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Describing the steganalysis tool: BBD15 “OurSecret detector”

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Abstract
Digital steganography is the art of hiding secret messages and data in innocent cover, most likely in images and videos. Images and videos offer the best cover files for steganography with their high capacity, by being innocent and for being easily exchanged without raising the suspicions of a third party. A lot are the free tools that embeds data in images and videos, among which is OurSecret. In this paper we aim to detect the stego images and videos created by OurSecret by developing a steganalysis tool BBD15.

Key words: steganography, steganalysis, images, videos, OurSecret, detect, BBD15

1. INTRODUCTION

Images and videos are innocent and excellent cover files for steganography. Many free embedding tools exists OpenStego [1], StegHide [2], OpenPuff [3] and OurSecret [4] …etc. detecting this stego files is a challenging task for the steganalysts, it requires the knowledge of the embedding algorithm, having the cover file, the stego files or both.
There are various steganalysismethods to detect and/or extract hidden datain/from images and videos. Some rely on visual and audible detection which is caused by the noise generated by the embedding algorithms. Other methods are based on statistical and histogram analysis, the change of image properties and header fields, or by looking for the signature of the embedding (steganography) programs[5]. It is worth noting that the blind steganalysis (general) may be less accurate than the specific steganalysis attacks where the embedding algorithm is known and to the best of our knowledge no steganalysis tool was specifically developed to detect stego files created by the tool Oursecret.
In this paper, BDD15 is developed to detect stego files created by Oursecret, in section 2 we try to understand the embedding algorithm of OurSecret the steganography tool, section 3 explains the detection process, section 4 contains a performance study of our tool BBD15.

2. OURSECRET, HOW DOES IT WORK?

OurSecret is a free steganography tool that embeds the secret data in multimedia files such as images and videos. The algorithm of the tool wasnot officially described by its developer. To understand how the embedding works, we did some tests using the HeX Editor tool[6], we compared between a stego files containing secret data and their original cover files (without data). We tested different kinds of files, for images: JPEG, JP2, BMP, TIFF, GIF and PNG. For videos: AVI, MPEG, MOV. We found that the tool compresses the data (we didnot know the compression algorithm used), optionally encrypts the data (if the passphrase is set) and embeds the compressed data at the end of the cover file without changing any bit from the original cover data.

3. DETECTING OURSECRET STEGO FILES

Since we were able to understand how OurSecret embeds the data, we decided to use this knowledge to program a steganalysis tool that detects the stego files generated by OurSecret. The application was developed using java to avoid portability problems and it detects 9 file formats: JPEG, JP2, BMP, PNG, TIFF, GIF, AVI, MOV and MPEG. It detects the files with a rate of 100%. The applications take advantage of the fact that most files have a beginning and an end markers and that OurSecret embeds data at the end of the image / Video file (after the end marker) without changing any other bit.

4. A PERFORMANCE STUDY OF BBD15

To judge the performance of our tool we decided to compare it with other steganalysis tools such as StegSpy[7], StegSecret[8] and Hidden Data Detector[9]. We did the comparison for the accepted format only and for the same stego files. Our application showed the best results in term of detection rate, also it offers both the search by file and by folder, and it is easy to use. The tables and the figures below show the obtained results.

TABLE 1: DETECTION RATE OF STEGSECRET, HIDDEN DATA DETECTOR, STEGSPY AND BBD15

		Detection rate			
Tools	**Format**	**StegSecret**	**Hidden data detector**	**StegSpy**	**BBD15**
OurSecret	BMP	100%	-	10%	**100%**
	JPEG	100%	100%	10%	**100%**
	JPEG2000	42%	0%	10%	**100%**
	PNG	34%	0%	46%	**100%**
	GIF	100%	-	35,70%	**100%**
	TIFF	41%	-	48,50%	**100%**
	AVI	44%	100%	37%	**100%**
	MPEG	46%	-	60%	**100%**
	MOV	51%	-	37%	**100%**

