

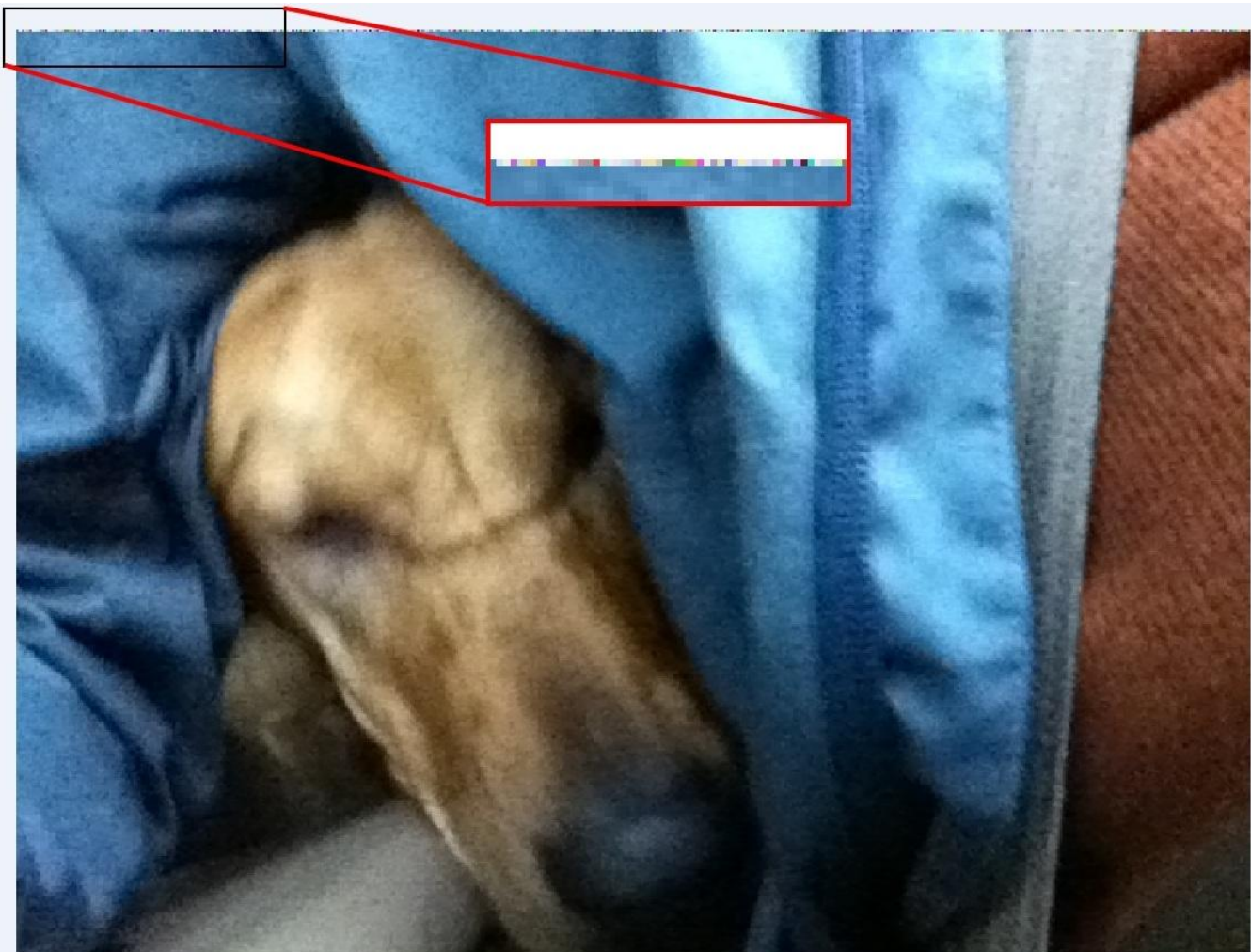
Forensic Challenge 13 – “A Message in a Picture“

