3. Comparison analysis of the denoising effect

Consider Gauss white noise with the same type and intensity (standard deviation is 10), the performance of the proposed algorithm and MP algorithm is compared in table 1.

Table 1. Denoising effect comparison

Algorithm	MSE	PSNR（dB）	CPU（s）
MP	29.01	28.56	5.5
The proposed	19.24	29.92	4.1

From the table 1, we can see that the algorithm can get a higher PSNR and smaller MSE, so the denoising effect is better. And through CPU running time for 50 images denoising (the data is the average of 10 times experiments) , the proposed method has shorter running time than MP algorithm, which confirms that the new algorithm can effectively improve the efficiency of sparse decomposition.

5. CONCLUSIONS

Image denoising based on sparse decomposition means decomposing the noisy image into sparse components and the other components. The sparse component corresponds to the useful information of the image, while the other components correspond to the noise in the image. Noise can be effectively removed from the image through reconstructing image by the sparse component. Based on the commonly existing algorithms, we proposes the gradient MP algorithm in this paper. The efficiency of sparse decomposition is effectively improved. To a certain extent, it improves the values of PSNR, which confirms the better denoising effect.

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