*Algorithms on Regular* *Data structures: Additional Problems*

1. **Sorting by swapping.** Sort an array of integers by repeatedly swapping pairs of consecutive elements that are in not in the right order. Keep taking passes on the entire array and swapping elements until no swaps occur in a pass, which indicates that the array is sorted.
   1. Give a step by step description of the algorithm.
   2. Give a pseudocode description of the algorithm.
   3. Trace the algorithm on the array {6, 3, 4, 8, 11, 2, 1}, ascending order.
2. **Denoising**. Given a black and white 8 bit image of size wxh (e.g. 6x5), find all pixels with an intensity larger than A (e.g. 200) and with immediate neighbors of intensity below B (e.g. 100), and replace such pixels with the arithmetic average of the immediate neighbors. A pixel has 8 immediate neighbors.
   1. Provide a brief step by step description of the algorithm.
   2. Provide a pseudocode description of the algorithm.
   3. What is the algorithm running time
   4. What is the output of the algorithm on the following image, for A = 200 and B = 100?

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| --- | --- | --- | --- | --- |
| 0 | 255 | 255 | 80 | 0 |
| 0 | 255 | 100 | 255 | 0 |
| 0 | 255 | 255 | 255 | 0 |
| 0 | 255 | 0 | 0 | 0 |
| 0 | 255 | 0 | 200 | 0 |
| 0 | 255 | 0 | 0 | 0 |
| Input image | | | | |

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| Output image | | | | |