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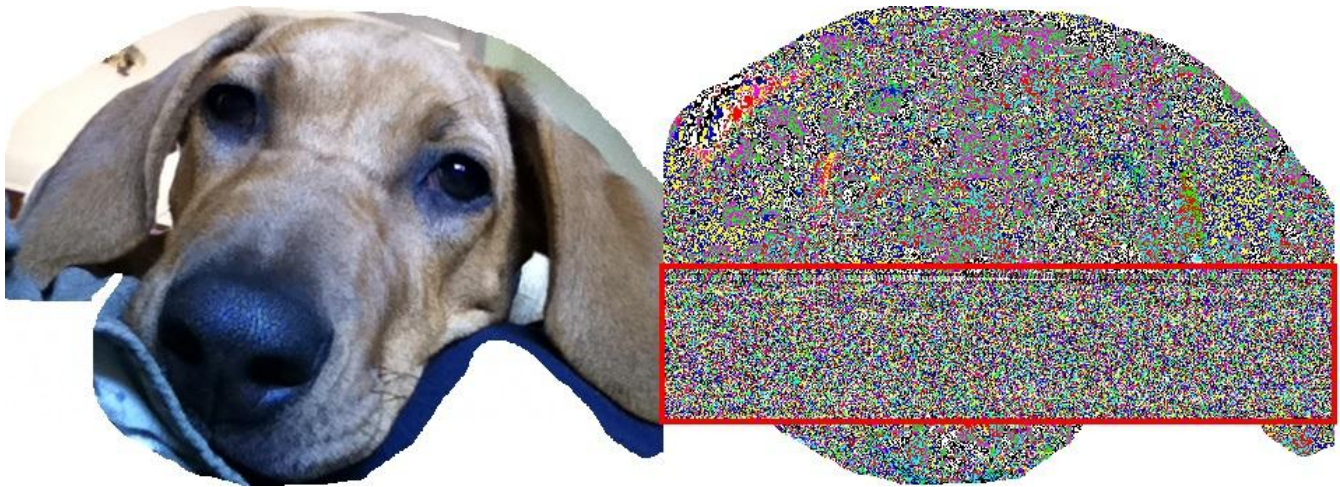
1. What images contain hidden messages? 15pts

Tools Used: [Simple Steganalysis Suite](#)  
 Awarded Points:

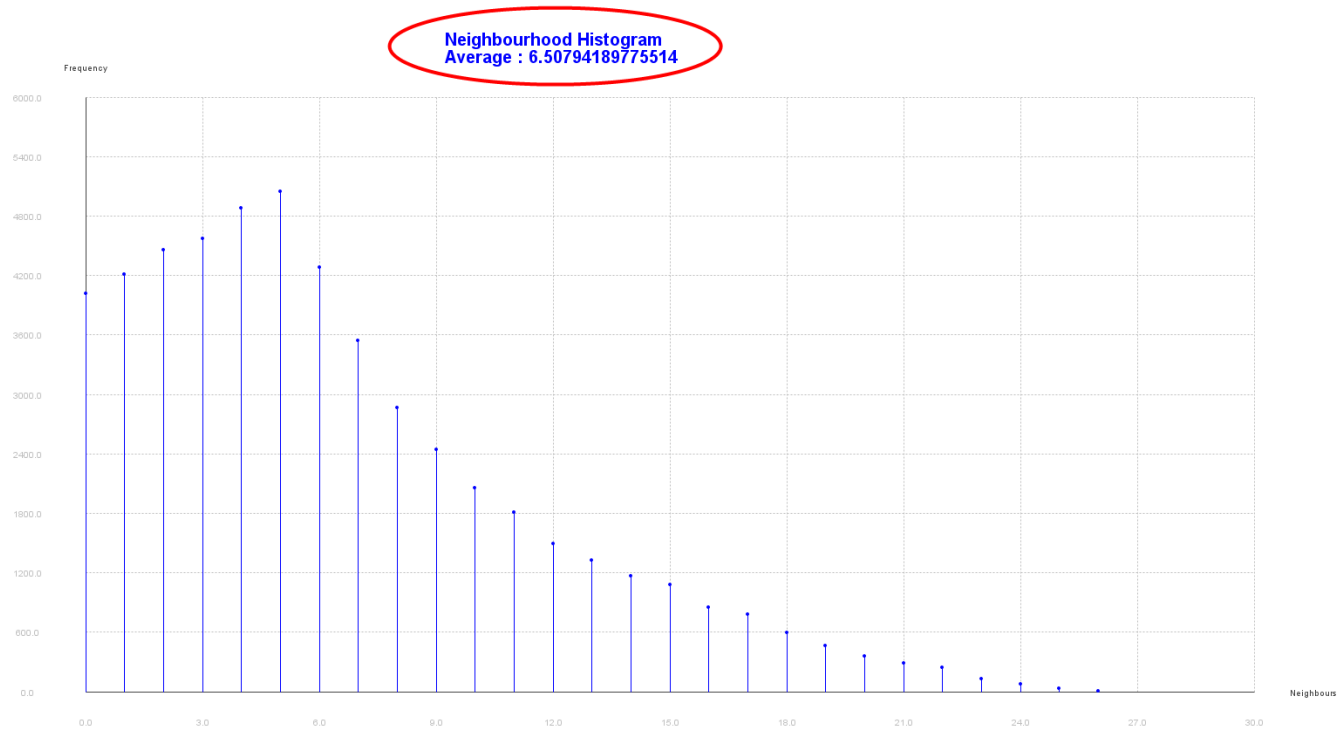
The first stego image I discovered was IMG\_0496.png from pack 2. The first row of pixels obviously contains a hidden message because pixel colours are completely unrelated from the others rows.



