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# Understanding Emotions in Virtual Reality

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**Abstract**

Emotion is a psycho-physiological process triggered by conscious and unconscious perception of objects or situations. Emotions play an important role in human communication, and eliciting emotions can be purposeful for various research work. With Virtual Reality applications becoming an integral part of research, we wish to obtain a thorough understanding of how human emotion can be elicited in Virtual Reality and how it corresponds to the real world.

**Author Keywords**

Virtual Reality; Inducing Emotions; Elicitation Techniques

**Introduction**

Over the years, Virtual Reality (VR) has emerged as a tool enabling us to enhance our lives with its applications, ranging over various fields [8]. The advent of advanced VR technology provides interesting potential for utilizing VR for research purposes, such as running user studies [5]. VR provides us with a level of control over the environment that traditional studies in the lab or in the field simply cannot match. This freedom allows us to acquire a greater control over the parameters under observation which helps us to study each affecting factor in greater detail.

If we are to study how Virtual Reality can act as a novel research paradigm in psychological research, we need to

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investigate how human emotions can be induced in VR. In this paper, we discuss the ideas of how VR can be utilized to induce various emotions, how long the effects of induced emotions may last, and how the induced emotions compare to real-world or lab-based emotion induction. We believe that this is a valuable direction of research that will provide us with understanding the strengths and weaknesses of VR in psychological research.

### **Related Work**

Research in inducing emotions include various elicitation methods such as autobiographical recall, videos, audio, and images [3]. Each elicitation method explores a broad range of emotions in one of the emotion models provided by psychology research (e.g. Russel's Circumplex model of Affect [7] which is based on the arousal/valence/dominance scales). The aim of studying the elicitation methods is to analyse if the individuals experience the targeted emotional states [1, 4] which can be detected using subjective and objective measures such as physiological sensing and self assessments [6].

### **Elicitation Methods in VR**

Emotions can be induced in various ways and each method has its own pros and cons. We wish to implement elicitation methods including audio, video, raw image and autobiographical recall in virtual reality and evaluate how well these methods compare to the real world. We not only seek to understand the effectiveness of the elicitation methods but also derive use cases in which VR may be a better fit for mood elicitation than real-world settings. Given a set of methods, we plan to measure how emotional responses differ, such as explored by Estupinan et al. [2]. We will study how effective each technique is in comparison to the real world, and also whether individuals have preferences for certain elicitation methods, given the type of emotion.

### **Lasting Effect of Emotions in VR**

Given the various elicitation methods currently being used by practitioners, we need to understand the aspects in which each method differs and also how emotional responses differ based on the method used.

One interesting influencing factor is to study the lasting effect of each elicitation method as this might provide useful design considerations for researchers. In theory, "Lasting Effect" would be the observation of how long a certain emotion stays within a participant, and we will explore this under various circumstances, such as the participant doing some task after the emotion/mood has been elicited. We wish to study the lasting effects of each certain emotion elicited through a given method in both "waiting scenario" and "task scenario" where we essentially measure how long elicited emotions last if the individual is doing a task or not. In the "waiting task" we ask the participant to simply wait for a given period of time and in the "task scenario" we ask participants to do simple tasks usually assigned in VR such as manipulation tasks or navigation tasks.

One interesting aspect to discuss in the workshop is different tasks that can be used to investigate the lasting effect of the elicited emotions in VR and their impact.

### **Future Work and Conclusion**

Beyond the sketched aspects there are several other interesting directions to explore. This includes, for example, how well different elicitation methods work for different user groups (age, prior experience with VR, etc.)

With our research we hope to not only advance our understanding of how VR can be effectively used as a research tool, but also to contribute to other areas of research that seek to enhance VR experiences so as to make them an interesting and valuable technology for our everyday life.

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