



## Website Quality Evaluation based On Image Compression Techniques Algorithm

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*Abstract-Internet is a way of presenting information knowledge the webpages plays a vital role in delivering information and performing to the users. The information and performing delivered by the webpages should not be delayed and should be qualitative. ie. The performance of webpages should be good. Webpage performance can get degraded by many numbers of factors. One such factor is loading of images in the webpages. Image consumes more loading time in webpage and may degrade the performance of the webpage. In order to avoid the degradation of webpage and to improve the performance, this research work implements the concept of optimization of images. Images can be optimized using several factors such as compression, choosing right image formats, optimizing the CSS etc. This research work concentrates on choosing the right image formats. Different image formats have been analyzed and tested in the SRKVCAS webpages. Based on the analysis, the suitable image format is suggested to be get used in the webpage to improve the performance.*

**Keywords:** Image, CSS, Image Compression and Lossless

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### I. INTRODUCTION

As images continues to be the largest part of webpage content, it is critically important for web developers to take aggressive control of the image sizes and quality in order to deliver a fastest loading and responsive site for the users. This research provides the technique to understand and properly address the image compression issues for the webpages.

The Worldwide Web has grown from a few thousand pages in 1993 to more than two billion pages at present. Due to this .Explosion in size, web search engines are becoming increasingly important as the primary means of locating relevant information. Such search engines rely on massive collections of web pages that are acquired with the help of web crawlers, which traverse the web by following hyperlinks and storing the downloaded pages in a large database that is later indexed for efficient execution of user queries, design and implementation of a high performance Distributed Web Crawler.

Developing a great website requires a lot of work. Besides the development process itself, there are a lot of things to be considered such as SEO, content, optimization etc. The website performance, or more specifically the loading times of your website or web app are essential in order to provide a greater user experience. This research work focuses on improving the web page performance by optimizing the web pages with factors such as format selection, compression, number of images, optimizing CSS and using shorthand coding.

The main objective of the image compression is to reduce the irrelevant and redundant image data in order to able to reconstruct the image or transmit data in an efficient form. Digital image [1] is basically array of various pixel values ranging from 0 to 255 where pure black is represented by 0 and pure white is represented by 255. Thus, there are total 256 shades of gray. Basically in images, there are three types of redundancies [2][3] in Order to compress the file size.

### II. PROBLEM DEFINITION

The performance of web page can greatly depend on the images that are used in the web pages. The images in the web pages can be optimized in order to improve the performance. Optimizing of images will reduce website's page loading time, reduce bandwidth and will improve the browsing experience for visitors. [4] As pages are loading quicker, the user search engine ranking can also improve.

If an image is optimized, the factor to be noticed is compression. When an image is compressed the image size will reduce and the quality of the image can be affected if it is compressed too much. It is therefore important to get a balance between image quality and image file size. Lazy load is the jQuery plugin which delays the loading of images in long webpages. In this technique, images outside of viewport will not be loaded before the user scrolls the webpage to view a particular image. This greatly reduces the initial size of webpages as images are only loaded when the user scrolls down the page.

### Optimization of Images

Images in the webpages add size to it and make the loading time of webpages slow. Image optimization efforts can be made on the images to improve the performance of the web page. Some of the image optimization techniques are listed below:

- Format Selection
- Compression
- Number of Images
- Optimizing the CSS
- Use Shorthand Coding
- Get Rid of Browser Specific CSS Code.

### III. METHODOLOGIES

The Graphics Interchange Format was developed in 1987 at the request of Compuserve, It is a compressed (lossless) format and compresses at a ratio of between 3:1 and 5:1. It is an 8 bit format and supports the maximum number of 256 colors. The two different GIF standards are 87a and 89a (developed in 1987 and 1989). The 89a standard has additional features such as improved interlacing, ability to define one color to be transparent and ability to store multiple images in one file to create basic form of animation.[5]

JPG is a standardized image compression technique. JPG is designed for compressing either full color (24 bit) images or gray scale digital images of natural (real world) scenes. JPG works well on photographs, artwork, cartoons and black and white line drawings. JPG handles only still images but MPEG supports for motion pictures as well.

