

# 2D-TO-3D FACE RECOGNITION SYSTEMS

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**Abstract:** We present developments for generating 3D geometric models from one or more photographs via 2D-to-3D technologies for building pose and lighting invariant face recognition (FR) systems. These systems extend legacy FR systems from their controlled application in access control and document verification to the uncontrolled settings of surveillance and passive identity management. The technologies described extend techniques from the field of computational anatomy to accommodate the projective geometry associated with video imagery. By integrating facial information from 2D projective photographs taken from arbitrary positions and pose via the 3D generated models, we demonstrate results from fully pose-invariant face recognition systems, Animetrics90 which is shown to perform ID up to  $-45^\circ$  and  $+45^\circ$  of pose and Animetrics180 operating on full profile.

We present recent developments for generating 3D geometric models from one or more photographs via 2D-to-3D technologies for building pose and lighting invariant face recognition (FR) systems. These systems can in principle extend legacy FR systems from their relatively controlled application in access control and document verification to the uncontrolled settings of surveillance and passive identity management. By integrating facial information from 2D projective photographs taken from arbitrary positions and pose via the 3D generated models, fully pose-invariant FR systems can be demonstrated. Such systems can perform identification (ID) up to  $-45^\circ$  and  $+45^\circ$  of pose and offer the potential of fully integrated profile ID systems as well.

**Keywords:** biometrics; 3D avatars; profile recognition; pose normalization; deformation