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# Influence of Head Orientation in Perception of Personality Traits in Virtual Agents

## (Extended Abstract)

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### ABSTRACT

The aim of this research is to explore the influence of static visual cues on the perception of a character's personality traits: *extraversion*, *agreeableness* and *emotional stability*. To measure how users perceived personality, we conducted a web-based study with 133 subjects who rated 54 images of a virtual character with varying head orientations and gaze.

### Categories and Subject Descriptors

H.4 [Information Systems Applications]: Miscellaneous

### General Terms

Experimentation

### Keywords

Personality perception, facial cues, virtual characters

## 1. INTRODUCTION

The motivation for this work can be stated as: *“is it possible to recognize someone's personality on his or her face?”*. Our premise is that personality can affect facial actions directly and independently of the mood [1], or the emotions. Therefore, we performed a study to explore how the personality traits of *extraversion*, *agreeableness*, and *emotional stability* [3] can be perceived when using two visual cues: head orientation and eye gaze. In the following, we present the experiment's methodology and results. We expect that: (1) the perception of each trait is influenced by the head orientation (e.g., there is a difference between facing upper-right or downwards-middle); (2) dependent on the personality trait, direction plays a role in how these traits are perceived (e.g., we expect a difference in how Extraversion is perceived in contrast to Agreeableness when the character is facing upwards); (3) variations of eye gaze further influence how the personality traits are perceived.

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## 2. EXPERIMENTAL STUDY

For this study we used a naturalistic head-only virtual character appearing as an elderly butler, named Alfred [2].

As for the stimuli we combined vertical (up, center, down) and horizontal (up, center, down) orientations for head and gaze, obtaining 9 targets for each cue, and a total of 81 images of both head orientation and gaze. However, a two-tailed independent *t*-test to the overall values for Extraversion, Agreeableness and Emotional Stability, dependent on the side the character is facing, led us to the conclusion that the direction of sideward head positions would not cause much of a difference. Thus we merged *left* and *right* oriented images into one “side” category. The associated eye gaze targets were mirrored to keep the proper relation between head and eye movements. In the end, we worked with a reduced set of 54 images (6 head directions × 9 eye gaze) of Alfred, where each image was judged at least 10 times. Combinations of orientations were written: <vertical>-<horizontal>, e.g. “upper-center”.

For the experiment 133 subjects (47 female and 86 male) participated through an online questionnaire. The mean age was 26.6 ( $SD = 8.8$ ). The questions were provided in English, German or Spanish, depending on the subject's mother tongue. The experimental stimuli consisted of 15 images per user presented one at a time, in random order. For each stimulus the participant had to answer to six items of the Ten-Item Personality Inventory (TIPI) [4] presented in a 7-item Likert Scale, where 1 corresponded to “Disagree Strongly” and 7 to “Agree Strongly”.

## 3. RESULTS

Over all ratings, Alfred was perceived neither as extraverted nor as introverted ( $M = 3.7$ ,  $SD = 1.2$ ). Further, he was perceived as neutral regarding agreeableness ( $M = 3.8$ ,  $SD = 1.4$ ). However, the subjects observed Alfred as slightly emotional stable ( $M = 4.3$ ,  $SD = 1.4$ ).

In the case of *Extraversion*, the one-way ANOVA showed a significant effect,  $F(5, 663) = 15.4$ ,  $p < .001$ ,  $\omega^2 = .10$ , while Tukey post hoc tests revealed several significant differences. Alfred with his head facing upper-side ( $M = 4.3$ ,  $SD = 1.2$ ) and upper-center ( $M = 3.9$ ,  $SD = 1.2$ ) was perceived significantly more extraverted than when pointing center-side, center-center, downwards-side and to downwards-center. The lowest values were obtained with the head facing

downwards-center ( $M = 3.5$ ,  $SD = 1.2$ ,  $p < .001$ ) (see Fig. 1). As we applied a two-tailed post hoc test, the significant results are also valid vice versa. Concerning eye gaze, we could not find any significant differences among the six head orientations combined with the nine gaze directions.



**Figure 1:** The head orientation *downwards-center* with the lowest rating (left) and *upper-side* with the highest (right) for *Extraversion*.

For the trait *Agreeableness*, there was a significant effect on its perception on levels of the different head orientations,  $F(5, 663) = 14.4$ ,  $p < .001$ ,  $\omega^2 = .09$ , while Tukey post hoc tests revealed several significant differences. The upper-side ( $M = 3.3$ ,  $SD = 1.3$ ) and upper-center ( $M = 3.1$ ,  $SD = 1.3$ ) head orientations were perceived as less agreeable than a head directed to the center-side, center-center, downwards-side and downwards-center. The highest values for Agreeableness were obtained when Alfred’s head was pointing downwards-center ( $M = 4.3$ ,  $SD = 1.2$ ,  $p < .001$ ) (see Fig. 2). Also for this trait, we could not find any significant differences for the varying eye gaze directions dependent on the six head orientations.



**Figure 2:** The head orientation *upper-center* with the lowest rating (left) and *downwards-center* with the highest (right) for *Agreeableness*.

In *Emotional Stability* the ANOVA test showed a significant effect,  $F(5, 663) = 3.6$ ,  $p < .01$ ,  $\omega^2 = .02$ , while Tukey post hoc tests revealed only one significant difference. The character directing its head to the center-side ( $M = 4.7$ ,  $SD = 1.2$ ) was perceived as significantly more Emotional Stable than when directing it upper-center ( $M = 4.0$ ,  $SD = 1.3$ ,  $p < .001$ ) or downwards-center ( $M = 4.2$ ,  $SD = 1.5$ ,  $p < .1$ ) (see Fig. 3). Again, eye gaze did not affect this trait’s perception.

#### 4. DISCUSSION AND CONCLUSION

The results of this exploratory experiment provided us with data that could be used to improve the modelling of



**Figure 3:** The head orientation *upper-center* with the lowest rating (left) and *center-side* with the highest (right) for *Emotional Stability*.

personality in virtual agents, and therefore, the communication between real users and these agents. An important aspect was the study of visual cues for certain personality traits that have been not studied before, as emotional stability and agreeableness.

With the experiment we concluded that, for the Alfred character the “upper-side” head orientation is related to extraversion, “downwards-center” head orientation to agreeableness, and “center-side” head orientation to emotional stability. We also found that the side to where the character is facing (left or right) and eye gaze do not influence the perception of personality traits.

We could also observe that people take into consideration other characteristics to infer personality. In this sense, and because of the nature of the study, it is necessary to perform more experiments related to these visual cues as well as other cues (physical characteristics of the face, gender, or facial expressions) in order to obtain a generalizable model.

The next step will be to create short animations using the data extracted in in this work, and verify whether characters with animated gaze and head behavior will elicit the same perceptions in the user.

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