JPG is lossy which means that the images you get out of decomposition is not quite identical to what the user originally puts in. The JPG algorithm achieves much of its compression by exploiting known limitation of the human eye. Thus, JPG is intended for compressing images that can be looked at by human eyes. When lossy compression comes to represent real world scenes, no digital image format can retain all the information. From the comparison, it is found that JPG losses less amount of information than GIF.[6]

There are three universally supported image formats. They GIF,PNG and JPG Classification of GIF, PNG and JPG based on its characteristics is given in the figure 1. Some browsers also support formats such as webp and JPEGXR.

GIF limits the color palette to at most 256 colors, which makes it a poor choice for most images. Further, PNG-8 delivers better compression for images with a small palette. As a result, GIF is the right answer only when animation is required. PNG does not apply any lossy compression algorithms beyond the choice of the size of the color palette. As a result, it will produce the highest quality image, but at a cost of significantly higher file size than other formats.[7]

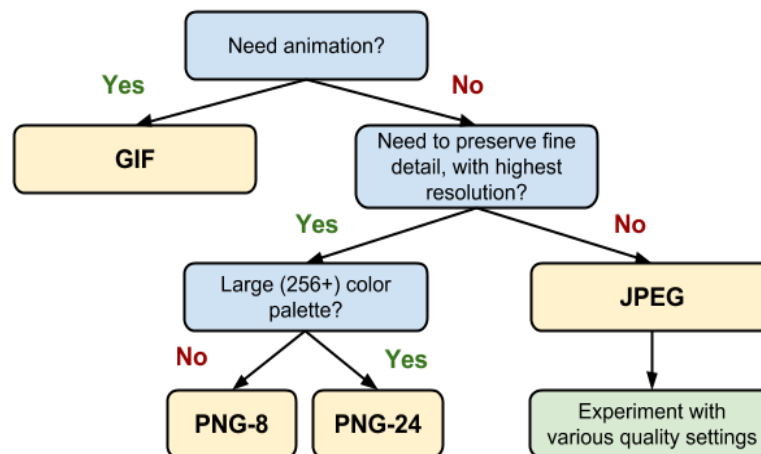


Figure 1: Classification of GIF, PNG and JPG Formats

### IV. ANALYSIS AND IMPLEMENTATION

#### Image Compression

Image compression plays an important role in web page performance. Image compression should be carried out by without affecting the quality of an image.

#### Choose the Right Format

JPG is the most popular format and accounts about 46% of images used in web are JPG. JPG creates high quality files in small size. JPG uses lossy compression by discarding some data to achieve smaller images. Formats like PNG and GIF uses lossless compression which does not discards data and results in reduced file size with quality image. In general,

- JPEG is best suited for complex images such as photos.
- PNG is best suited for simple or transparent images such as logos.
- GIF is best suited for animations and simple, low-resolution images.

Some of the image formats and its properties are listed in the Table 1.

Table 1: Comparison of Image Formats

Format	Browser Support (as of June 2015)	Compression	Transparency	Animations
JPEG	All	Lossy	No	No
PNG	All	Lossless	Partial	No
GIF	All	Lossless	Yes	Yes
WebP	Android, Chrome, Opera	Both	Yes	Yes
JPEG XR	Internet Explorer	Both	Yes	Yes
JPEG 2000	Safari	Both	Yes	Yes

Image editing tools allows user to adjust the quality level when exporting an image. This is mostly done for convenience, since there is no single factor that controls the overall quality of an image. Tools such as Webpage Test, Page Speed can provide in depth in managing the quality of the images.

### Image Loading

The next focus after image optimization is should be on browser. Image requires memory and processing power to load, too many unoptimized images could strain the user devices.

### Image Processing for SEO

The Image processing system gets all image URLs from Website and processing the Image URL in server .A unique image can generate multiple images has different formats . After the end of conversion its will be checking the size of the images and finally suggest the least size image. The figure given below describes this process.