Then I started to perform LSB Enhancement technique. I found hidden messages in IMG\_0406.png from pack 1.

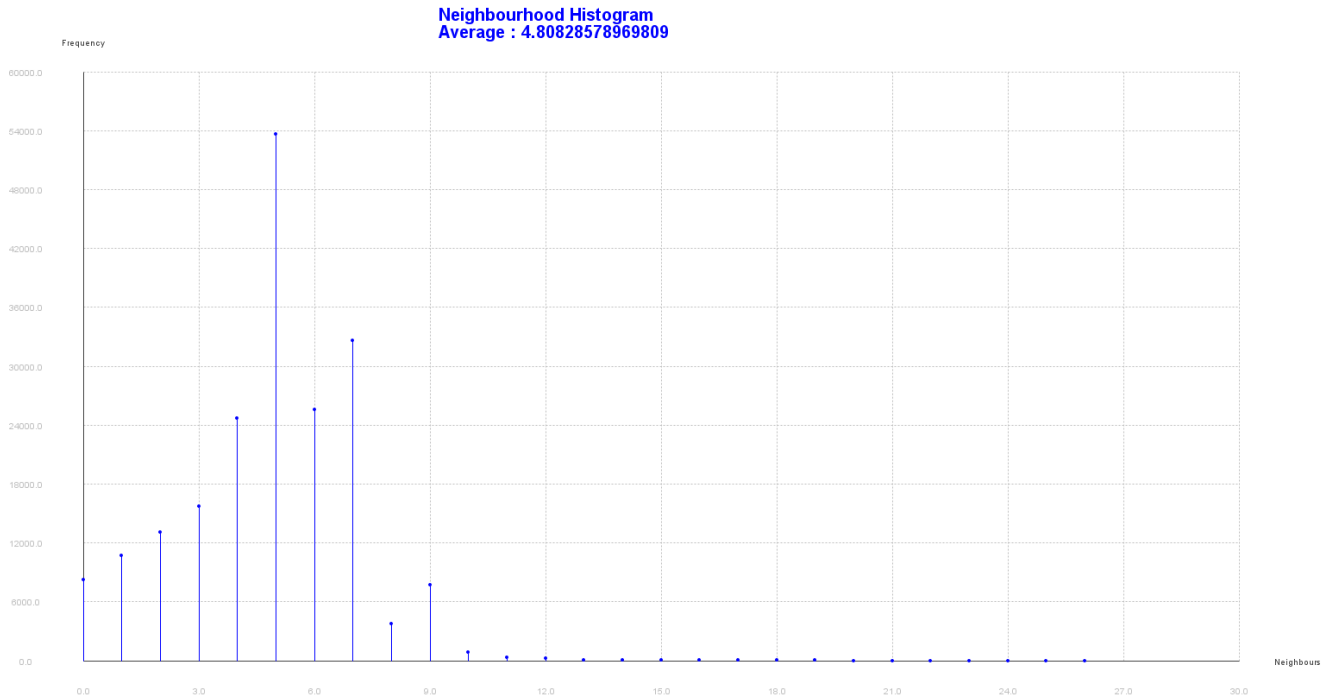


This is verified by a neighbourhood histogram :

