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**Statistical mechanics of image processing by digital halftoning**<sup>1</sup> JUN-ICHI INOUE, WATARU NORIMATSU, Hokkaido University, YOHEI SAIKA, Wakayama NCT, MASATO OKADA, The University of Tokyo — We consider the problem of digital halftoning (DH). The DH is an image processing representing each grayscale in images in terms of black and white dots, and it is achieved by making use of the threshold dither mask, namely, each pixel is determined as *black* if the grayscale pixel is greater than or equal to the mask value and as *white* vice versa. To determine the mask for a given grayscale image, we assume that human-eyes might recognize the BW dots as the corresponding grayscale by linear filters. Then, the Hamiltonian is constructed as a distance between the original and recognized images which is written in terms of the mask. Finding the ground state of the Hamiltonian via deterministic annealing, we obtain the optimal mask and the BW dots simultaneously. From the spectrum analysis, we find that the BW dots are desirable from the view point of human-eyes modulation properties. We also show that the lower bound of the mean square error for the inverse process of the DH is minimized on the Nishimori line which is well-known in the research field of spin glasses.

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