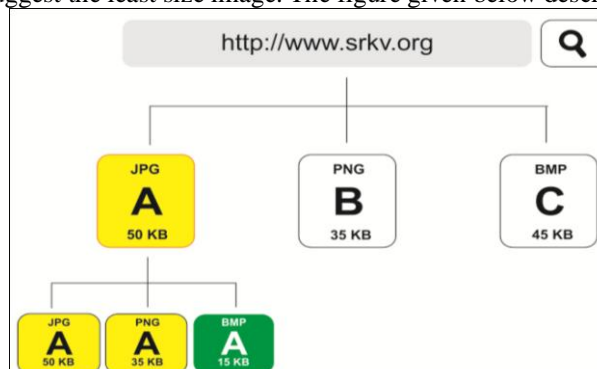


Figure 2: Classification of GIF, PNG and JPG

- First we pass website URL in this application
- And this app fetches all images URL s in that website.
- And loop images one by one and convert images has different format like JPG to BMP, TIFF, PNG etc.
- The images has generated has different sizes.
- And finally we suggest the least size for fast rendering in web.

### Image Processing for SEO Algorithm

```
//Collect image URL string
Images[] ← Get list of image URL
// declare and initialize the variable for store Suggestion Images
SuggestionList ← new list of class for store images as Image,existingsize as integer,existingformat as string,suggestionsize as integer,suggestionformat as string
for each (Images[] in item)
{
format ← GetFileExtention of item
St ← ReadImage item;
lstFormats[] ← initialize the Key value Pair
img ← st convert to image
size ← size of img
mem ← Create new memorystream
img has image save has JPEG format
jpeg ← mem length
lstFormats[]← add jpeg string has Key and jpeg variable has Value
mem ← new memorystream
```

```

img has image save has BMP format
bmp ← mem length
lstFormats[] ← add bmp string has Key and bmp variable has Value
mem ← new memorystream
img has image save has GIF format
gif ← mem length
lstFormats[] ← add gif string has Key and gif variable has Value
mem ← new memorystream
img has image save has PNG format
png ← mem length
lstFormats[] ← add png string has Key and png variable has Value
mem ← new memorystream
img has image save has TIFF format
tiff ← mem length
lstFormats[] ← add tiff string has Key and tiff variable has Value
low ← Get minimum Value in lstFormats[]
Key ← Get best format on lstFormats based on low value
suggestionList ← add image=item ,existintFormat =format,existingSize
=size,suggestionFormat=Key.Key,suggestionSize=Key.Value
    
```

## V. RESULTS AND METHODOLOGY

### Links in the Entered URL

The research work is carried out by testing different webpages. Different webpage URLs are entered and the performance has been measured. The status of each webpages is measured and more importantly the time taken to view the particular webpage after its URL got entered in the address bar has also been measured. The URLs of SRMVCAS and its elapsed time are given in the tabel 2. The figure shows the load time of each webpages along with its content and images inside in it.

Table 2: Links In The Entered URL

S.No	Website Links	Status	Page Load
1	<a href="http://srmvcas.org/index.php">http://srmvcas.org/index.php</a>	OK	687 ms
2	<a href="http://srmvcas.org/aboutus.php">http://srmvcas.org/aboutus.php</a>	OK	751 ms
3	<a href="http://srmvcas.org/the_principal.php">http://srmvcas.org/the_principal.php</a>	OK	667 ms
4	<a href="http://srmvcas.org/ug_courses.php">http://srmvcas.org/ug_courses.php</a>	OK	764 ms
5	<a href="http://srmvcas.org/pg_courses.php">http://srmvcas.org/pg_courses.php</a>	OK	674 ms
6	<a href="http://srmvcas.org">http://srmvcas.org</a>	OK	678 ms

### Images in the Entered URL

The SRMVCAS has number of images used inside it. The images used in the webpages are listed out in the table 3. This figure shows the images used in the webpages along with its image formats. Here JPG images are used. JPG images are lossy but can holds quality. So JPG format are used in SRKVCAS webpages. Metrics like load time and size of each image are measured. The load time is represented in milliseconds and sizes are represented in bytes. It is observed that the load time is based on the image size. If an image size is large then the load time increases and vice versa.

