# Arriving at Scene / Image Segmentation via Selected Problems

Vlad Wojcik
Department of Computer Science
Brock University
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## Text Matching:

**Problem 0 [xx]:** Write a program that would read in two text strings and identify within the second string all occurrences of the first string. Observe that each instance of the substring may occur several times in the parent string. All these substring occurrences should be identified by your program.

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**Problem 1 [xx]:** Write a program that would read in two text strings and identify within them all occurrences of a longest common substring. Observe that:

- The longest substring may not be unique - your program should be able to identify all instances of all such substrings in both parent strings.
- Each instance of each substring may occur several times in each parent string. All these substring occurrences should be identified by your program.

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**Problem 2 [xx]:** The problem is identical to Problem 1, but now you allow n misspellings in the substring, where n = 0 .. 3.

## B&W Pixel Matching:

Please design your output carefully, in order to facilitate marking by your TA. Provide brief explanation of your design rationale and methodology.

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**Problem 3 [xx]:** The problem is similar to Problem 2, but now the input alphabet of the two byte arrays consists of shades of gray in the range 0 .. 255, rather than text characters.

Match criteria:

- Two gray levels in the pixels being compared are considered matching, if their values differ by at most m gray levels, where m = 0 .. 15.
- Allow n misspellings in the pixel subset, where n = 0 .. 3.

## Colour Pixel Matching:

Please design your output carefully, in order to facilitate marking by your TA. Provide brief explanation of your design rationale and methodology.

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**Problem 4 [xx]:** The problem is similar to Problem 3, but now the input consists of six byte arrays representing shades of gray in the range 0 .. 255. First three strings contain Red, Green, Blue values of one input row of pixels, the remaining three strings describe corresponding RGB values in another row of pixels.

The pixel colours are to be compared pair wise:
Red with Red, Green with Green, Blue with Blue.

Match criteria:

- The pixel colours are to be compared pair wise:
  Red with Red, Green with Green, Blue with Blue. Two pixels match if:
    - The sum of all three differences in RGB intensity levels lies within m gray levels, where m = 0 .. 15.
    - The sum of two largest differences in RGB intensity levels lies within m gray levels, where m = 0 .. 15.
    - The largest difference in RGB intensity levels lies within m gray levels, where m = 0 .. 15.
    - Their all three intensity levels (RGB) are identical.

- Allow n misspellings in the pixel subset, where n = 0 .. 3.

## B&W Image Region Matching:

Please design your output carefully, in order to facilitate marking by your TA. Provide brief explanation of your design rationale and methodology.

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**Problem 5 [xx]:** The problem is similar to Problem 3, with the input alphabet of the byte arrays consisting of shades of gray in the range 0 .. 255.

However, we consider now an image as an x by y array of B&W pixels. We are searching now for the largest 2D common sub region in two B&W images. Please assume x = y = 50. The size (area) of the sub region equals the number of its constituent pixels.

Match criteria:

- Two gray levels in the pixels being compared are considered matching, if their values differ by at most m gray levels, where m = 0 .. 15.
- Allow n misspellings in the pixel subset, where n = 0 .. 3.

## Colour Image Region Matching:

Please design your output carefully, in order to facilitate marking by your TA. Provide brief explanation of your design rationale and methodology.

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**Problem 6 [xx]:** The problem is similar to Problem 4, with the input alphabet of the byte arrays consisting of shades of gray in the range 0 .. 255.

However, we consider now a colour image as an x by y array of colour pixels. We are searching now for the largest 2D common sub region in two colour images. Please assume x = y = 50. The size (area) of the sub region equals the number of its constituent pixels.

As before, the pixel colours are to be compared pair wise:
Red with Red, Green with Green, Blue with Blue.

Match criteria:

- The pixels are to be considered pair wise: Red with Red, Green with Green, Blue with Blue. Two pixels match if:
    - The sum of all three differences in RGB intensity levels lies within m gray levels, where m = 0 .. 15.
    - The sum of two largest differences in RGB intensity levels lies within m gray levels, where m = 0 .. 15.
    - The largest difference in RGB intensity levels lies within m gray levels, where m = 0 .. 15.
    - Their all three intensity levels (RGB) are identical.
- Allow n misspellings in the pixel subset, where n = 0 .. 3.