Abstract

The goal of this dissertation is to study, implement and analyze enhanced compression methods for road map images. Such images have characteristics that are not well-exploited by existing compression standards such as JPEG or file formats such as GIF.

Approaches based on a statistical lossless compression technique, known as arithmetic coding with adaptive context-based modeling, were tried. Arithmetic coding is known to give optimum compression, given a model of the data.

Two approaches involving context-based modeling were used. The first is bitplane coding, where the image is decomposed into bitplanes, and compression is applied to each bitplane using fixed order context modeling. The second is Prediction by Partial Matching (PPM), which is the state-of-the-art in text compression and adapted here for image compression. It uses variable order context modeling. A method combining both bitplane coding and PPM, each acting independently on the different image planes, was also investigated.

The methods were implemented and tested on randomly selected road map images. Several characteristics of the methods were investigated and the best parameters were found to obtain the most effective compression.

All the methods were able to compress the test images effectively. Compared to GIF, PPM gave an overall reduction of up to 62.8%, while bitplane coding gave a reduction of 43.6%. The compression effectiveness of the combined method was close to that of PPM, but has the advantage of better scalability, which is a problem for PPM. These methods warrant further investigation for use in other types of map images.