The role of external features for person recognition

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1 Introduction

Face recognition is a remarkable human skill, as we are able to remember many thousands of faces. A great deal of research has investigated how it is possible to achieve such high levels of performance and what kind of information we encode to reach such a level of proficiency [Bruce and Young 1986]. One important distinction that is made in the literature is the distinction between external and internal facial features. Internal facial features refer to the size and outline of the eyes and mouth and their configuration. External facial features rather denote the shape of the face or the hairstyle associated with a particular face [Ellis et al. 1979]. Here, we explore this issue in the context of motion, an area that has only recently begun to concern face researchers [O'Toole et al. 2002; Knappmeyer et al. 2003]. In our displays avatars were animated to approach the observer in depth. Intuitively internal features are likely to play less of a role when a person is far away. Conversely, external features such as gait and clothing are likely to be more important if the person to recognize is further away.

2 Experiment and results

For the current experiment, two 3D head stimuli were taken from the MPI database (http://faces.kyb.tuebingen.mpg.de). Using Poser©, these heads were mounted onto male 3D avatars and animated as moving towards the observer. Each face was animated with the same body, clothes, hairstyles and walk pattern. Five different sequences were rendered for each face. The basic avatar (condition: STUDIED), was a casually dressed male body with a casual male hairstyle. In the other conditions this same avatar was used with one of the following modifications: long hair (LONG HAIR), no hair (BALD), dressed in business clothes (BUSINESS) or wearing a hat (HAT). See figure 1.

Figure 1. Example frames of the five conditions for one target face. (from left to right): STUDIED, HAT, BUSINESS, LONG HAIR and BALD.

To familiarize observers, two static images (final frames of the STUDIED moving sequences) were shown on the screen. Observers completed a questionnaire concerning personality traits and characteristic facial features. In the test phase, on each trial, a movie clip of one of the men approached them on the screen. Observers had to indicate as soon as possible, which of the two learned persons was approaching them. Across trials, the sequence condition was randomly varied.

For analysis, data were grouped according to observers who responded relatively quickly (< 100 frames (N=8)) and observers who responded relatively slowly (> 100 frames (N=7)). The overall accuracy of observers was in the range from 65% - 92% with a mean of 79.4%. Compared to the STUDIED condition (82%), only the addition of a hat consistently decreased performance (71%). For faster observers, the addition of long hair and a business suit consistently slowed their performance relative to the baseline STUDIED condition. This was not the case for the slower observers. Complete removal of the hair slowed observers in both fast and slow groups. These patterns are summarized in Table 1.

	BALD	HAT	BUSINESS	LONG HAIR
Fast group	8.29	6.68	10.68	8.36
Slow group	5.43	1.31	-2.94	-1.9

Table 1. Average RT data (in frames) for each condition presented as the difference from the STUDIED condition for the slow group and the fast group of observers. One frame equals 40 ms.

3 Conclusions

It is clear from the current results that observers do not base identity decisions solely on internal facial features. Both accuracy and RT results confirm that changes to external features can impair recognition performance to some extent and therefore are important for recognizing unfamiliar faces. Furthermore, we have shown that computer graphics and animation techniques can provide effective tools to investigate important perceptual issues in a greater detail than previously possible.

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