**Logo, company name

Description automatically generatedASSIGNMENT 1**

**Digital Image Processing**

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**Question 1**

Consider the two images subsets, S1 and S2, shown in the following figure. For V= {1}, determine whether these two subsets are (a) 4-adjacent, (b) 8-adjacent, or (c) m-adjacent.

**Answer**:



The pixels in s1 are 4p connected whereas the pixels in s2 are m connected or 8p connected because one white pixel is at diagonal of the other neighbor. As in m-adjacency we can move at diagonals when there is no link through 4 adjacent neighbors. In 8 adjacency we can always traverse the 4 initial members and 4 diagonals if satisfies the matching criteria. The sets s1 and s2 are m-connected or 8 connected because s1 and s2 have only one pixel for their adjacency and that pixel shown by red arrow is at diagonal of the other. So, either these two subsets are 8 adjacent or m adjacent.

**Question 2**

3x3 Mean

Text

Description automatically generated

Output

A picture containing text

Description automatically generated

3x3 Median result

A picture containing ground, outdoor, dirt

Description automatically generated

5x5 MeanGraphical user interface, text, application

Description automatically generated

A picture containing text

Description automatically generated

**Graphical user interface, text, application

Description automatically generated**5x5 Median

Background pattern

Description automatically generated

First have applied averaging using 3x3 window and then with 5x5 window by using both mean and median but median has removed the noise but pictures details have also been lost whereas in mean noise is not completely removed.

**Question 3**

An automobile manufacturer is automating the placement of certain components on the bumpers of a limited-edition line of sports cars. The components are color coordinated, so the robots need to know the colour of each car in order to select the appropriate bumper component. Models come in only four colors: blue, green, red, and white. You are hired to propose a solution based on imaging. How would you solve the problem of automatically determining the color of each car, keeping in mind that cost is the most important consideration in your choice of components?

**Answer:**

Color determination of a car can be done by using histograms. First, we trains our detection system from the multiple histograms for each color car and set it as a standard. Then for identification of a car, we will have the image of car. From that image draw the histogram of that car. Now, we will compare cars histogram with four standard histograms, and it will match to the one show that the car is of the same color of standard histogram’s cars. As the car can only be in four colors red, green, blue, and white so we can use histogram matching as it is not computationally expensive. Moreover, there is a limited-edition line of sports car so they can be identified through histogram matching.

**Question 4**

State an algorithm for converting a one-pixel-thick *m*-path connectivity to *4*-path connectivity?

**Answer:**

**Algorithm**

**Step 1:** First, we will identify the pixel that is at m connectivity.

**Step 2:** Then identify the pixel positions that is at 4p distance from both pixels that are connected through m path

**Step 3:** Pick one such position and place the matching criteria value at that pixel position.

**Step 4:** Now we can go through that common 4p neighbour.

In this way we will have a 4p connectivity for that one-pixel thick m connectivity.