**CMSE492 Lab 2. Wu & Tsai’s method**

06.04.2021

**Task:**

1. Implement Wu & Tsai’s algorithm [1] in any programming language/operating system
2. Test your implementation using Seminar 2 06.04.2021 examples: “Embed data from the following secret binary data as much as possible,

S=’ 1 1 0 1 0 1 0 1 0 1 0 0 0 0 1 0 1 1 0 1 1 1 1 0 1 0 1 1 0’,

into the cover image, CI=(190, 255, 161, 100, 1, 159, 15, 56, 192, 195, 10, 15) by Wu and Tsai’s method [1] using range table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| k | lk | uk | Widthk=uk-lk+1 | Bitsk=log2(widthk) |
| 1 | 0 | 7 | 8 | 3 |
| 2 | 8 | 15 | 8 | 3 |
| 3 | 16 | 31 | 16 | 4 |
| 4 | 32 | 63 | 32 | 5 |
| 5 | 64 | 127 | 64 | 6 |
| 6 | 128 | 255 | 128 | 7 |

Extract the data embedded. Check that the data extracted match the data embedded”.

1. Test your implementation on 4 host 512x512 images (Mandrill/Baboon, Peppers, Jet, and Lena) and 4 secret 256x256 images (Mandrill/Baboon, Peppers, Jet, and Lena) used in [1], [2].
2. For each of 16 variants of embedding secret into the covers, calculate PSNR and compare your results versus [1, Table 2, p. 1622], and [2, Table 1, p. 112].
3. **Defend the Lab on May 13, Thursday, 18.30-20.20, Teams (upload your report, run your program, and explain your work done).**
4. Report shall have
	1. Cover page (University, Department, Course, Semester, Year, City, Country, Lab subject, Team members, Lecturer, Lab assistant)
	2. Outline
	3. Problem definition (see items 1-4 above)
	4. Wu & Tsai’s method description
	5. Description of Wu & Tsai’s method implementation in your programming language/operating system
		1. Description of the host/secret images you use and their sources
		2. Description of falling of boundary condition checking implementation
		3. Description of embedding using inverse difference function implementation
		4. Description of extraction implementation
		5. Description of PSNR and embedding capacity calculation
	6. Description of the tests conducted and their results, **screenshots** of them
	7. Comparison of your results versus [1, Table 2, p. 1622], and [2, Table 1, p. 112].
	8. Conclusion
	9. References
	10. Appendices with the code developed
	11. Archived file (zip, or rar) with all Lab related materials (report, images used, test results, sources, executables). It shall be possible to install your program from the archive, run it on your examples, and view results you got.

**References**

1. D.-C. Wu, W.-H. Tsai, A steganographic method for images by pixel-value differencing, Pattern Recognition Letters 24 (2003) 1613–1626, [Wu&Tsai](https://staff.emu.edu.tr/alexanderchefranov/Documents/CMSE492/WuPRL2003%20PVD.pdf)
2. 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, [paper](https://staff.emu.edu.tr/alexanderchefranov/Documents/CMSE492/LSB%20modulo%20AMC2005.pdf)

**Grading policy: report – 50%, explanations – 50%**