OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY
FACT SHEET

National Security

Facility Surveillance with Face Recognition

Facial Recognition in Unconstrained Environments

It has recently become clear that currently available face recognition algorithms are not robust in unconstrained environments. The presence of confounding factors, such as variable illumination, facial expression, and/or decoration (e.g., eyeglasses or facial hair), can reduce the performance of commercially available systems to unacceptable levels. Researchers at ORNL have developed a new face recognition algorithm that is significantly more robust to such factors and is suitable for personnel monitoring in secure facilities.

Base Technology

The ORNL face recognition method employs modular subsystems – each frontal face image is processed by three different observers, each trained to recognize different regions of the image (see Fig. 1). Each of these observers is a template-based classifier that employs a dimensionality reduction approach recently developed at ORNL called direct, weighted linear discriminant analysis (DW-LDA). The output of each of the three observers is then integrated using classifier combination to produce an identification result with a confidence measure. Experimental results have demonstrated that the ORNL system is robust in the presence of confounding factors.

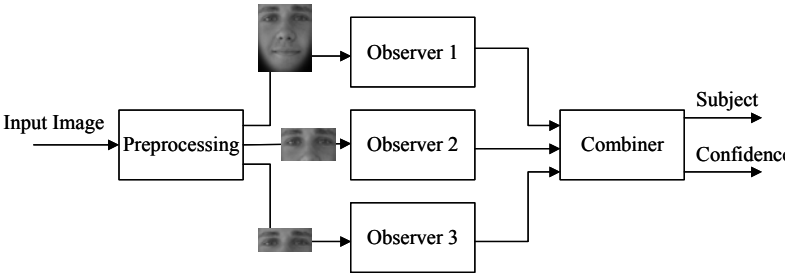

Figure 1. ORNL modular face recognition algorithm with three observers.

Applications

The target application for the ORNL face recognition technology is passive, automated personnel monitoring in secure facilities. The system can be combined with existing security measures, such as radio frequency personnel and material tags, to enhance facility security.

Specifications and Features

- Robust to illumination, expression, and decoration
- Easily extendible to multiple modalities (thermal, 3D) and multiple poses
- Provides confidence measure and can indicate multiple potential matches
- Intended for video-based personnel monitoring in secure facilities

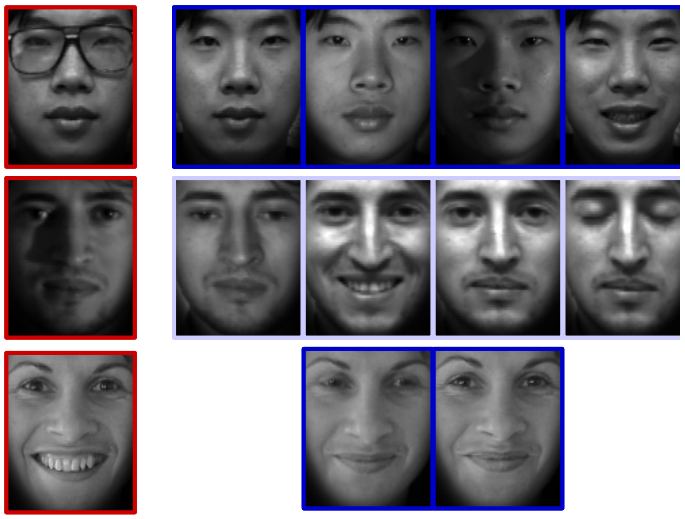

Figure 2. Successful queries (left) in ORNL system with complete training data (right). Note decoration (top), illumination (middle), and expression (bottom) variation in queries with respect to the corresponding training data.

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