

In this paper, a new dynamic facial expression recognition method is proposed. Dynamic facial expression recognition is formulated as a longitudinal groupwise registration problem. The main contributions of this method lie in the following aspects: 1) subject-specific facial feature movements of different expressions are described by a diffeomorphic growth model; 2) salient longitudinal facial expression atlas is built for each expression by a sparse groupwise image registration method, which can describe the overall facial feature changes among the whole population and can suppress the bias due to large intersubject facial variations; and 3) both the image appearance information in spatial domain and topological evolution information in temporal domain are used to guide recognition by a sparse representation method. The proposed framework has been extensively evaluated on five databases for different applications: the extended Cohn-Kanade, MMI, FERA, and AFEW databases for dynamic facial expression recognition, and UNBC-McMaster database for spontaneous pain expression monitoring. This framework is also compared with several state-of-the-art dynamic facial expression recognition methods. The experimental results demonstrate that the recognition rates of the new method are consistently higher than other methods under comparison.