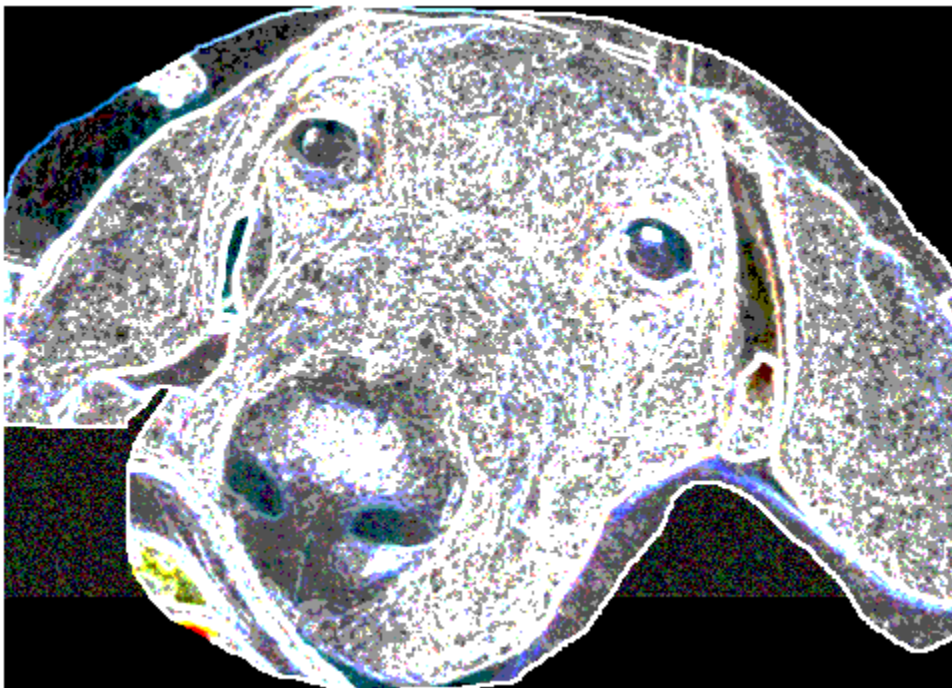


The average number of neighbours for each pixel is between 4 and 5 for a normal image. Here the average value is 6.5.

A typical histogram looks like this :



This is also verified by a “pixel value” attack :



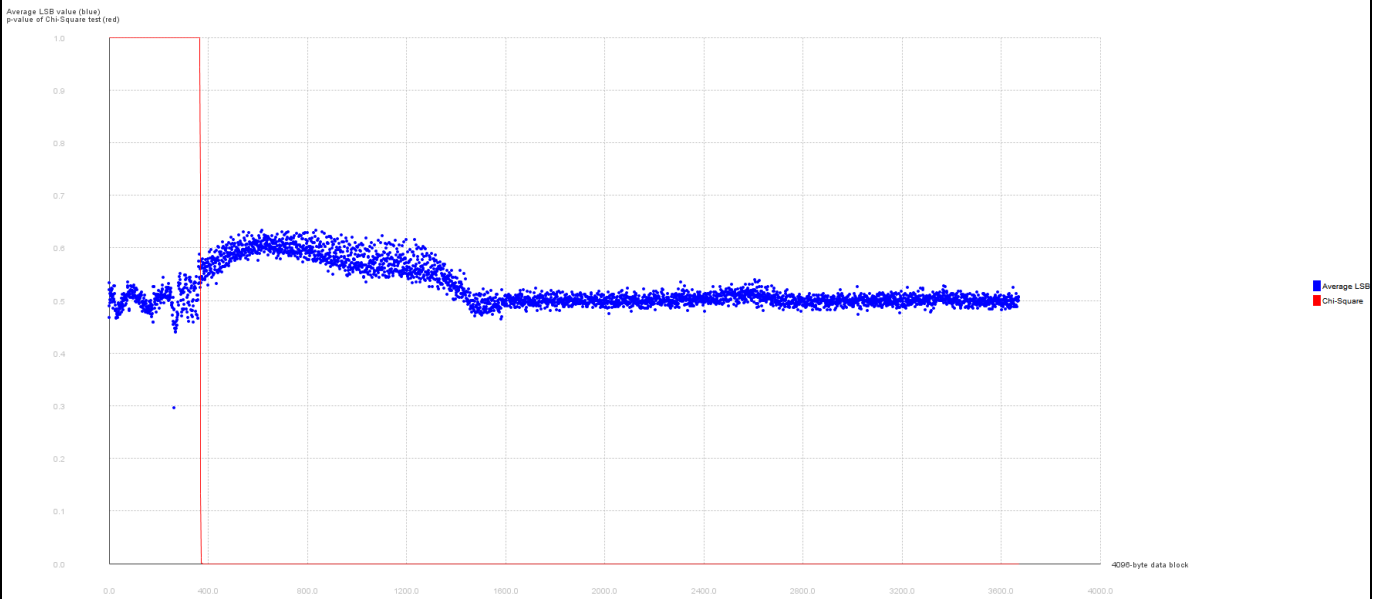
This attack is an idea I had and need to be improved. It looks like edge detection techniques.

