Chapter XI
Web Map Servers Data Formats

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ABSTRACT

Web map services, such as Google Maps and MapQuest, are among the most popular sites on the Internet. One can easily access these services through a Web browser on a personal computer or mobile device. The high accessibility and efficiency offered by these sites is possible, in part, by the use of standard image formats. The present review is a description of the most common image formats available from web map servers nowadays, as well as other formats with great possibilities for the future. We describe raster and vector formats and highlight advantages and disadvantages in each case. We also refer to protocols and image formats supported by the Open Geospatial Consortium (OGC) standards.

INTRODUCTION

Web map servers are currently very popular on the Internet. By serving data through the standard HTTP/HTTPS protocols many clients have access to map information. Some examples of public Web map servers are Google Maps and MapQuest which provide map images that can be seen on a regular Web browser. Web map servers may return data in different formats in response to a query. The most typical types of data provided by such servers are map images, although some feature descriptions and other properties are served as well. Map image formats can be divided into

two main classes: raster and vector maps. Several formats from each class will be presented below with a comparative analysis of them. For each class, a table that outlines the comparison among the formats is included. The author also refer to some of the standards developed by the Open Geospatial Consortium (*OGC*) and the image data formats supported thereby.

RASTER FORMATS

A raster or pictorial image consists of a 2-dimensional array of pixels. An uncompressed raster image is typically referred to as a bitmap. The most commonly used raster formats on the Web are *GIF* (W3C, 1990), *JPEG* (W3C, 2003a), and *PNG* (W3C, 2006). These formats can be visualized in every Web browser without the need of any additional plug-in or component. Another raster format that has been largely used in GIS desktop applications is TIFF. A TIFF image can contain tags with additional information such as the georeferencing information of GeoTIFF. It can also contain multiple layers in a single image or different types of compression. These, among other features, make TIFF a very flexible but complicated format. Therefore, common Web browsers do not support TIFF and its use on the Internet is very restricted.

JPEG shows its advantages over the rest of the Web suitable raster formats by the compression ratio that can be achieved. It is the best choice for aerial photographs and satellite images. However, GIF and PNG are better for compression of images with evenly colored areas; their compression is loss-less as opposed to JPEG. Some examples of images that can be compressed as GIF or PNG are those generated out of geometric elements such as topography or road maps, also those with homogeneous areas such as bathymetry images. Furthermore, GIF and PNG support transparency which is very useful when the elements in the image do not cover the whole space so several images can be superimposed on top of each other. This is often the case when the elements included in the maps are points and polylines. Even though it is possible to superimpose images, it causes problems of its own. The overlapping needs to be implemented on the client side application, which usually runs on a Web browser. Because of differences in the way Web browsers layout the page contents, and other incompatibilities, the solution may be somewhat tricky.

Although GIF and PNG are very similar, some differences can be pointed out. PNG is more recent than GIF; it was created to fulfill the patent related problems with the algorithm used in the compression of a GIF image. In addition, GIF is limited to a maximum of 256 colors. Although

Table 1. Comparison of raster formats supported by WMS

Feature \ Format	***JPEG***	***GIF***	***PNG***	***TIFF***
Transparency	No	Yes	Yes	Yes
Supported by Web browsers	Yes	Yes	Yes	With the use of plug-ins
Number of colors	Over 16 million	256	Over 16 million	Over 16 million
Compression	Lossy, better for photographs	Loss-less, better for images with uniformly colored areas. Formerly patented	Loss-less, better for images with uniformly colored areas	Different methods
Georeferenced	No	No	No	Yes, with special tags for it