

What we will do –

An exhaustive study of Geo tagging technology, it's use-cases.

Definition - The process of adding geographic information to a photograph is known as geo-tagging.

What we care about –

1. Understand how geo-tagged images can be extracted from social media and survey of how easy it is to collect geo-tagged data
2. Are users aware that they are sharing the geo-tagged data on the internet? If know a proposal to design a browser plugin that will alert the user when he/she is about to upload the geo-tagged image on the internet.
3. Analysis of threats caused because of irresponsible sharing of location coordinates. Here we discuss what all things can go wrong.
4. How do several social media platforms have in their policy about geo-tagged data.

RED FLAGS (Where geo-tagging can cause problems)

1. Geo-tagging can make it easier to track your physical location to anyone who has access to your geo-tagged image.
2. Geo-tagging in case of wild-life photography could be disastrous to wild-life. Poachers can locate exotic animals and cartels may later target them.
3. When users upload images on the internet, most web-sites strip the geo-tagged info, but there is no guarantee that this information is not maintained and utilized for targeted advertising (Although it's innocuous, most of the times the geo-tags get shared unknowingly). It's difficult to blame a party (a user or the website) when the user data like geo-location gets shared unknowingly. Later, if the data collecting website gets compromised, then this whole information can be available to an adversary. (i.e. consider Cambridge Analytica Scandal) Users may be also unaware that they would need separate tools to strip the Geo tags.
4. The problems also lie on the other side of the spectrum. I.e. such EXIF data is mutable so, wherever, such artifacts are used as evidence in courts, they should take a note that it can be easily manipulated. (tampering of evidence is possible)
5. Serves as a soft target for large scale user data harvesting. Eg. Program like XKeyscore by NSA.

Some observations -

We uploaded some geotagged image to popular platforms like Twitter, Facebook etc. when found that while downloading the published image, we found out that the geo-tags were stripped off. But, there is no guarantee that they are not maintained by these companies in their back end databases.

Services that support GeoTags

1. Flickr - possible to get images tagged to geo-locations
2. Twitter - possible to get content through APIs though general images uploaded on twitter don't contain the geo tags
3. Panoramio - discontinued site.
4. MoBlog

Potential Solutions:

1. Disable geo-tagging altogether. But this defeats the purpose of the innovation. It will also defeat the good contributions of the technology too.
2. Make users aware somehow that their geo-location is getting shared. (Our approach - Ideally we want to design a web-browser plug-in that opens up your .jpeg image that you are about to upload, screens for geo-tagging and asks you if you want to share your location data. If no - then helps you stripping the geo-tags and uploading only the pixel values) This will help users make informed decisions and give them more control over their data.

A short study of EXIF (**Exchangeable image file format**) format: a standard used for storing metadata related to sound and image files. This format is mainly implemented in devices like scanners, digital cameras (including smart phones). It is used with the following file formats .JPEG (description) .TIFF (description) and RIFF WAV (description). It is not implemented for JPEG 2000 and .GIF format. The format consists of file specifications for image and audio files.

The standard is supported by all camera manufacturers. The latest version being 2.3.2 (revision 17<sup>th</sup> May, 2019).

EXIF standard has tags to maintain the data related to following types -

1. Date and time
2. Sensor data (manufacturer data) and hardware info
3. Thumbnail of the image
4. Copyright info
5. Descriptions.

#### GPS

Latitude	40; 54; 34.7723000000114268
Longitude	73; 7; 0.760699999984346675
Altitude	18.3

#### File

Name	orange.jpg
Item type	JPG File
Folder path	C:\Users\niran\Downloads
Date created	9/25/2019 5:49 PM
Date modified	9/25/2019 5:49 PM
Size	4.03 MB
Attributes	A
Availability	

GPS tag example

Compression	
Resolution unit	2
Color representation	sRGB
Compressed bits/pixel	
Camera	
Camera maker	OnePlus
Camera model	ONEPLUS A6000
F-stop	f/1.7
Exposure time	1/20 sec.
ISO speed	ISO-1250
Exposure bias	0 step
Focal length	4 mm
Max aperture	1.53
Metering mode	Center Weighted Average
Subject distance	
Flash mode	No flash, compulsory
Flash energy	
35mm focal length	25
Advanced data	

Sensor information stored in EXIF data.

Would be functionality of our plug-in -

1. Sniff the image being uploaded using the browser.
2. Parse for a geo-tag.
3. Prompt user for about the existence of the geo-tag. And ask him/her if he/she wishes to share the geo-tagged photograph.
4. If yes, than let the picture to get uploaded.
5. If no, then (in best case if we are able to implement) remove the geo-tags and return a geo-tag free copy of image and upload it to the portal.
6. For pro users, maintain a functionality to turn-off the advise.

For starters we will try to implement a simple extension for either of the browsers (firefox or chrome)