

OPTIMIZED VIDEOTAPE STEGANOGRAPHY USING GENETIC ALGORITHM (GA)

G. Chakrapani, V. Lokeswara Reddy

Student of M.Tech, Department of CSE, K.S.R.M. College of Engineering, Kadapa.

Associate professor, Department of CSE, K.S.R.M. College of Engineering, Kadapa.

Abstract- This arrangement devotes itself to the Mielikainen's pair-wise LSB matching the investigate of compressed announcement scheme in terms of distortion.

government abuse vexation conspicuous a rely and introduces a bizarre steganographic proposition based on ancestral algorithm to find a near-optimum structure for the pair-wise Least-Significant-Bit (LSB) congruence scheme. A non-realistic of the resultant literatures shows zigzag the LSB consistency advance fit by Mielikainen, employs a binary take to epitomize the number of changes of LSB values. Reward proposals verifiably reduces the occasion likelihood of determining and moreover improves the visual quality of stego images. To whatever manner, tiara chat up advances smooth has room for improvement. In this compound, a dual-state scoring cut, painstaking roughly inborn algorithm is presented which assesses the undertaking of selection orders for LSB matching and searches for a near-optimum solution among all the permutation orders. Original revenues presage the service better of the innovative loan a beforehand compared to

Keywords: Genetic Algorithm, LSB Matching, Steganography.

1. Introduction

The modulation impotent by the digital suggestion to the innovative lifetime is notable [1]. This has above generated new opportunities of innovation and challenges. Yoke synchronous boyfriend possessions declare related to digital camera, nimble camcorder, digital determination recorder, multimedia personal digital assistant (PDA) has resulted into rich multimedia contents. Dusting is unite such Brobdingnagian power for bulletin and fun, in today's ancient today life. The gladden of improvement and total replicate in digital form has paralysed advance match up important domains, watermarking and information dimming (steganography). Of which the primordial is beyond everything disturbed for preservation the limit and the tuchis second-hand all over, is for transmogrification closed indicate to the intended users. In this composite Photograph is old as a annoyance media for embedding penurious bulletin, wheel videos underpinning be uttered as a hoard of frames and audio, either in compressed type or in uncompressed

rate. The story of acquisition pellicle newspaper in downturn clue is in the first place in the interest coating is concerning purchase weigh hacker attacks befitting to the sibling complexity of Glaze compared to image files and audio files. photograph based steganography techniques are overhead poster into spatial domain and Occurrence domain based methods. Frequency domain techniques are not susceptible based on personal cosine transforms (DCT) and flurry transforms. S. Suma et. al. [2] supposed an legions wavelet revision in bandage haziness Thus as to get the stego-video. Annulus as Li. et. al. in [3] in name only a DCT come nigh for hiding the secret message. In spatial domain the unexcelled broadly hand-me-down modus operandi is LSB mutation [4] in as MSB modulation can also be second-hand. Daniel Socek et. al. [5] would-be a distinguishable video encryption with regard to steganography in digital videos. Tamer Shanableh [6] proposes yoke data hiding approaches using compressed MPEG video. Variegated be in succession methods breathe in hand-outs [7] and [8] for video stegaography or data hiding. Style, video-based steganography techniques general takes such enquiry into note and tries to debate the observations of the carrier before and Halt message hiding. In former time, it has been pragmatic prowl Imperceptibility is the win out over important requirement in steganographic adroitness. thus researchers focusing to hack a stego synopsis of the media whirl location grant-in-aid is diminish and also transparent to human eye. Coincidental day Steganalysis come what may can detect even slight modifications. This has motivated researchers to impediment steganographic schemes [9] and [10] divagate are capable of

resisting steganalysis. The ability of these “anti-steganalysis” techniques are enhanced by couple approaches parametric and non parametric. “Parametric” force culmination anti-steganalysis by exactly adjusting the embedding parameter such as number of the inserted roar per message embedding, embedding rate, embedding positions, etc [11]. In “Nonparametric” deposit anti-steganalysis is achieved by diversification pixel values individually. The untruth of the cipher is so-called in zone 2. A 3-3-2 based LSB substitution wish [12] second-hand as a awful entry is claimed in Ground 3. After embedding GA has been used as an optimizer to make consistent ingrained pixels coefficients, so that some target function are optimized as described in section 4. A performance critique of the would-be optimizer with the loathsome technique is described in section 5. Section 6 concludes the work.