Table 3: Images in the Entered URL

S.No	Image Name	Image Type	Load Time	Image Size(Bytes)
1	Home1	Image/jpge	14 ms	235394
2	Home2	Image/jpge	7 ms	254429
3	Home3	Image/jpge	10 ms	190491
4	S1	Image/jpge	7 ms	456297
5	S2	Image/jpge	6 ms	216704
6	S3	Image/jpge	6 ms	7902

### Suggested Image Information in the Entered URL

In order to improve the performance by reducing the load time of images, the image format of GIF is used. The JPG formats are replaced with the images of GIF formats. This shows in reduction of image sizes automatically and reduces the loading time and thereby improves the performance of the webpage.

Table 4: Suggested Image Information

S.No	Image Name	Image Type	Image Size(Bytes)	Suggested Format	Estimated Size(Bytes)
1	Home1	Image/jpge	235394	gif	130006
2	Home2	Image/jpge	254429	gif	127367
3	Home3	Image/jpge	190491	gif	93963
4	S1	Image/jpge	456297	gif	158598
5	S2	Image/jpge	216704	gif	98794
6	S3	Image/jpge	7902	gif	3176

The Table-4 shows the difference between JPG format and GIF format. The bytes occupied by JPG formats are more when compared to the bytes occupied by the GIF formats. This shows that GIF is more suitable than JPG in terms of file size.

**Pie Chart and Bar Chart**

Figure 4 of graph shows the rendering time measured in milliseconds for images, links, styles and scripts used in webpages.

Pie chart shows that, the more time is consumed by images with about 51.5% and next with links of about 43.1%. Styles and scripts consumes only less rendering time.

The bar chart shows the bytes occupied by images, links, styles and scripts. It is observed from the graph, the bytes occupied by the images are very high and then followed by scripts and less occupied by styles.

