(a) Original image

(b) Noisy image, PSNR = 13.55, SNR = 5.23

(c) NLEM, PSNR = 25.68, SNR = 17.36, FSIM = 0.952

(d) VNLEM, PSNR = 25.48, SNR = 17.16, FSIM = 0.944

(e) VNLEM-DD, PSNR = 25.54, SNR = 17.21, FSIM = 0.943

(f) NLEM, difference, SOB = 0.033

(g) VNLEM, difference, SOB = 0.042

(h) VNLEM-DD, difference, SOB = 0.044

FIGURE 11. Example 4: the clock.

Second, although the manifold model has been widely accepted in the field, and our algorithm is also based on the manifold structure, it is certainly arguable if in general a patch space could be well approximated by a manifold. On one hand, we need to consider a more general model than the fiber bundle; on the other hand, for different problems we may want to better understand its associated manifold structure, if there is any. In other words, we might need different models, and hence different metrics, for different kinds of images. For example, while the RID helps reduce the dimension of the patch space of a "structured" image, its deterministic nature might render it unsuitable for analyzing a "texture" image, since the texture features are stochastic in nature. In short, it might be beneficial to take the metrics designed for the texture