State-of-the-art methods for bi-level image compression rely on two processes of modelling and coding. The modelling process determines the context of the coded pixel based on its adjacent pixels and using the information of the context to predict the probability of the coded pixel being 0 or 1. The coding process will actually code the pixel based on the prediction. Because the source is finite, a bigger template (more adjacent pixels) doesn’t always lead to a better result, which is known as “context dilution” phenomenon. Adaptive tree modelling is our new method for preventing the context dilution. It’s easier to view this method by considering a pruned binary tree. The tree has a maximum depth of Md (which can reach to many hundreds). The leaves of the tree correspond to the contexts. Each node of the tree has a data structure with the statistical information of the context, the number of times this context has been visited, and two pointers to its children contexts.

In this method, the template used for each coded pixel will have variable size. The method utilizes a list of pre-ordered adjacent pixels. The model starts by a template with no pixel. This corresponds to the root of the tree. Whenever this context is visited more than a fixed number of times, which is defined by a threshold parameter, we will create two children contexts from the original context. These correspond to the value of the first pixel in the list of pre-ordered adjacent pixels. Whenever these children contexts are created, the contextual information is copied from parental node to children nodes, so a children context doesn’t have to learn the distribution from the beginning. It has only to adapt the distribution information inherited from its parental node to its own distribution.

We have implemented the proposed method in software. Experimental results over ITU-T test images show that the proposed method outperform standard methods using static templates.

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