

In this paper, a robust fringe projection profilometry (FPP) algorithm using the sparse dictionary learning and sparse coding techniques is proposed. When reconstructing the 3D model of objects, traditional FPP systems often fail to perform if the captured fringe images have a complex scene, such as having multiple and occluded objects. It introduces great difficulty to the phase unwrapping process of an FPP system that can result in serious distortion in the final reconstructed 3D model. For the proposed algorithm, it encodes the period order information, which is essential to phase unwrapping, into some texture patterns and embeds them to the projected fringe patterns. When the encoded fringe image is captured, a modified morphological component analysis and a sparse classification procedure are performed to decode and identify the embedded period order information. It is then used to assist the phase unwrapping process to deal with the different artifacts in the fringe images. Experimental results show that the proposed algorithm can significantly improve the robustness of an FPP system. It performs equally well no matter the fringe images have a simple or complex scene, or are affected due to the ambient lighting of the working environment.