

Comparative Study of JPEG & TIFF File Formats for Geographic Information System based on Road Map of Chandigarh

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Abstract

Image file formats are standardized means of organizing & storing digital images. Basically Image files consist of two graphic formats either vector or raster. In this paper authors are comparing to raster file formats Tagged Image File Format (TIFF) and Joint Picture Expert Group (JPEG), and advantages of TIFF over JPEG for GIS based applications. The objective of this research is to evaluate the results and characteristics of image file formats in GIS applications. The evaluation and analysis of image files are based on visual assessment and analysis of various attributes. The result of this experiment is mainly to evaluate the revenue maps pixels, size of maps, outlining the advantages and disadvantages between two file formats. The investigation indicates that JPEG and TIFF format files appears to have discrepancy in the original image file and also have differences in their respective sizes. Result shows that TIFF is better than JPEG from GIS perspective as size is maintained during scanning and after editing, so files are not compressed and data is not lost, due to these advantages accurate spatial data analysis can be performed on GIS applications.

Keywords: Tagged Image File Format (TIFF), Joint Photographic Expert Group (JPEG), Geographic Information System (GIS), Lempel-Ziv-Welch (LZW)

1.1 Image File Format

Image File Format is the means of storing digital images. Images are made of pixels, geometric data, or a combination of two. It is possible that every format is rasterized to pixels. Pixels are combination of grid cell and each pixel constitutes a magnitude of color. On the basis of computer graphics two file formats are used vector file format and raster file format which further divide in extensions. Here we perform comparison between two extensions of raster graphic format JPEG and TIFF file and proposed a TIFF extension is better than a JPEG extension, for GIS applications on the basis of Road map of Chandigarh.

1.2 Raster

Raster graphics are the most common type of image files. It is a data structure generally rectangular grid of pixels, which is viewable by a monitor, paper or other display

medium. It is graphical technique using array of pixel values where each pixel represent a color. Raster graphics is resolution dependent. Raster images are produced by digital image capture devices: digital scanners or digital cameras or by pixel editing programs. Raster images are composed of matrix bitmap of digital picture elements (pixels) [1].

1.3 Lempel-Ziv-Welch

LZW is named after Abraham Lempel Jakob Ziv and Terry Welch, the scientists who developed this compression algorithm. Dictionary based algorithms scan a file for sequences. These sequences are then stored in a dictionary and within the compressed file, references are put wherever repetitive data occurred. LZW compression replaces strings of characters with single codes. It does not do any of the incoming text. Instead, it just adds every new string of characters it sees to a table of strings. Compression occurs when a single code is output instead of a string of characters. The code that the LZW algorithm outputs can be of any arbitrary length, but it must have more bits in it than a single character. The first 256 codes are by default assigned to the standard

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character set. The remaining codes are assigned to strings as the algorithm proceeds.

1.4 JPEG

JPEG compression is used in a number of image file formats. JPEG is the most common image format used by digital cameras and other photographic image capture devices; along with JPEG/JFIF, it is the most common format for storing and transmitting photographic images on the World Wide Web. These format variations are often not distinguished, and are simply called JPEG [2].

1.5 Geographic Information System

GIS is a set of computer tool that allows people to work with data that are tied to a particular location of the earth. GIDs are used to input store, manage, analyze and display data. GIS allows us to view, understand, question, interpret & visualize data in many ways that reveal relationship, pattern, and trends in forms of maps, globe, report and chart.

From GIS perspective TIFF format is better because there is no data loss in this format so, visualization of different objects and geographical data managed easily, map projection and spatial referencing is done in a better way and data analysis of different locations can be done accurately.

Scanning in GIS

GISA scanning technology continues to improve; the uses for scanned maps continue to grow, especially for data conversion. Scanning facility and property maps for terrorization will be a major use and will continue to inverse as automated conversion techniques continue to advance. The scanning of irreplaceable document allows the safe handling of raster images. Second maps have several uses for GIS data conversion [3].

Comparison between JPEG and TIFF

Table 1 shows the comparison between JPEG and TIFF on the basis of various factors and below it various tables are shown of maps which are scanned in both formats and comparisons is perform on them by considering various factors.

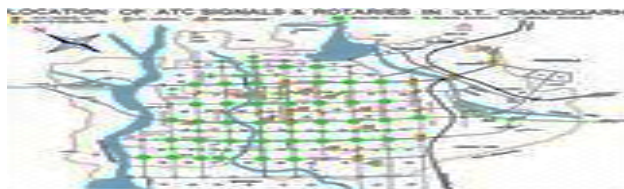


Figure 1 Road Map of Chandigarh scanned in JPEG format.

Figure 1 and 2 shows the maps of Chandigarh road which are scanned in both formats and comparison is perform on it by considering various properties. As shown figure 2, road map of Chandigarh in TIFF, which have more in size because of lossless compression, data should be maintain so that accurate spatial analysis perform.

For comparative study of other locations tables should maintain which shown comparison on the basis of various properties.

