Surface Geodesic Derivative Pattern for Deformable Textured 3D Object Comparison: Application to Expression and Pose Invariant 3D Face Recognition

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Abstract : This paper presents a new Surface Geodesic Derivative Pattern (SGDP) for matching textured deformable 3D surfaces. SGDP encodes micro-pattern features based on local surface higher-order derivative variation. It extracts local information by encoding various distinctive textural relationships contained in a geodesic neighborhood, hence fusing texture and range information of a surface at the data level. Geodesic texture rings are encoded into local patterns for similarity measurement between non-rigid 3D surfaces. The performance of the proposed method is evaluated extensively on the Bosphorus and FRGC v2 face databases. Compared to existing benchmarks, experimental results show the effectiveness and superiority of combining the texture and 3D shape data at the earliest level in recognizing typical deformable faces under expression, illumination, and pose variations.