Colorization of Monochrome Photography without Coloring Samples

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Currently, most colorization of black-and-white photos is performed manually. However, manual colorization is expensive, as well as being inaccurate because of depending on the intuition of technicians. If the true colors could be acquired directly from only the target image, without requiring reference material for color clues from the same time period, then colorization could be performed more accurately and cheaply even if the material of the target photo is poor for providing color clues, such as in the case of family photos. Therefore, the present research proposes an automatic theory-grounded colorizing method. First, a three-dimensional color model which expresses colors as vectors adjusted to the appropriate brightness was constructed. Experimental results indicated that the standard colors in the image of a single-color object with shading are almost the same. Therefore, with the help of values called inflection points, a standard color can be used to approximate all colors in the image. Next, by using an equation employed in CG rendering, color differences can be approximated as differences between normal vectors in the case of a single-color objects. Therefore, it is possible to replace the image. By comparing the original image to an ideal model which fits conditions at the time that the photo was taken, a colorized version of the image can be created. This approximation process restored the image with a mean error rate of 4%, given the appropriate standard color. The developed cheap, automatic, theory-based method is considered to be well suited for replacing conventional colorizing methods.

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