1 with durations ranging from 1 to 10 minutes. We used BIOPAC MP150 system sensors with Acqknowledge 4.3 for data logging, to record EDA data. The EDA data was recorded with and without event. The baseline data was considered to compare with the EDA data logged during the active presentation of the video. Participants' were asked to rate the valence and arousal using SAM scales, immediately after completing the video. (Figure 1) [7].

3 Result

The EDA data collected with a sampling rate of 1000 Hz, and was analyzed using the software Ledalab. Due to the long duration of the videos, the data was quite large. Hence it was downsampled to 100 Hz. Then the data was smoothed with a gauss window of 8 samples width. Continuous Decomposition Analysis (CDA) was performed to obtain the change in Skin conductance response (SCR) at various instances in a given video. This gave us the rate of change of skin conductance at the given instances. The mean of these values was taken for further analysis.

The current pilot result (figure 2) shows negative SCR in comparison to the baseline SCR (presented as 0 level) for low and high valence, and low arousal, suggesting reduced EDA while watching

these videos. However, we observed positive SCR in comparison to the baseline for high arousal, and moderate arousal and moderate valence videos, indicating comparatively high EDA while watching high and moderate arousing videos.

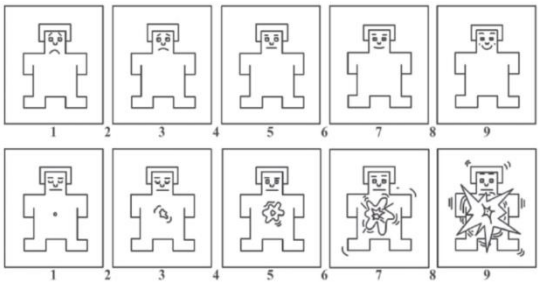

Figure 1: The Self-Assessment Manikin (SAM) used to rate the affective dimensions of valence (top panel - unpleasant -to-pleasant) and arousal (bottom panel - deactivation-to-activation).

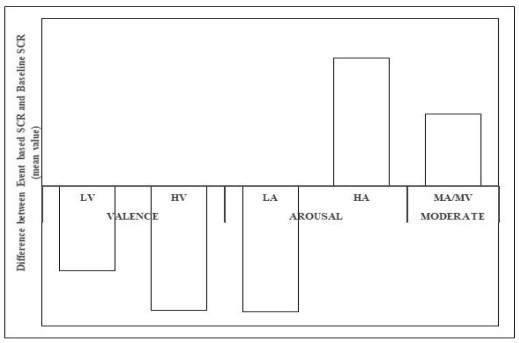

Figure 2: Graph comparing mean average change of SCR of the different categories of stimuli.

For comparison of the Stanford ratings with the ratings that we obtained, a cartesian graph was plotted(Valence vs Arousal). Each point in the graph (Figure 3) represents the valence and arousal ratings of the 'n'th video in the Stanford database (see 1 for the video number reference). The current pilot data shows partial alignment with the Stanford database valence and arousal measures, with certain exceptions: 1st, 20th, 50th, 58th, and 67th video. Such as, Figure 3 shows comparatively large variation in valence than arousal.

The comparative variation in psychological responses favors the role of social context compared to universal understanding of emotion perception and experience. Such studies would be critical to the longstanding debate on emotion to be considered as universal or social construct. The varying psychological and physiological responses affirms the need for creating Indian VR affective database and validating Stanford database by Indian population.

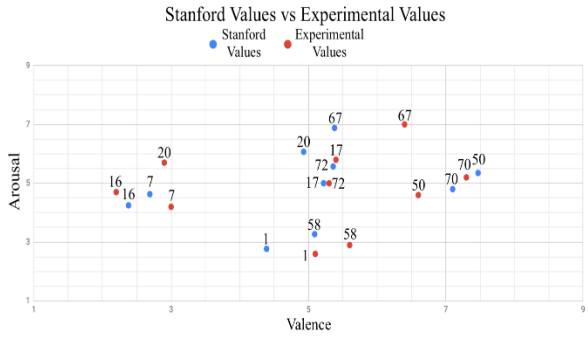

Figure 3: Graph comparing Stanford ratings with experimental ratings.

4 Conclusion

Despite encouraging results, we cannot generalize the observation because of the small sample size We plan to extend this study further with more participants and examine the correlation between behavioural, physiological and psychological data to perform better comparison with the Stanford database.

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