

# Introducing Mood Swings

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**Abstract.** Mood Swings is introduced: an affective interactive art installation that interprets and visualizes affect expressed by a person. Founded on the integration of a color model and a framework for affective movements, Mood Swings recognizes affective movement characteristics, processes these, and displays a color that matches the expressed emotion. Mood Swings was successfully evaluated by 36 museum visitors, using Costello et al.'s Trajectory of Interaction [1].

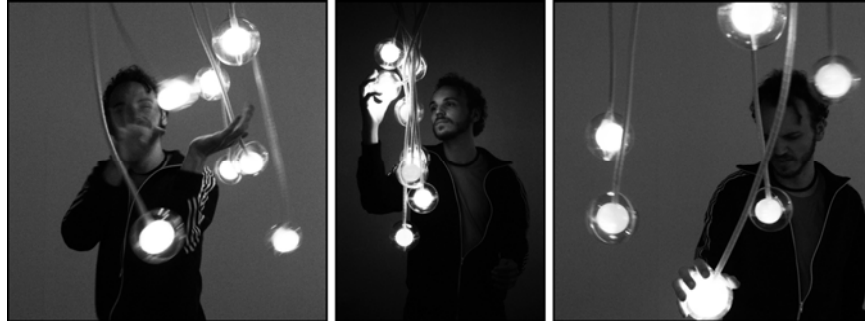
**Keywords:** Mood Swings, affect, movement, interactive art.

## 1 Introduction

With Sony's "smile shutter" [2], a photo camera was launched that recognizes whether or not the person in focus is smiling. The camera detects a smile, but is it possible to detect happiness? The field of affective computing is concerned with the design of systems that can recognize, interpret, and process emotions [3,4]. Picard, the spokesperson of affective computing, states that computers need the ability to (at least) recognize and express affect to achieve natural and intelligent interaction with humans [4]. Hence, interest shifts from intelligent to empathic products.

Affective technologies are also applied in creating (interactive) art. Artists use the new developments in technology with a twist to send their own message; here, science and art melt. For example, Shugrina, Betke, and Collomosse [5] developed an interactive artwork: The Empathic Painting. It recognizes the emotional state of a person through facial expression recognition, and uses this information to adjust the painting's color use and type of brushstroke. This allows users to experience digital art in a novel way.

It is interesting to expand this type of research to gain more insights in affective computing in different contexts. This resulted in Mood Swings, a light installation that tries to challenge the user to express his or her emotion. The installation consists of eight luminous orbs that react on movement and take on certain colors with distinct movements, creating patterns of light. Figure 1 shows a person interacting with Mood Swings.



**Fig. 1.** A person interacting with Mood Swings' luminous orbs.

## **2 Mood Swings' foundations**

### **2.1 Emotions Expressed in Movement**

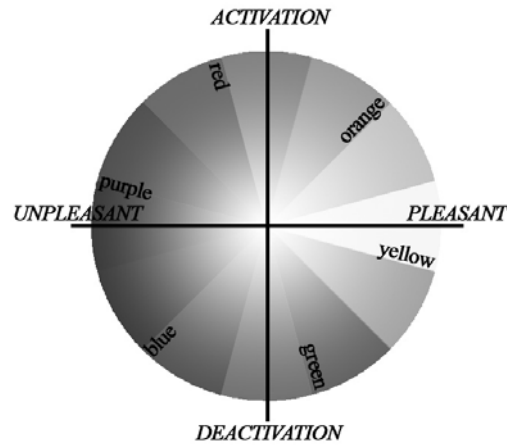
In general, affect is labeled by discrete or dimensional emotions. Discrete emotions use basic emotions (e.g., fear, joy, sadness) to describe the affective state. One widely accepted approach of the last category is described by Russell [6]; his circumplex model of affect describes emotions in two dimensions: valence (pleasure-displeasure) and arousal. This model is transformed by Lee, Park, and Nam [7] to be applicable to affective movements. They integrated movement characteristics into the affective dimensions: velocity and smoothness (the regularity of a movement).

The model of Lee et al. [7] was incorporated in the design of Mood Swings. The smoothness of a movement is linked to the valence axis, with smooth movements being pleasant and jerky movements being unpleasant. The velocity of a movement relates to arousal, with slow movements linked to low arousal and fast movements linked to high arousal. The emotion expressed by a user is thus derived from the movement pattern of the orb. To determine its movements an accelerometer was placed inside the orb.

### **2.2 Visualizing Emotion in Color**

We can feel blue, become red with anger, or green with envy. Due to evolution, personal experience, and cultural factors, meaning is given to color [8]. Goethe even believed that color appeals directly to the emotions [9]. Painters use this theory to provoke emotions in the audience. Ståhl, Sundström, and Höök [10] developed eMoto, a mobile messaging service that uses sub-symbolic expressions for expressing emotions. After writing a text message, a user can adjust the background (i.e., colors, shapes, and animations) of the message to fit the emotional expression s/he wants to achieve. They linked emotions to color according to Ryberg's color theory (as cited in [10]). In this theory, red represents the most powerful and strong emotions, and at the

other end of the color scale one finds blue, which represents less energy. Ryberg's color theory can be related to Itten's circular color model [10,11]. Itten's color system, on its turn, can be adjusted to fit Russell's circumplex model of affect, as is shown in Figure 2. When moving from the outside to the inside of the circle the colors fade to white in parallel to the decrease of both valence and arousal.



**Fig. 2.** Itten's color system [10,11] adapted to Russell's circumplex model of affect [6].

Mood Swings applies Itten's transformed color circle, as used in Ståhl et al. [10], using six colors in combination with the emotion-movement relation framework of Lee et al. [7]. Both are merged into one model, as is depicted in Table 1. The actual colors Mood Swings expresses are generated by six LEDs per orb that react on the accelerometer inside it. These colors represent users' movements, which reflect their emotional states: the essence of Mood Swings. The colors and their accompanying emotions are presented in Table 1.

**Table 1.** Mood Swings' input (movements) are interpreted as emotion in terms of valence and arousal and, subsequently visualized through colors. The relation between these aspects is shown in the table below.

Arousal	Valence	Color
High	Negative	Red
High	Positive	Orange
Neutral	Negative	Purple
Neutral	Positive	White
Low	Negative	Blue
Low	Positive	Green

### 3 Conclusions

Mood Swings was founded on a theoretical framework to facilitate the recognition of emotions as expressed in movements and reflects them by displaying corresponding colors. Mood Swings was evaluated by 36 museum visitors, using Costello, Muller, Amitani, and Edmonds' Trajectory of Interaction [1]. All the Trajectory's phases but one were observed. Hence, more evidence for The Trajectory of Interaction was provided, illustrating its generic applicability, and confirming Mood Swings' correct working. Thus with Mood Swings a unique interactive affective artwork was designed.

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