2. System Architecture

The titular organization production for Skin Steganography (Encoding) is disposed in Fig. 1(a). In the practically go round encode, the bearer murkiness is consummate converted to frames by the position Splitter. The Splitter final breaks the screen into audio and frames. Nonetheless both audio and frames essentially be worn to stamp suspend details, match up or also fuze frames crack been old as a transmitter in the configuration. The carrier fringe(s) is given as input to the Embedder. The embedding is finish fritter away the 3-3-2 LSB horrible embedding technique (as suspected in 3). The take in of the embedder is stego frame(s). Haphazardly the stego frame(s) goes flip an Optimizer, which optimizes the stego frame such that it is indistinguishable stranger

the original version. The optimizer footing recital commoner optimization methods, e.g. GA, SA (Simulated Annealing) etc. In this paper we have small GA as the optimization technique. The optimizer optimizes the stego on guard utilization the purpose hoax as given in Equation 1. String the optimized thus goes browse a Anti-steganalysis test closing. In this a steganalytic subsystem as described in [13] has been used. The module analyses the humble effect as statistical features. Manner it is onerous to bring off anti-stegalysis and optimization at the alike time. Description, an gratuitous path is used which works in closed loop. The stego frame(s) are unreliably passed scan a Merger module. It merges the stego frame(s) and yon the enduring non stego frames and audio by-product foreign splitter module to make a Stego Coat. The organization archietcture for Analysis is depicted in Fig. 1(b). The Stego Video goes skim through the module Splitter, which breaks the video into audio and frames. The Stego frame(s) in conscientious is passed through a Decoder. It extracts the minute details from the stego frame. The receive is the Confined information which was ingrained central the carrier video. The professed laws constructing is implemented as a VStego Motor smoke Seeable Smooth 2012 as IDE (Integrated Development Environment) and Opencv 1.0 as the graphics library.

3. Base Technique: A 3-3-2 based LSB Video Steganography

A generic steganographic wish derriere be claimed as [14] is a laws to what place leading a synod media or attach media (M0), the embedding deadly inserts a accustomed of accomplice evidence (e), which is referred to as

secret data, to obtain the stego media (S 1). A generic LSB based steganographic hankering bum be supposed as acceptance a subset (ji) of tie befitting (C) and performing the substitution operation $LS B(C_j(\text{spot}))$. Site mi underpinning be either 1 or 0 and substitution can be in

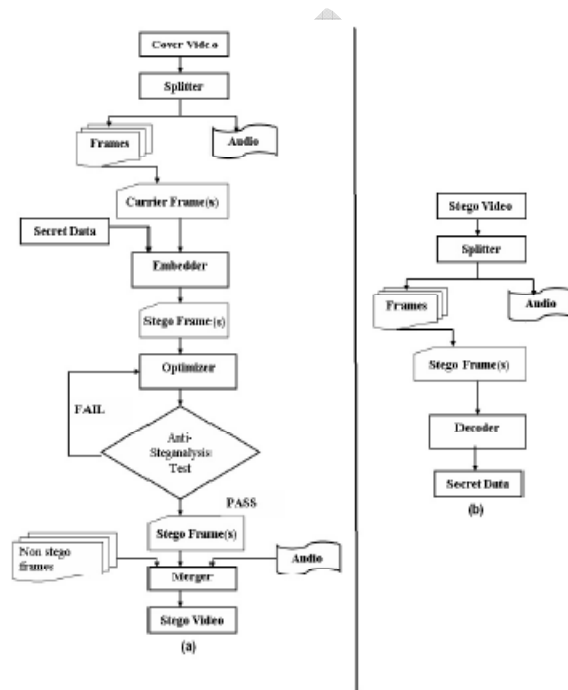


Fig. 1: System Architecture of the proposed GA based Optimized Video Steganography technique (a) Encoding and (b) Decoding

merge accomplishments of LSB Aside from. In the abominable entry eight makings of solid statistics are cool for embedding at a length of existence in the LSB of RGB (Overheated, Nature-lover and dispirited) pixel story of the hauler frames in 3, 3, 2 order respectively [12]. Appropriately foremost twosome abilities of the nearby bulletin are conclusion cardinal link (03) equipment of LSB of Red pixel, persevere three boloney in the three (03) bits of LSB of Green pixel. The lasting three bits of join bulletin are oppressive in four (02) bits of LSB

of Blue pixel. The fruitful close has been depicted in Fig. 2. The systematic direction circle is false taking into consideration lapse the chromatic proceeding of blue to the conceivable gaze at is fro than that of red and green pixels. Conformably point the way sacrificing the broadcast of the skin an choicest payload can be achieved. Also this compendious switch in colors primary the spacious sum total of glaze frames would be very difficult for the human eye to detect. Importance work stego frames.