I also found a hidden message in IMG\_0744.png from pack 3.



This is verified by a Chi-Square test :

Chi-Square and Average LSB



I found a hidden message in IMG\_0601.png from pack 2. The neighbourhood histogram average value is 6.26. The message could be hidden in the bottom of the image (chi-square test).

Summary of images containing hidden messages :

Images	Pack	Certainty
IMG_0496.png	2	100%
IMG_0406.png	1	100%
IMG_0744.png	3	100%
IMG_0601.png	2	100%
IMG_0454.png	2	75%
IMG_0412.png	1	40%
IMG_0560.png	2	50%
IMG_0713.png	3	40%

2. Describe how each hidden message is stored in the images. Be very specific.

15pts

Tools Used: [Simple Steganalysis Suite](#)

Awarded Points:

Images I'm pretty sure they contain hidden messages :

- IMG\_0496.png:
  - Message hidden in the first row of pixels, except the first one (top left). All the bits are potentially used.
- IMG\_0406.png, IMG\_0744.png and IMG\_0601.png:
  - messages embedded in the LSB

Images I'm less sure :

- IMG\_0412.png:
  - I suspect this image to contain hidden message because the difference histogram attack value is unusual. I'm 40% sure.
- IMG\_0454.png :
  - I suspect this image to contain hidden message because both the difference histogram attack value and the Primary Sets attack value are high. I'm 75% sure.
- IMG\_0560.png:
  - I suspect this image to contain hidden message because the difference histogram attack value is unusual and the Chi-Square tests from right to left and from bottom to top seem to indicate a small hidden message. I'm 50% sure.
- IMG\_0713.png:
  - I suspect this image to contain hidden message because of the result of a top to bottom Chi-Square test. I think a message could be hidden in the sky. I'm 40% sure.

<b>3. What are the hidden messages contained in those images (save each hidden message in a file and submit as a .zip archive along with this document)? List what message was extracted from what image below.</b>	15pts
<b>Tools Used:</b> <b>Awarded Points:</b>	

<b>Bonus 1: With the tools you have developed, what hidden messages are you able to identify in the wild (bittorrent, usenet, web)?</b>	5pts
<b>Tools Used:</b> <b>Awarded Points:</b>	

<b>Bonus 2: Provide a link to your tool (src, binary and documentation)</b>	10pts
<b>Tools Used:</b> <b>Awarded Points:</b>	
<p>I started to develop a Java program and implemented simple steganalysis techniques. The program is called Simple Steganalysis Suite.</p> <p>You can find more information here :  <a href="http://code.google.com/p/simple-steganalysis-suite/">http://code.google.com/p/simple-steganalysis-suite/</a></p> <p>Documentation :  <a href="http://code.google.com/p/simple-steganalysis-suite/wiki/Documentation">http://code.google.com/p/simple-steganalysis-suite/wiki/Documentation</a></p> <p>Sources :  <a href="http://code.google.com/p/simple-steganalysis-suite/source/checkout">http://code.google.com/p/simple-steganalysis-suite/source/checkout</a></p> <p>Executable JAR :  <a href="http://code.google.com/p/simple-steganalysis-suite/downloads/list">http://code.google.com/p/simple-steganalysis-suite/downloads/list</a></p>	

**Conclusion:**

That was a really interesting challenge. I didn't have enough time to implement everything I wanted. I mainly focused on LSB embedding.

**Further developments:**

- implement RS steganalysis technique
- palette image steganalysis techniques
- machine learning techniques
- ...