31.03.2019; Updated 1.04.2019

**CMSE-492 Term Project “Investigation of data hiding methods” Spring 2019**

**Task**:

1. Develop an application implementing methods [1-3] so that embedding is followed by extraction, and the data extracted are always verified versus the data embedded. Have an exception for the discrepancy found.
2. Compare methods [1-3] using host images specified in [1-3] and secret messages specified in [1] (256x256 gray scale images).
	1. Embedding capacity
	2. PSNR
	3. Image quality index
	4. Time for embedding (extraction) of one secret image into (from) one cover (stego) image
3. Find the best parameters for each method
	1. ml, mu, T for [1]
		1. Try T=32\*I, i=1,3,7
		2. Try ml=8+4\*I, i=0,3, 6, keeping ml<2log2T, ml<mu
		3. Try mu=8+8\*I, i=0,3, 6, keeping mu<2log2(256-T)
	2. Ranges for [2]
		1. Try two ranges used in [2] and {[0,31],[32,63],[64,127],[128,255]}.
	3. For [3]
		1. Try n=3, 4
		2. Try L= 16, 32
4. Show results of your study in tabular form as it is made in [1, 2]
5. Report on the Term project shall be handed to Lab Coordinator Felix Babalola latest on **Monday, May 27, 2019, before 13.00, CMPE-119. Later submission will be penalized by 10% off per day.**
6. Date of the defense will be agreed with Lab Coordinator after the report submission during May 28-31, 2019.
7. Report is prepared by a team. Teams are the same as in Laboratory works.
8. Report shall be arranged as follows:
	1. Cover page (University, Department, Course, Semester, Year, City, Country, Term Project subject, Team members, Lecturer, Lab assistant)
	2. Outline
	3. Problem definition (see Items 1-4 above)
	4. Methods [1-3] descriptions
	5. Description of your application implementing methods [1-3] in your programming language/operating system according to Item 1 above.
	6. Description of the tests conducted and their results, **screenshots** of them
	7. Comparison of the methods according to Items 2-4 above
	8. Conclusion
	9. References
	10. Appendices with the code developed and raw results obtained
	11. CD with all Term Project related materials (report, images used, test results, sources, executables, user guide). CD shall be runnable (it is possible to install your program from the CD, run it on your examples, and view results you got).
9. **Grading policy: 40% report and 60% explanations out of totally 20 points**

**References**

1. S.-J. Wang, Steganography of capacity required using modulo operator for embedding secret image, Applied Mathematics and Computation, 164 (2005), 99-116, doi:10.1016/j.amc.2004.04.059, <http://cmpe.emu.edu.tr/en/CourseLoad.aspx?id=CMSE492&page=lecturenotes>
2. D.-C. Wu, W.-H. Tsai, A steganographic method for images by pixel-value differencing, Pattern Recognition Letters 24 (2003) 1613–1626, <http://cmpe.emu.edu.tr/en/CourseLoad.aspx?id=CMSE492&page=lecturenotes>
3. X. Zhang and S. Wang, Efficient Steganographic Embedding by Exploiting Modification Direction, IEEE COMMUNICATIONS LETTERS, VOL. 10, NO. 11, NOVEMBER 2006, pp. 781-783, <https://staff.emu.edu.tr/alexanderchefranov/Documents/CMSE492/Spring2019/main%20reference%20for%20EMD.pdf>