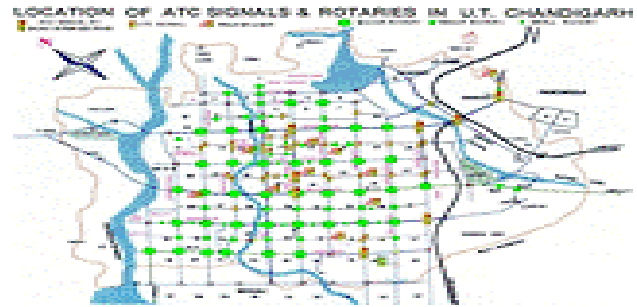


Figure 2 Road Map of Chandigarh scanned in TIFF format.

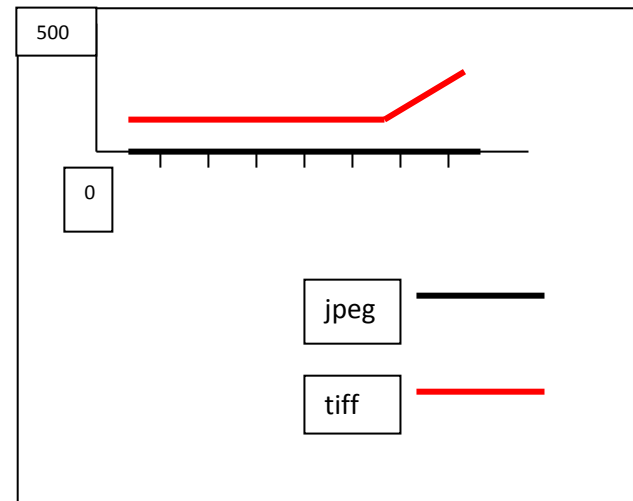


Figure 3 Graphical Comparison of Revenue as on the basis of size (Size in Megabytes)

This sample file was saved in two file formats – the relative sizes are shown in graph on the right. As we can see, the flattened TIFF has a significant size advantage over JPEG format. As shown in Figure 3 TIFF file size is more than JPEG because there is no data loss in TIFF format. Other comparative study performs on the basis of map editing. As editing is perform on JPEG files their properties should be vary but in TIFF they remain same. There is change in file size after editing. As results shown there should be sustainable change in file size after editing in JPEG. So TIFF is better choice for GIS because editing is perform on file its property remains same means data maintain in its original form so data analysis performs accurately [4].

Table 1 Comparison of JPEG and TIFF with general attributes.

S. No.	Attributes	TIFF	JPEG
1	Compression Algorithm	Lossless, so accurate data analysis performed.	Lossy, so data analysis is cumbersome.
2	Errors	Reduced, so accurate geodatabase is created.	Not reduced, so not suitable for geodatabase.
3	Color Management	Easier, so better for digitization.	Digitization is typical because accurate location cannot be shown.
4	File Size	Maintained, as after scanning and editing of maps file size remain same.	Reduced, Because data is lost.
5	Editing	Better choice, because data does not lose.	Not a better choice, as maps are edited and resaved, it losses some quality.
6	Scanned Data	Better and Clear	Not Better
7	Archiving	Easier, so better for portability and data maintenance.	Typical, because data is lost.
8	Supported By	Most Photo Sharing websites.	Not supported.
9	RGB	24 or 48 bits	24 bits
10	Grayscale	8 or 16 bits	8 bits
11	Artifacts, smears text, lines and edges	Does not add.	Add
12	Data Analysis	Accurate, because of lossless comparison spatial referencing and map projection is better.	Not accurate, because data is lost.

Table 2 Comparative Table for Road Maps

Attributes	TIFF	JPEG
Size	44.4 KB	6.62 KB (6789 bytes)
Size on disk	48.0 KB	8 KB (8192 bytes)
Dimensions	1024*768 pixels	1024*768
Width	1024	1024
Height	768	768
Horizontal Resolution	300 dpi	300 dpi
Vertical Resolution	300 dpi	300dpi
Compression	LZW	JPEG
Resolution Unit	2	N/A
Bit depth	N/A	24

Table 3 Attributes

Attributes	TIFF	JPEG
Size	42.1 KB	5.4 KB
Size on disk	43.0 KB	7.2 KB
Dimensions	640*480	640*480
Width	540	640
Height	480	480
Horizontal Resolution	300 dpi	300 dpi
Vertical Resolution	300 dpi	300dpi
Compression	LZW	JPEG
Resolution Unit	2	N/A
Bit depth	N/A	24

Result

In this paper, we have reviewed TIFF and JPEG file format for scanning maps in GIS both the formats are used for storing images and work better in their specific domain. We have shown comparison on the basis of graphs by considering original size of maps after scanning. First comparison result shows by scanning the maps size in TIFF is more than JPEG due to lossless compression in TIFF therefore information of data remains in maps which is required for data analysis, spatial referencing and map projection in GIS.

Another comparison shows in figures are on the basis of editing, if a JPEG image is edited and re-saved, it loses some quality each time, therefore size of maps is reduced because of lossy compression.

Conclusion

So, after analyzing the results we conclude that JPEG format does not have much suitability for GIS based applications because in spatial referencing particular locations on maps are used to locate the features on earth so, in JPEG due to data loss particular location is not found for spatial referencing, data analysis and map projection purpose [5,6].

TIFF files do not get compressed so 100% of the data is captured during scanning and retains the quality for data analysis, spatial referencing and map projection even after editing. Hence, accurate analysis of data takes place, which helps decision makers for GIS, based applications.

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