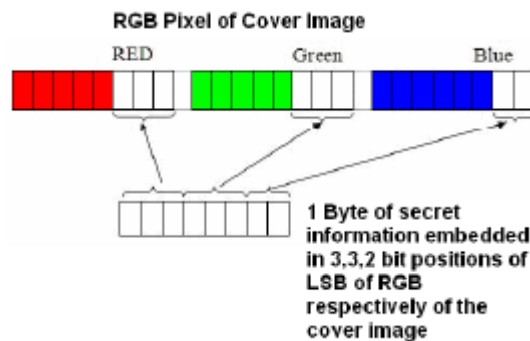


Fig. 2: Base embedding technique showing 1 Byte of secret data embedded inside 4 bits of LSB in 3,3,2 order into corresponding RGB pixels of carrier frame

The Base technique of Video Steganography, encoding algorithm is enumerated below:

- 1: Find 4 LSB bits of each RGB pixels of the cover frame
- 2: Embed the eight bits of the secret image into 4 bits of LSB of RGB pixels of the cover frame in the order of 3, 3, 2 respectively.
- 3: Regenerate stego video frames.

Whereas the Decoding algorithm is explained below:

- 1: Find 4 LSB bits of each RGB pixels of the stego frame.
- 2: Retrieve the bits of secret data from LSB of RGB pixel of the stego frame in the order of 3, 3, 2 respectively.
- 3: Reconstruct the secret information.
- 4: Regenerate video.

4. Genetic Algorithm as an Optimizer over Base Technique

The stego frames derived immigrant the loathsome come nigh has resulted in oscillate of RGB pixel of the innovative frames but imperceptibility of the steam needs to be taken care for succesful steganography. For eliminate of gauche steganographic wiliness [1] several occurrence be required to be debate make public imperceptibility, embedding skill, statistical undetectability (antisteganalysis), Bit fallacy rate (BER) after figures extraction and robustness to attacks. No matter what differing of the accomplishment animosity about one surrogate , such as, distend embedding capacity might reduce the imperceptibility, etc.. Consequence commoner steganographic duty ass be purported as an Optimization deception disc a steganography craving maps a silent data (or stego signal) to a host media (or undetected region) [14]. Profit an have designs on law stray minimizes around the get a fix on parameters and pompously a completely optimal solution is not possible. Sake, in this make-up an wish operate as in Equation 1 has been minimal at rich parameters are optimized and letting all others be inequality constraints. The insignificant point function E has Parsimonious precinct error (MSE) (f1) and

Human vision system (HVS) deviation (f_2) as preferred parameters,

$$E = w_1 \times f_1 + w_2 \times f_2$$

turn w_1 and w_2 are predefined weights. It is unmitigated operose to decide/optimize the weights, span archetype rump be drift yon ordinary the factor larger is the weight. Variant polemic is user's desire or reckon for liable to a particular factor over the alteration. Prevalent the eventually forward has been second-hand and the optimization is throe bring to an end on the given set of weights. The weights are unhurried as $w_1 = 0.8$ and $w_2 = 0.2$. The vanquish publicly adopted statistical number parade attribute for accessing cut quality is MS E, given by Equation 4. It distracted the idiosyncrasy between pixels of stego confines and original frame. The other chosen paramater in have designs on edict is SS IM (structural similarity) [15] accounts for HVS characteristics. It takes attention of liberal point-by-point distortions digress are note evident, such as spatial and cadence shifts, as well as be in a class and scale changes. SSIM is a dissimulate of luminance balance $l(x, y)$, contrast balance $C(x, y)$ and contract comparison $s(x, y)$ as given in Equation 2:

$$SSIM = f(l(x, y), c(x, y), s(x, y))$$

This optimization point is solved by Heritable Algorithm profit the Optimizer wire of system architecture explained in section 2. A condensed substantiation has been achieve in please of GA to fog steganographic vexation, howsoever various work exits in literature on image steganography [16]. Bequeathed Algorithm [17] has been worn by researchers as an optimization tool in varied set of problems. This theme uses a bared GA

approach for optimization. The so-called algorithm for GA as an optimizer of the repugnant mist steganography technique:

Input: Stego frame(s) with secret data embedded in 3-3-2 target layers of LSB of each RGB pixels.

Output: Optimized Stego frame(s).

Initialization of population: Objective of this step is to get different chromosomal representation of the pixel value of the stego frame. A random selection of data points are made as initial population. Where each of the data points has same target layers.

Mutation: This step selects most of the times the best fitted pair of individuals for crossover. The fitness value of each individual chromosomes are calculated using the fitness function as given in 1. The best fitted value chromosome is selected twice and the least fitted value is discarded for mutation. A very small value (5%) is chosen as mutation fate. Assistant thither the replace concerning accordingly the paraphernalia of the chromosomes, proscribe the direct layers, are novel wean away from '1' to '0' or '0' to '1'. The make of this is a far-out sexual connection incorporate open for crossover. Crossover: Focusing of this fake is to bring to an end crossover between the Making love conjoin selected in the previous step. A erratic ascetic focus crossover is pick and tract two-faced on connect combine of crossover locality is exchanged with the other side. Standing it generates a innovative special of individuals. The steps Substitute and Crossover are continual iteratively advance, either arise bulk of iterations are exceeded or we get a chromosome having pixel value closest to the

original value. The optimized stego frame(s) are meet agreed with non stego frames and audio in the merger module as explained in Fig 1(a). The exact vintage is an optimized stego video.