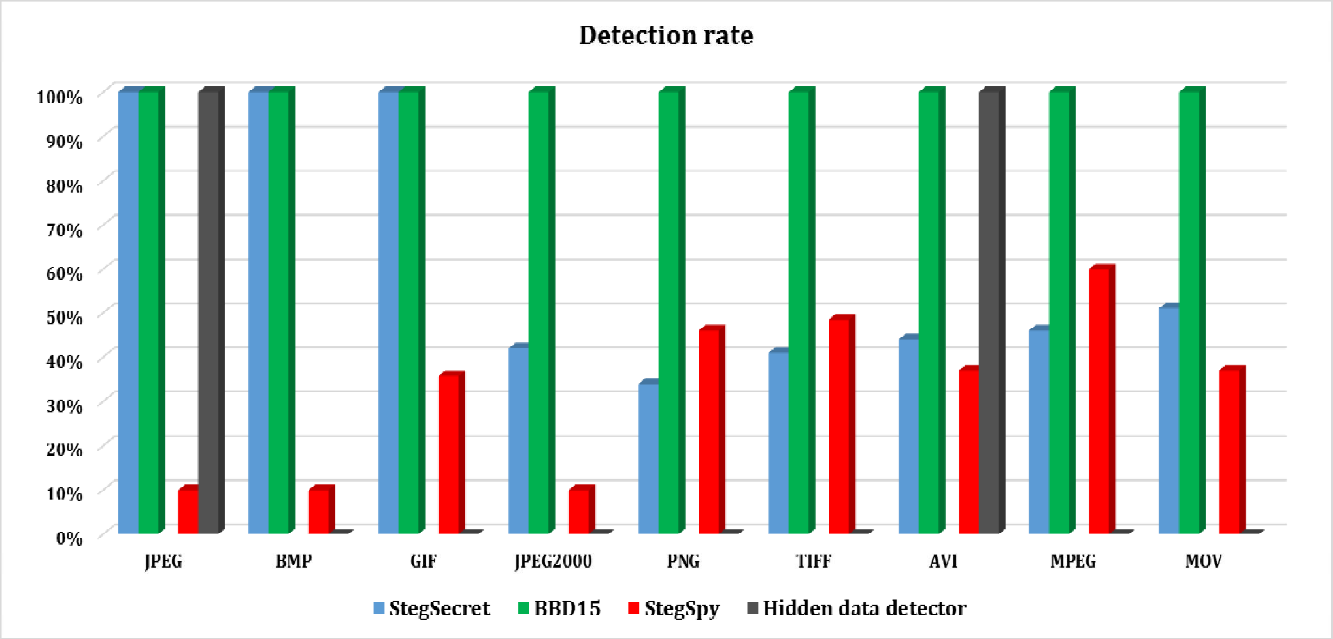

Figure 1: Detection rate of StegSecret, Hidden Data Detector, StegSpy and BBD15

We tested the four tools on the same sample of images and videos. We found that StegSecret detects with 100% rate the BMP, JPEG and GIF stego images. Hidden data detector could not detect the stego images of types JPEG2000 (JP2) and PNG while it detects with 100% rate the JPEG images and AVI videos. StegSpy detects best the MPEG videos (rate = 60%). Our Detector BBD15 detects with 100% nine types of files which are BMP, JPEG, JPEG2000, PNG, GIF, TIFF, AVI, MPEG and MOV. The summary of the results is presented in table 2 and figure 2.

TABLE 2: GLOBAL DETECTION RATE OF STEGSECRET, HIDDEN DATA DETECTOR, STEGSPY AND BBD15

	Detection rate	
Tools	**OurSecret**	
	Images	**Videos**
StegSecret	**70%**	**47%**
StegSpy	**27%**	**45%**
Hidden Data detector	**33%**	**100%**
BBD15	**100%**	**100%**

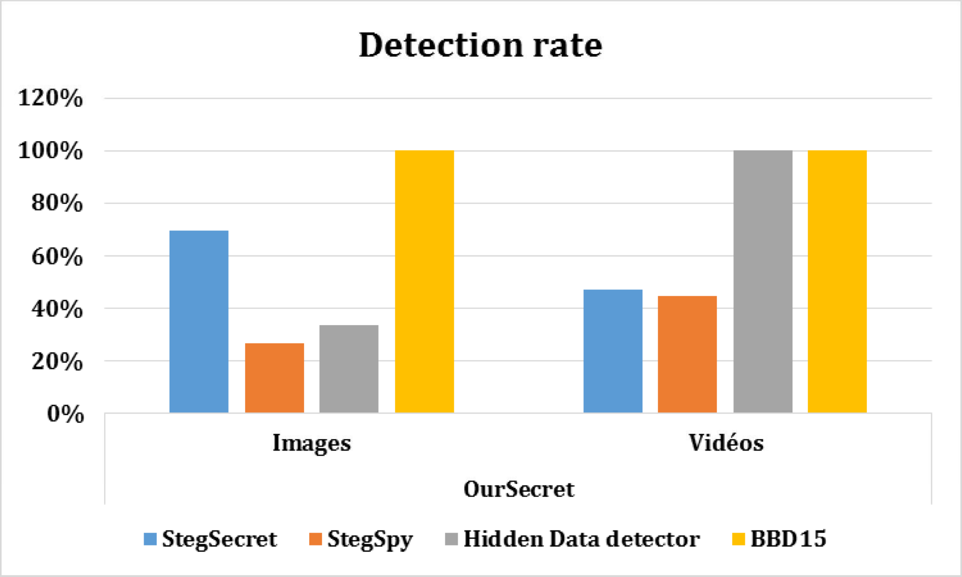

Figure 2: Global Detection rate of StegSecret, Hidden Data Detector, StegSpy and BBD15

5. CONCLUSION

OurSecret is a free steganography tool for embedding data in multimedia files (images and videos), it allows the embedding of multiple files at once, it imposes no limit on the size of the secret data and allows the encryption of it. Its algorithm wasn't described by the developer. Having used the tools and tested its ability, we decided to understand its embedding algorithm and use it to develop a steganalysis tool that is specialized in detecting the stego files produced by OurSecret. We developed the java application BBD15 to detect stego files of types: BMP, JPEG, JPEG2000, GIF, PNG, TIFF, AVI, MPEG and MOV. It has the detection rate of 100% and exploits the fact that OurSecret embeds the data at the end of the file.

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