**Mindful Space in Sentences**

**A Dataset of Virtual Emotions for Natural Language Classification**

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**Project Overview**

This research measured the emotions expressed in virtual reality (VR) spatial experiences. The study analyzed the sentence descriptions and classifies emotions for further application in architectural design. More specifically, the research used EEGs to analyze the relationships among virtual spaces, virtual experiences in linguistic descriptions, and the labels for spatial emotions. We varied the parameters in the visual-spatial environments and mapped from a spatial description dataset of sentences to spatial emotion labels.

First, the 26 subjects described 10 designed virtual spaces experienced with a VR headset (Quest 2 device) in about 1,402 sentences that correspond to the different space parameters of shape, height, width, and length. Simultaneously, the EEG (Muse 2 device) measured the emotions of the subjects using four electrodes and the five brain waves of alpha, beta, gamma, theta, and delta. Second, a visual-spatial dataset of about 1,402 sentences with 2 labels – *calm* and *active* – analyzed from EEGs was built by the researchers to describe these virtual reality spaces. Third, the text dataset was trained through the Bidirectional Encoder Representations from Transformers (BERT) classification model in natural language processing (NLP) for further application of spatial design guidance in architecture.

**Limitations**

Our dataset has two main limitations. First, the default objects in the virtual room such as windows and doors may affect the participants’ emotions about the spaces. Second, our EEG device can detect very limited brainwaves with active or calm states.

**Conclusion**

This research attempts to offer a useful NLP emotion classification dataset for architectural design improvement using everyday sentences. The dataset helps architects understand the virtual spatial emotions in everyday descriptions. Therefore, the trained BERT model from our dataset can be utilized to analyze everyday descriptions to obtain the pure spatial emotions as a resource to guide design.

Video 1

Experiment process

Video 2

The parameters of 10 VR rooms

Figure 1

The 10 VR rooms

Figure 2

EEG data analysis of Participant 26 in VR Room 7, the emotion is labeled as active since the EEG is above the baseline of the participants

Figure 3

The room scene, sentences example, and EEG data of Room 7

Figure 4

Sample of our dataset