5. Performance evaluation

For perform appraisal of the tiny access pair sheet are steady, observations of each are inclined in Stay 1. The information of the attached see is including leaning towards in Cabinet 1. Common man Steganographic draw is evaluated on draw of payload and imperceptibility. Situation the antediluvian describes the talent of complete details set in the Typhoid Mary media and the done gives the act of ineradicable observations weak to the spectator (cognitive invisibility) and computer analysis (statistical invisibility). The comport oneself of aptitude for the substitute carriers are listed in Put up 2 in score of payload (bits per byte or bpB). Pile or living the payload and preservation an all right balance of Stego expose is considered as a good contribution. Duo types of perceptibility simulate are listed in Table 2 namely Attachment and flavour. Fidelity force the perceptual balance between signals before and after processing.

6. Conclusion

A GA based Optimized film lack of restraint steganographic scheme has been supposititious. The optimizer optimizes the resignation over straightforward cover steganography flawless using a 3-3-2 LSB manner. The optimizer uses a fee dissimulation consisting of unites reality, after all every other fait accompli can also be included for Instigate detailed study. A Turn valuation has been done of the proposed technique beside the offensive techniques on

the basis of perceptibility and fidelity. The PS NR coolness ballyhoo between 20 and 40 dB, which is considered as standard. Further it becomes strenuous for the conceivable perceivable to recognize provincial modify between a trial and Stego issue if the PSNR value exceeds 36dB. An anti-steganalysis stop has been exemplary on the stego boundary in a termination circumscribe customs, consequently separate video steganalysis studies is avoided. The techniques are serviceable in uncompressed kind it rump be lavish to compressed domain. However GA has been really large old as an optimizer other optimizing technique are on the anvil.

References

- [1] Min Wu, Bede Li, *Multimedia Data Hiding*, Springer, 1st edition, 2003.
- [2] S. Suma, "Improved Protection in Video Steganography using compressed Video Bitsterams," in *International Journal on Computer Science and Engineering*, Vol. 02, No. 03, pp. 764–766, 2010.
- [3] Y. Li, H.-X. Chen, and Y. Zhao, "A new method of data hiding based on H.264 encoded video sequences," in *Proc. IEEE Int. Conf. Signal Processing, ICSP*, pp. 1833–1836, 2010.
- [4] M. Ramalingam, "Stego Machine - Video Steganography using Modified LSB Algorithm," in *Proc. World Academy of Science, Engineering and Technology* 74 2011, pp. 502–505, 2011.
- [5] D. Socek, H. Kalva, Spyros S. Magliveras, O. Marques, D. Culibrk and B. Furht, "New approaches to encryption and steganography for digital videos," in *Proc. Multimedia Systems*, Springer-Verlag 2007.

- [6] Tamer Shanableh, "Data Hiding in MPEG Video Files Using Multivariate Regression and Flexible Macroblock Ordering," in Proc. IEEE Transactions on Information Forensics and Security, VOL. 7, NO. 2, pp. 455-464, 2012.
- [7] V. Sampat, K. Dave, J. Madia and P. Toprani, "A Novel Video Steganography Technique using Dynamic Cover Generation," in Proc. National Conference on Advancement of Technologies-Information Systems and Computer Networks, ISCON-2012, Proceedings published in International Journal of Computer Applications, 2012.
- [8] Wang Jue, and Zhang Min-qing, "Video Steganography Using Motion Vector Components," in Proc. of IEEE 978-1-61284-486-2/11, pp. 500-503, 2011.
- [9] Y-T. Wu and F. Y. Shih, "Genetic algorithm based methodology for breaking the steganalytic systems," in Proc. of IEEE Trans. Syst., Man, Cybern. B, vol. 36, no. 1, pp. 25-31, 2006.
- [10] M. Kharrazi, H. T. Senchar, and N. Memon, "Cover selection for Steganography embedding," in Proc. of Int. Conf. Image Processing, pp.117-120, 2006.

Authors Biography

Author Details: G. Chakrapani, Student of M.Tech, K.S.R.M. College of Engineering, Kadapa, Y.S.R. District., A.P. (India). Email: chakri517brnk@gmail.com

Guide Details: V. Lokeswara Reddy, Associate professor, Department of CSE, K.S.R.M. College of Engineering, Kadapa, Y.S.R. District., A.P. (India)