

Face recognition in uncontrolled conditions - Can compressive sensing and super-resolution meet requirements of this challenge?

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Significant face recognition accuracy has been achieved for under controlled conditions whereby images are of reasonable quality. Indeed, significant accuracy has been achieved by schemes designed to mitigate modest variations in illumination and pose. This paper is concerned with face recognition under uncontrolled conditions whereby captured images are severely degraded and of low resolution, e.g. at a distance in surveillance scenarios, and post-rioting forensic. Challenging factors include difficulties in determining a model of degradation that encompasses a range of realistic conditions. Super-resolution techniques have been developed to improve resolution but the success has been modest in improving the quality of the super-resolved images. The emerging paradigm of Compressive Sensing (CS) could provide new schemes to super-resolve face images from low-resolution degraded images, using over-complete dictionaries. The existence and recovery of super-resolved face images assumes that these dictionaries satisfy some form of Restricted Isometry Property (RIP). Face recognition schemes have been developed that initially super-resolves degraded low resolution images using pairs of dictionaries learnt from a large set of good quality high resolution face images and their artificially blurred and down-sampled versions. The recognition rates are rather modest in comparison to recognition at the low resolution. Moreover, CS prefers un-adapted dictionaries. We shall demonstrate that non-adaptive deterministic as well as non-deterministic dictionaries achieve face recognition accuracy levels as good as, if not better than, those achieved by learnt dictionaries learnt from face image databases using elaborate procedures. We shall also compare these dictionaries in terms of the known numerical RIP indicators.

Biography

Sabah A. Jassim is a graduate of Baghdad University (B.Sc. & M.Sc. in Mathematics) and gained his Ph.D. in Mathematics from the University of Wales-Swansea. He held various lecturing posts at UK and international institutions including Sulaimani University Iraq, University of Swansea, City University - London, and Fachhochschule Wedel – Germany. In 1989, he joined the University of Buckingham where he is currently Professor of Mathematics and Computation, and head of Applied Computing department. His research interest includes face biometrics and recognition, security of biometric templates, compressive sensing, steganography, visual speech/word recognition, emotion detection/recognition, and analysis and classification of biomedical imaging.

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