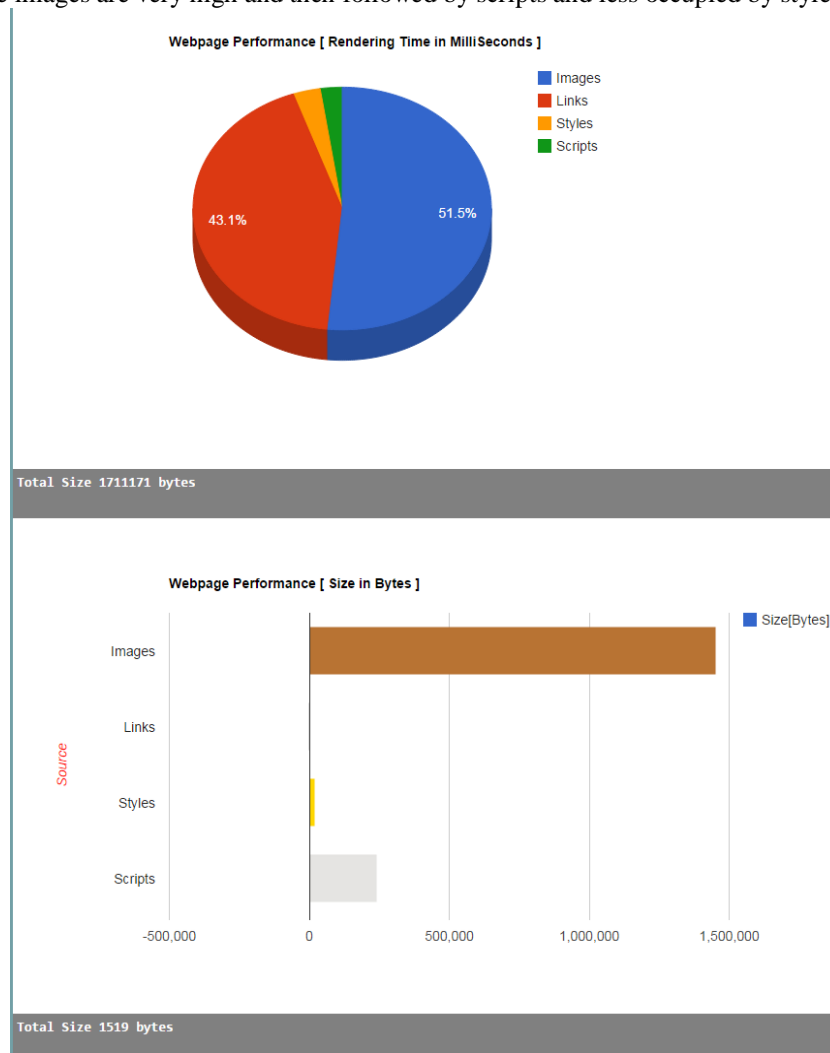


Figure 4: Pie Chart and Bar Chart for Column Chart and Pie Chart for Images

Amount of data consumed by different image formats have been measured. The figure 5 of graph shows the amount of data consumed by JPG, GIF, PNG and other formats. This comparison shows that PNG consumes very large amount of data followed by JPG and then followed by other formats. GIF did not consume any amount of data. So GIF formats are suggested and suited than any other image formats in webpages.

The pie chart shows that the GIF format is suggested more of 98.60% than the JPG format

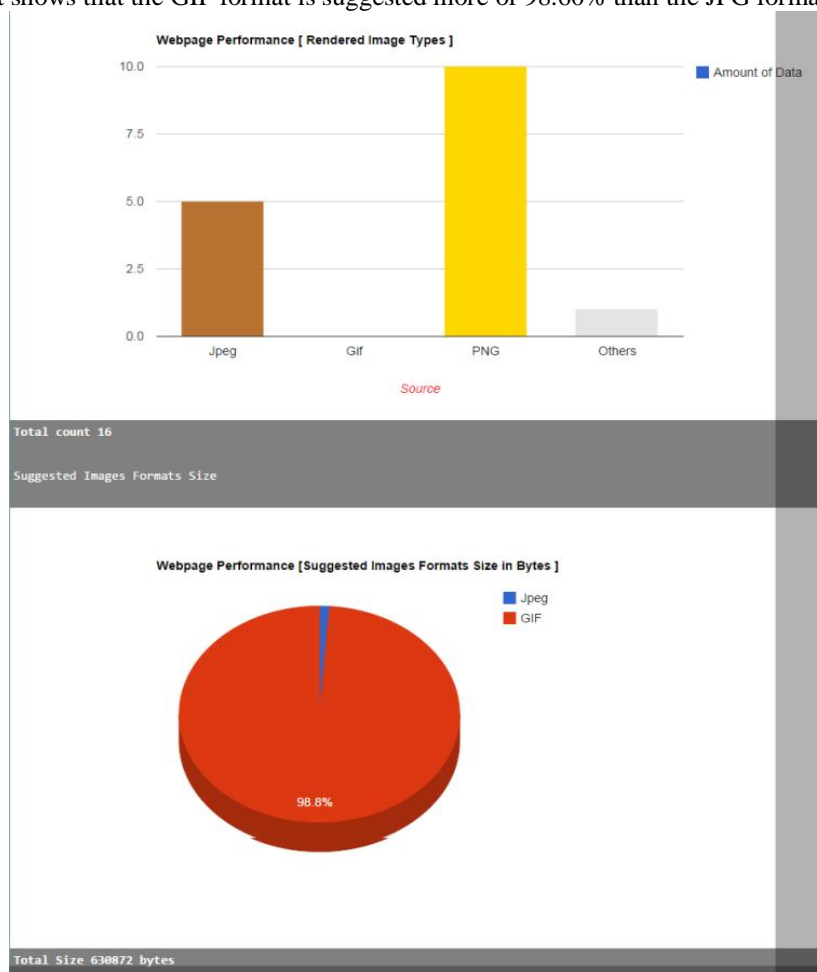


Figure 5: Column Chart and Pie Chart for Images

## VI. CONCLUSION

This research work shows that the performance of a webpage can be improved by using image optimization technique. As image formats are more important in improving performance of webpages, this research concentrates on image formats and implements different types of formats. From the analysis, it is shown here, that GIF format is well suited for webpages as it has consumed only fewer amounts of data and the loading time is to be less.

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