

# Towards Empathic TV Interaction using Body Postures

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## ABSTRACT

Empathy is usually associated with detection of someone's feelings and acting appropriately upon this. This act creates a feeling that the empathic person understands you. In this paper we explore whether postures, which people use to detect affective state, can be used to detect feelings of someone watching TV. We report on an initial experiment in this regard that replicated a study found in literature. In this experiment we were unable to detect a correlation between postures and emotions felt while watching a short series of video fragments. We discuss potential applications of the detected postures as such and reflect on situations that might trigger emotion-related posture change.

## Author Keywords

Affective states, emotion elicitation, television, body posture.

## ACM Classification Keywords

H.5.m. Information Interfaces and Presentation (e.g. HCI): User Interfaces, Interaction Styles.

## General Terms

Performance; Experimentation; Design; Human Factors.

## MOTIVATION & RELATED WORK

Television is part of our everyday life. The average person worldwide spends at least 3.2 hours a day watching television [2]. Yet televisions are not known for having intuitive user interfaces.

In this paper we explore body postures of TV viewers. Furthermore, we describe how analysis of these data can reveal insights on how people feel while watching TV. Our objective is to understand relationships between TV viewers' body postures and emotions to create empathic television interaction.

Research regarding the emotions experienced while watching television is mostly related to commercials [1, 6]. However, to our knowledge, there is no literature that intertwines

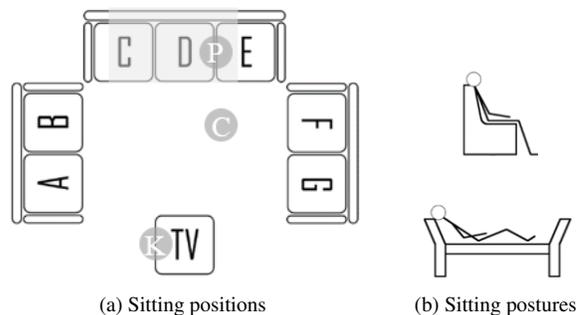


Figure 1: Most common sitting positions (C-E) and most frequent postures in study 1. Overlays indicate position of couch, participant (P), camera (C) and Kinect (K) in study 2.

body postures and corresponding emotions to investigate the way people watch TV. Therefore we conducted two studies to research this. In our first study we interviewed 15 participants regarding their sitting position and body postures while watching TV. The second study investigated the recognition of body postures of people watching TV and if body postures could relate to the current emotion of a viewer while watching video clips that elicited certain emotions.

## STUDY 1: TV VIEWERS POSTURES AND ACTIVITIES

We conducted a first study to get a better understanding of the context in which people watch television. Fifteen European participants (10 males and 5 females, with a median age of 21 years), were asked about their TV watching habits using a questionnaire. The items in the questionnaire include graphical depiction of preferences on the sitting positions (Figure 1a) and 4 postures of which 2 were most popular (Figure 1b).

The results from the questionnaire on sitting position were consistent with the results from the Japan Ergonomics society [2] gathered in 6 large countries on 4 continents. The most frequent sitting postures (Figure 1b) were leaning back (top) and lying stretched backwards (bottom).

## STUDY 2: USER OBSERVATION

We conducted a second study to observe the body postures and side-activities in a living room lab setting. The goals of this study were: (1) assess the subjective reports of the users about their body postures while watching TV, (2) determine how body postures change over time while watching movie fragments that elicit different emotions, and (3) explore correlations between body postures and viewers' emotions.

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EmpaTeX'14, June 25, 2014, Newcastle, UK.

## Procedure

After a briefing, participants were seated in a sofa as indicated in Figure 1a. The participants were then connected with a skin conductance sensor on their non-dominant hand and a webcam was used to capture their facial expressions. A three-minute baseline was established by watching a designated emotionally neutral video clip (i.e. stardust simulation). Every participant viewed a series of six emotion elicitation video clips. The video clips were identical to those used by Ray [8], with the exception of the clip that should trigger disgust, for which an animation was used on the same topic. After each video clip, the participants solved a simple mental quiz to let the participants resume a neutral state. After viewing all video clips, participants filled out a short survey in which they rated the intensity of their emotions, and valence and arousal on a 9-point Likert scale for each clip.

## Participants & Apparatus

Eleven undergraduate and post-graduate students were recruited (7 males and 4 females, aged 17 to 35, median 26). In our living room lab, which we arranged according to our findings from the first study (see Figure 1a), the Kinect was vertically tilted and turned so that the participant was visible from head to toe when standing exactly in front of the sofa seat at about 2.5 meters distance. We used the OpenNI framework for skeleton tracking. We implemented a posture recognizer that uses an existing approach [4] to define skeleton features for detecting different poses (such as arms crossed, lean sideways, etc.).

The affective state recognizer uses a ProComp Infiniti to measure the value of skin conductance, which can be approximated as a proportion to the arousal of the participants [7]. To avoid attaching EMG sensors on the participants' face, we opted to use FaceReader to automatically analyze facial expressions for the valence value. The values of arousal and valence were then normalized so that they could be generalized over all the participants based on Mandryk's approach [5] to determine the affective state by transforming the values of valence and arousal in a 2-dimensional emotion space. We used Weka to train a Naive Bayesian classifier on 5-seconds window averages of valence and arousal of each participant. We applied a filter on the average window valence in the interval [-0.05, 0.05], corresponding to the neutral region in arousal-valence space. An accuracy percentage of 66.3% was obtained from the trained classifier using the filtered data.

## Results

The average rating for all emotions per video clip was calculated over all participants. Statistical testing using a T-test is then used to compare the results to those reported by Ray [8]. We observed that the measured affective states and self-reports of our questionnaire survey followed the results from Ray [8] except for *leg surgery*.

By reviewing the video recordings of the body postures, we found that eight of the participants sat in a laid back position (confirming with our questionnaire results) and practically did not move during the series of video clips besides re-sitting on the couch (with the exception of one participant

leaning forward during the video clip on *Leg surgery*, which was intended to elicit disgust). This prohibits us of making correlations between postures and viewers' emotions.

## DISCUSSION

Our results indicate that it should be possible to detect high-level person-independent postures in a relatively reliable manner from skeleton information. It seems plausible that these detection rates could be even further improved when combined with properties of body movement, similar to the work presented by Kleinsmith et al. [4]. It can thus be worthwhile to use posture (and derived attention to the television) to drive television behavior e.g. lower volume when people in front of television are focused on a conversation.

In general, the measured and self-reported emotions were consistent with those reported by Ray [8]. We observed that participants rarely changed their posture during the series of video clips. This could be attributed to the fact that the feelings were not highly intense nor in group. When these factors both occur, people are known to show (reactions to) their emotions in movement [3].

## ACKNOWLEDGMENTS

We would like to thank Dries Vanmeert for his contributions. Part of this work was supported by the ITEA2 "Empathic Products" project, ITEA2 1105, co-funded by IWT 120171.

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