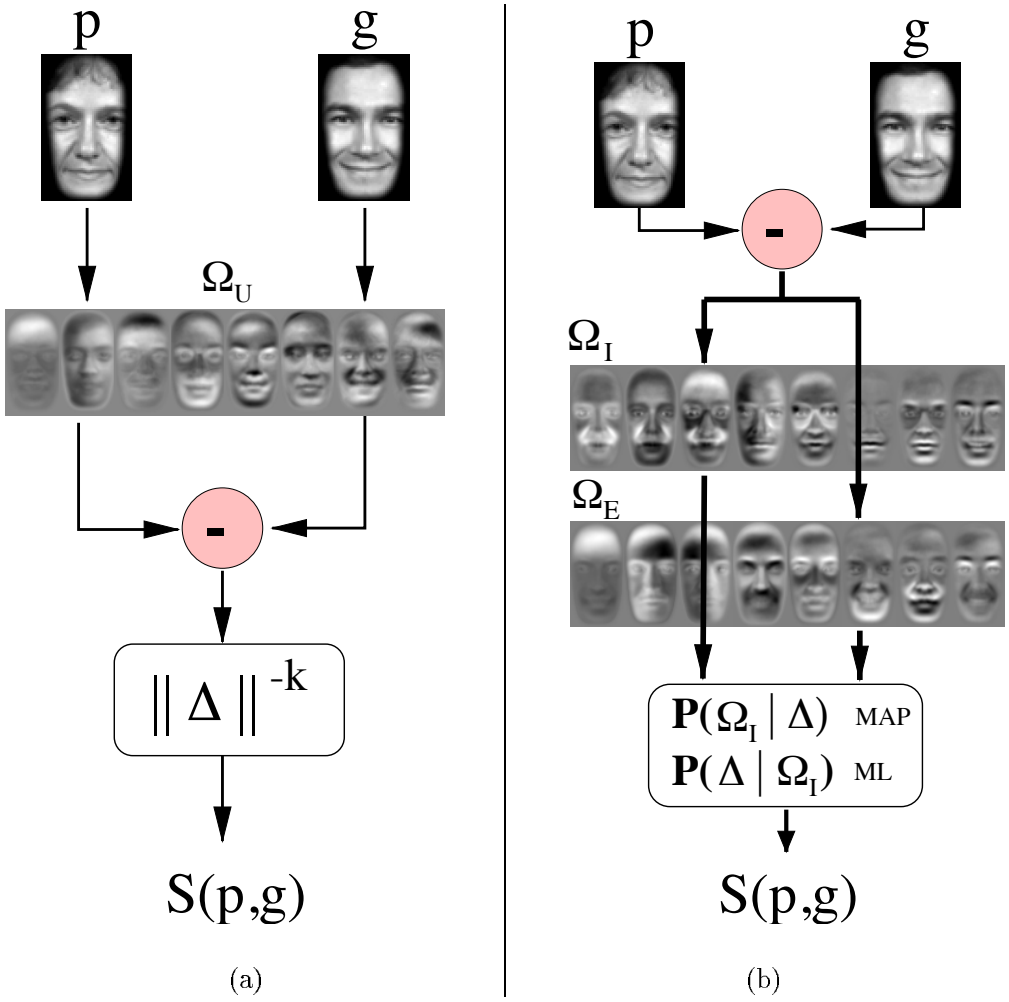

Figure 9: Operational signal flow diagrams for (a) Eigenface similarity and (b) Probabilistic similarity.

6 Conclusions

The performance advantage of our probabilistic matching technique was demonstrated using both a small database (internally tested) as well as a large (1100+) database with an independent double-blind test as part of ARPA's September 1996 "FERET" competition, in which Bayesian similarity out-performed all competing algorithms (at least one of which was using an LDA/Fisher type method). We believe that these results clearly demonstrate the superior performance of probabilistic matching over eigenface, LDA/Fisher and other existing Euclidean techniques.

This probabilistic framework is particularly advantageous in that the intra/extra density estimates explicitly characterize the type of appearance variations which are critical in formulating a meaningful measure of similarity. For example, the appearance variations corresponding to facial expression changes or lighting (which may have large image-difference norms) are, in fact, *irrelevant* when the measure of similarity is to be based on *identity*. The subspace density estimation method used for representing these classes thus corresponds to a *learning* method for discovering the principal modes of variation important to the recognition task. Consequently, only a single image of an individual can be used for recognition, thus