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Book review

Review of Face Recognition: Cognitive and Computational Processes, S.S. Rakover, & B. Cahlon; Amsterdam: John Benjamins Publishing Company, 2001, 304 pp

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The purpose of the book is to introduce the authors' original "Catch model" of face recognition and reconstruction. With this end in mind, they open the book with an extensive, systematic and critical review of the main theoretical and methodological issues involved in the conceptualization of and research on face recognition. Being goal-directed, the review does not provide a comprehensive coverage of the phenomena, models and experiments that are related to face recognition. Rather, it selectively discusses those aspects of face recognition that serve as a basis for the presentation and substantiation of the authors' own model.

As the authors rightly point out at the very outset, the issues involved in face recognition are specific cases of more general scientific issues; particularly as they relate to cognitive psychology. Adopting a cognitive (computational) approach to the study of face recognition, the authors are well

aware of its limitation in that it does not provide explanations for private experiences. This approach, it is also noteworthy, only marginally considers the neuroanatomical and neurophysiological aspects of face recognition whose interactive effects with the cognitive aspects of the process bears heavily on the philosophical issue of brain–mind relationships. Within the computational framework, the main methods used for face recognition are holistic template matching or analytic feature analysis of the target- and test-faces, and structural descriptions which also take into account the spatial relationships among the various facial features. Clearly, these methods are theoretically based in the sense that students of face recognition who believe that faces are perceived configurationally as a whole, and those who believe that they are perceived by feature-by-feature analysis, are likely to employ in their studies differential experimental techniques. These methods, however, are applicable not only to the study of faces, but also to the study of other visual stimuli.

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The question therefore arises if, and to what extent is face recognition special; that is, different from the recognition of other objects. This issue which has been preoccupying many scholars in the field, has not yet been conclusively solved.

The review opens with a brief description of the various face recognition tasks (such as comparison, recall and recognition) and their cognitive attributes, and proceeds with a discussion of several variables associated with face recognition (such as exposure duration, familiarity, attractiveness, facial expressions, distinctiveness, and own-race bias). Theoretical discussion and empirical evaluation of some basic conceptual issues then follows, with a focus on the mode of perception (holistic or analytic), and the nature of the facial stimuli (special or non-special). In conclusion, the authors observe that while none of the pertinent models has been definitely either supported or refuted by the data, there is a tendency to move from macrostructural to microstructural models of face recognition; that the many faces stored in memory are multidimensional sources of information; and that face recognition is basically a matching process.

However, the process of face recognition is interesting not only from a theoretical view point, but also from a practical perspective. The latter is manifested in procedures of face reconstruction, such as those used by the police in order to produce composites of suspected criminals by putting together isolated drawn (Identikit) or photographed (Photofit) facial features (such as eyes, mouth and nose). Unfortunately, these procedures have failed to produce good composites; mainly because the sample of facial features used for reconstruction is small (whereas the number of faces is infinite); reconstruction of the target face is based on verbal description (which impairs recognition); it involves examination of isolated facial features (whereas face recognition is naturally configurational); and it depends on the operator's skill (which may be inadequate).

These problems have led the authors to suggest a new, original model of face reconstruction, the Catch model, which by virtue of its advantages is supposed to replace the old, failing models. The Catch model is based on a two-stage procedure of experiment and response analysis. In the first stage,

a randomly chosen composite (target) face is presented, followed by a presentation of a series of pairs of composite faces. The participant's task is to tell for each pair which member is more similar to the target face. Analysis of the participant's choices in terms of the frequency of appearance of specific facial dimensions (hair and forehead, eyes, nose, mouth and chin) serves as a basis for the target face reconstruction. The major advantages of this procedure are obvious: It is based on nonverbal, configurational recognition rather than on verbal, featural recall; and, being computerized, it is independent of the operator's skill. The most important element in this procedure is the configurational recognition, since it is the naturally superior mode of face recognition. As such this procedure is expected to yield higher rates of correct identifications than the currently used featural procedures.

According to the authors, the Catch model (which they take pains to demonstrate that it is mathematically proven and empirically supported) differs from the older models of face recognition in that the former are descriptive, hypothetico-deductive (i.e., account for the person's responses), whereas the latter is prescriptive, deductive-reconstructive (i.e., reconstructs the target face from memory, based on a particular theory and the person's responses). Basically, face reconstruction follows the "law of face recognition by similarity", according to which the more similar to each other the individual composites in a given collection are, the more indistinguishable are the face values of the composites from each other, and the more inhibited is the reconstruction of the target face. Identification of the target face is possible from a small number of test faces, even when some errors are made in the process.

Clearly, because of the different goals and methodologies of the Catch model (of face reconstruction) and all other models (of face recognition), they are incomparable. Unlike the previous, descriptive models that focus on the process of face recognition by template matching, the prospective Catch model focuses on face reconstruction from memory. Undoubtedly, the advantages of the Catch model of face reconstruction over its predecessors make the procedure based on this model ideal for police work. It remains to be seen,

however, whether its success in the laboratory can be replicated in the real world. Some of the practical questions that come to mind are: Given the multitude of test faces in a mugshot, how long will the selective process of composites that resemble the target face (in the perceiver's mind) last? For how long can the perceiver focus attention on the selection task? What is an acceptable rate of identifications and misidentifications? These and other questions await the results of a systematic application of the new model in the field.

As a whole, the book entails a systematic presentation and a critical evaluation of models, methods and findings related to face recognition.

It should be of interest to cognitive psychologists (particularly those interested in face perception), as well as to practitioners (such as police interrogators) who are involved in person identification. The review provides a sound basis for the authors' original contribution, the Catch model, that is theoretically thought provoking, and practically challenging. It certainly has heuristic value in that it raises numerous questions that can be tested experimentally. Finally, the metapsychological issues involved in the construction and application of the Catch model should be of interest to students of the philosophy of science in general, and of the social sciences in particular.