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$$H(X) = E[I(X)] = E[-\ln(P(X))],$$

Image Enhancement Techniques using Information Entropy

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Abstract. In this report, we implement Shannon's information theory on image processing and generate entropy map to use weight assignment. Simulation results show Shannon's entropy map on different images.

Keywords: Image, entropy, information theory.

1 Introduction

$H \quad X \quad = \quad P \quad x \quad I \quad x \quad = \quad - \quad P \quad x$

$(\quad) \quad (\quad) \quad (\quad) \quad (\quad) \log \quad (\quad),$

The entropy is an assessment measure of the vagueness in random variable for information theory. Normally, this entropy indicates Shannon entropy. The entropy is the average unpredictability in a random variable, and this is equivalent to its information.

In this report, we implement Shannon's entropy on test images and obtain entropy map. In Section 2, we review the Shannon entropy theory and present the block diagram of our presented idea. Sections 3 and 4 show the experimental results and conclusions.

P

$i \quad i \quad i \quad b \quad i$

$i \quad i$

2 Review of Entropy Theory and Presented Idea

Shannon denoted the entropy *H* of discrete random variable *X* as,

(1)

where *E* is the estimated value operator, and *I* is the information of *X*. The entropy can be written as

(2)

where *b* is the base of the logarithm used, and commonly we use *b*=2.

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Figure 1 shows the block diagram of the presented idea.

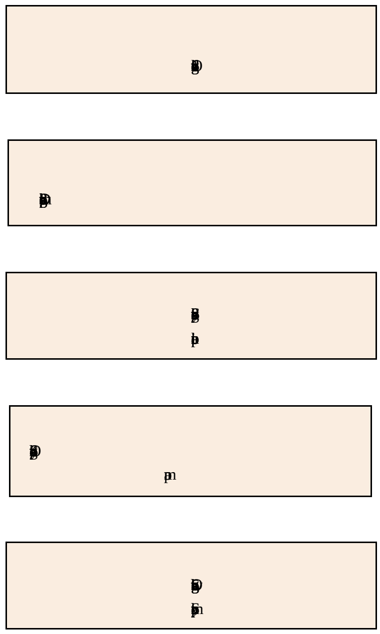

Fig. 1. Block diagram of the proposed method.

3 Experimental Results

Figure 2 shows obtained Shannon entropy map.

(a) (b)

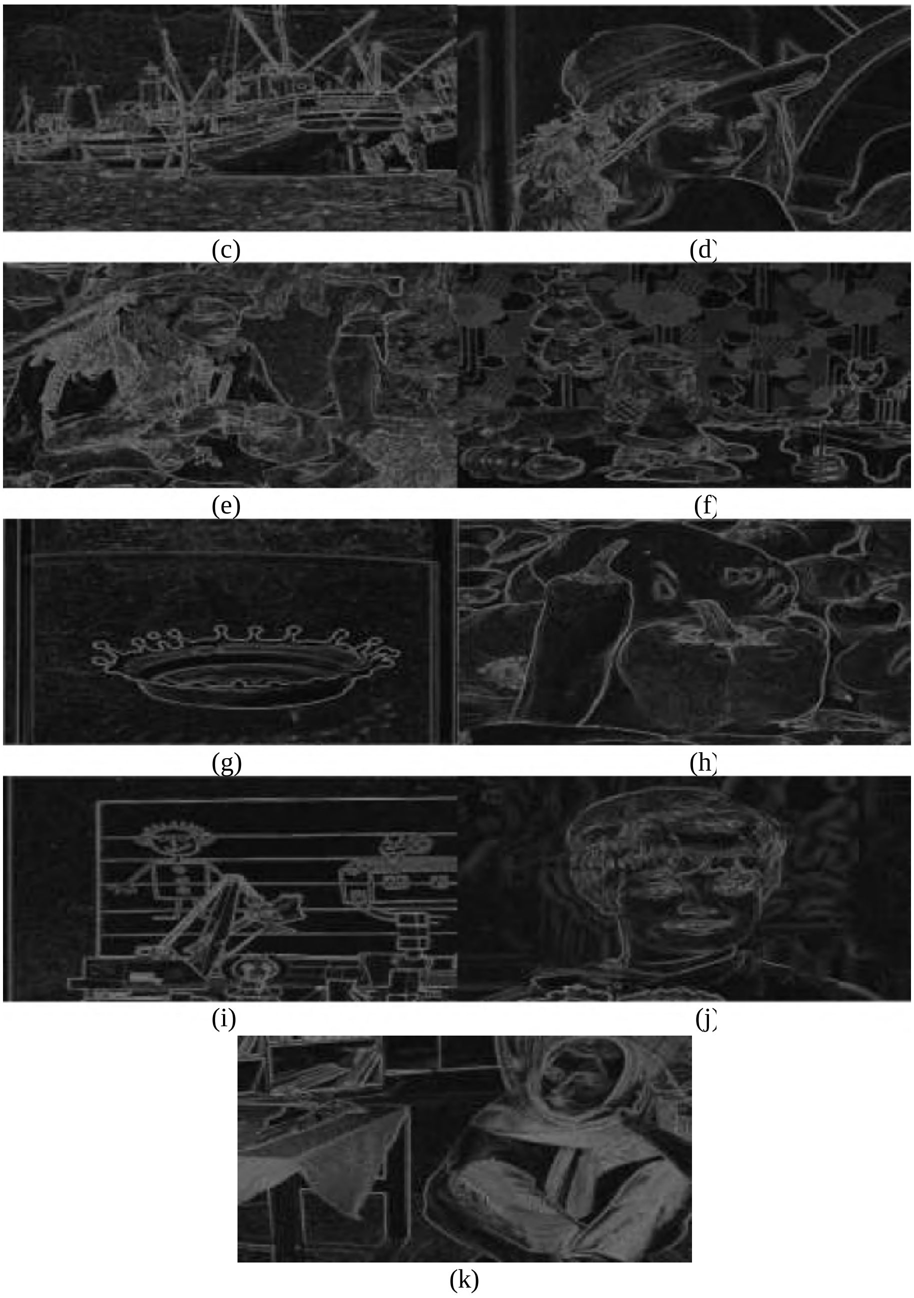

Fig. 2. Shannon entropy map on different images: (a) Airplane, (b) Baboon, (c) Boat, (d) Lena, (e) Man, (f) Girl, (g) Milkdrip, (h)Pepper, (i) Toy, (j) Zelda, and (k) Barbara.

4 Conclusion

In this report, we implement Shannon's information theory and generated entropy map to use weight assignment. Simulation results show visual quality of obtained Shannon's entropy map on different images.

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