**IMAGE STEGANOGRAPHY**

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# Abstract

**IMAGE STEGANOGRAPHY**

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The project deals with the best approach in image steganography using Least Significant Bit (LSB) that further improves the quality of the existing LSB substitution methods to improve the security strength of the hidden information.

It is a new technique to substitute LSB of BGR true color image. The new security formation hides the secret information within the LSB of the image where the secret key encrypts the hidden information to protect it form unauthorized people. Generally, in LSB techniques hidden information is embedded into a fixed position of LSB of the image. For this purpose, knowing retrieval techniques, anyone can extract the hidden information. In my project, hidden information is embedded into different position of LSB of the image depending on the secret key.

As a result, it is difficult to extract the hidden information knowing the retrieval techniques. The implemented technique results in LSB based image steganography using secret key which gives good security issue than LSB based image steganography techniques.

**Keywords:** Steganography, Cryptography, Data Hiding, LSB, Digital Image, Hash, Security.

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# INTRODUCTION

* 1. Definitions

Usually nowadays if we want to transfer sensitive data, we encrypt the data before transferring it across the internet. Transferring messages like this, still can cause suspicion: there is clearly secret/sensitive data in your encrypted message that you are trying to hide. Attackers know precisely where to look to try to procure the information [1]. But privacy and anonymity is a concern for most people on the internet. Image Steganography allows for two parties to commune secretly and covertly. Steganography is the art of concealing information. In computer science, it refers to concealing data within a file or message. It serves a related motive to cryptography, but rather than encrypting data, steganography simply hides it from the user [2]. The word steganography comes from New Latin steganographia, which merges the Greek words steganos, meaning “concealed or covered”, and -graphia meaning “writing” [3].

In general, a steganographic system consists of a cover media into which the secret information is embedded. The embedding procedure fabricates a stego medium by replacing the information with data from the information to be hidden. Commonly secret information is embedded into the fixed position of Least Significant Bit (LSB) of a cover image which is the carrier to embed secret information. Since anyone can ensure that particular position of LSB contains secret information, so it is then easier for anyone to extract the secret information using the extraction method. The core purpose of image steganography is to guarantee security of the hidden information [4].

There are several researches available detailing properties of image steganography. Numerous steganographic techniques have been suggested. The most familiar of these is substituting the LSB of the pixels with secret information. A notable LSB established image steganography technique is given in [5] and it suggest an adaptive technique based on inter pixel relationship. The technique tremendously enhances the stego-image quality. Using this method it is feasible to extract the secret information for anyone by using the extraction method [6]. A different LSB established image steganography technique is given in [7] and it suggests three effective steganographic techniques that take advantage of the neighborhood information to approximate the quantity of data to be embedded into the input pixel of the cover image and that embed exactly three bits of secret information in smooth sections and a varying amount of bits are embedded into the edged sections.This technique uses various pixels of the image store too many bits of the secret information but separate pixels stay unchanged. In result, some pixels are manipulated harshly whereas other pixels stay unused. Using this technique it is feasible to extract the hidden information for anyone, since they did not issue any security measures [6].

In order to ensure the security of the secret information, I have tackled it by using creative LSB based image steganography. In this technique I introduced a secret key which guarantee the security of secret information. The embedding of the secret information is determined by the secret key. The secret key determines the suitable location of secret information. It is extremely difficult to extract the secret information without the identical secret key. Here a bit of secret information is put in either LSB of Blue or Green or Red matrix of a particular pixel which is guaranteed by the secret key and the pixel column. So by adding secret key, I increased the security intensity of the secret information in LSB based image steganography.

* 1. Goals

Goals come here.

* 1. Ethics

Ethics come here.

* 1. Required Software

Required Software come here.

# 2. LITERATURE SURVEY

Typically, should cover the following items (at least 3 pages):

A survey and comparative analysis of sufficiently large number of works (publications) in the area of study. This survey should include a brief history of the subject, but main attention should be paid to publications in journals, conference proceeding and published thesis during the last 5 – 7 years. It is desirable to include and comment here an appropriate classification of used methods and approaches in the form of a table or a diagram. The student should avoid referencing Internet (Web) publications in the project, since many of them are not reliable sources of related information.

A detailed description and analysis of two or three published works that are most close to the topic of the project. Clearly specify positive and negative aspects of these works. Use appropriate illustrations and figures here to make your analysis clearer. This part of the project can take two or more sections.

# 3. BACKGROUND INFORMATION

This chapter explains theoretical aspects of the project. It should give, in 3 – 4 sections, a detailed description of what you propose as a new contribution to the area (your method or approach). The chapter can include a general description of the proposed approach, specification of tools (theoretical and experimental) to solve the problem, flowcharts of algorithms, their descriptions, timing diagrams, related mathematical expressions, proposed models and their descriptions, with necessary assumptions under which your method or solution can work.

# 4. IMPLEMEMTATION DETAILS

This chapter also should contain a scheme of the implementation of your method or solution, organization of experiments, based on computation, simulation, and statistical analysis, with appropriate graphs and other illustrations. The obtained results must be discussed and compared with the results given in published works.

Chapter 3 and this chapter together represent the most important parts of your new contribution to the area of study. If necessary, the material of this chapter can be divided into two chapters.

# 5. CONCLUSION AND FUTURE RECOMMENDATION

This Chapter can conclude the project. It should summarize the results of study, emphasize their positive and negative aspects and suggest directions of a further study of the topic to improve the proposed scheme, method or approach.

# 6. REFERENCES

1. Zdziarski, Z. (2018, Oct 5). Image Steganography - An Introduction, Zbigatron. Retrieved May 27, 2020, from <[https://zbigatron.com/image-steganography-an-introduction](https://zbigatron.com/image-steganography-an-introduction/)>.
2. Christensson, P. (2020, Feb 24). Steganography Definition. Retrieved May 27, 2020, from <<https://techterms.com/definition/steganography>>.
3. Merriam-Webster. (n.d.). Steganography. Merriam-Webster.com dictionary. Retrieved May 27, 2020, from <<https://www.merriam-webster.com/dictionary/steganography>>.
4. Gangwar, A & Shrivastava, V. (2013). Improved RGB-LSB Steganography Using Secret Key. International Journal of Computer Trends and Technology. [Online]. 41(2). pp. 85-89. from <[https://pdfs..semanticscholar.org/7a7b/54d6557fd5f2945f8720d098fbf77d165457.pdf](https://pdfs.semanticscholar.org/7a7b/54d6557fd5f2945f8720d098fbf77d165457.pdf)>.
5. Long, Min & Li, Fenfang. (2018, July). A Formula Adaptive Pixel Pair Matching Steganography Algorithm. Advances in Multimedia. 2018. 1-8. 1155/2018/7682098.
6. Karim, S. M. Masud & Rahman, Md & Hossain, MD. (2011, Dec). A new approach based image steganography using secret key. 286-291. 10. 1109/ICCITechn. 2011.6164800.
7. Haque, Sadia & Sharmin, Farhana. (2010, June). Variable Rate Steganography in Gray Scale Digital Images Using Neighborhood Pixel Information. Int. Arab J. Inf. Technol.. 7. 34-38. 10. 1109/ICCIT. 2009. 5407128.

# APPENDIX

(if any) can contain additional material, such as source texts of programs, large tables of obtained results, descriptions of used protocols, utility programs, etc. Each Appendix must have its title on a separate page.