



3D Face Authentication and Recognition Based on Bilateral Symmetry Analysis

AzTE Case #M04-077

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Intellectual Property Status:

Patent pending

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Background

Automatic face authorization has long been an active research area for its wide potential applications, such as law enforcement, security access, and man-machine interaction. Among various approaches, Principal Components Analysis (PCA) to face imaging is now a cornerstone in face recognition. However, 2-D face recognition methods are in general unable to overcome the problems resulting from illumination, expression or pose variations. The emerging trend noted by many researchers in the field of face recognition is the 3-D technology. 3-D method is more accurate and is able to overcome the problems of 2-D methods, as 3-D information is viewpoint and lighting condition independent.

Invention Description

Researchers at Arizona State University have developed a novel approach for *3-D Face Authentication and Recognition Based on Bilateral Symmetry Analysis* that identifies 3-D triangular facial mesh by a 3-D scanner and extracting unique features for authentication from a database of 3-D face scans.

This invention utilizes the ready availability of such a data to provide a system of face authentication and recognition by real-time scanning of an individual's face in 3-D and instantly matching it in a database of 3D scans.

Utilizing both the mean curvature plot of the facial surface and the curvature plot of the symmetry profile curve, three essential points of the nose on the symmetry profile are automatically extracted. The three essential points uniquely determine a Face Intrinsic Coordinate System. Different faces are aligned based on the FICS. The Symmetry Profile, along with two transversal profiles, namely the Forehead Profile and the Cheek Profile compose a compact representation, called the SFC representation of a 3-D face surface. The face authentication and recognition steps are finally performed by comparing the SFC representation of the faces.

Potential Applications

- **Security** – Providing accesses to the designated people to areas of high security.
- **ATMS/BANKS** – Provide authentication and a validity measure for secure transactions
- **Airports/Immigration** – Help governments by storing a database of current immigrants and identify them alongside fingerprinting.

Benefits and Advantages

- **Usability** – Portable 3D scanners can now take face scans at high level of detail in instant time. Therefore enabling accurate feature extraction from the face scans
- **Cost** – The application of the system can be easily integrated with current biometrics at very little cost, the scanner costs are negligible as they only occur as a one time establishment cost
- **Accuracy & Effectiveness** – Results are shown to be far more accurate than current day 2D systems. Adaptability and ease of integration with other biometrics make it extremely effective for replacing existing technologies.