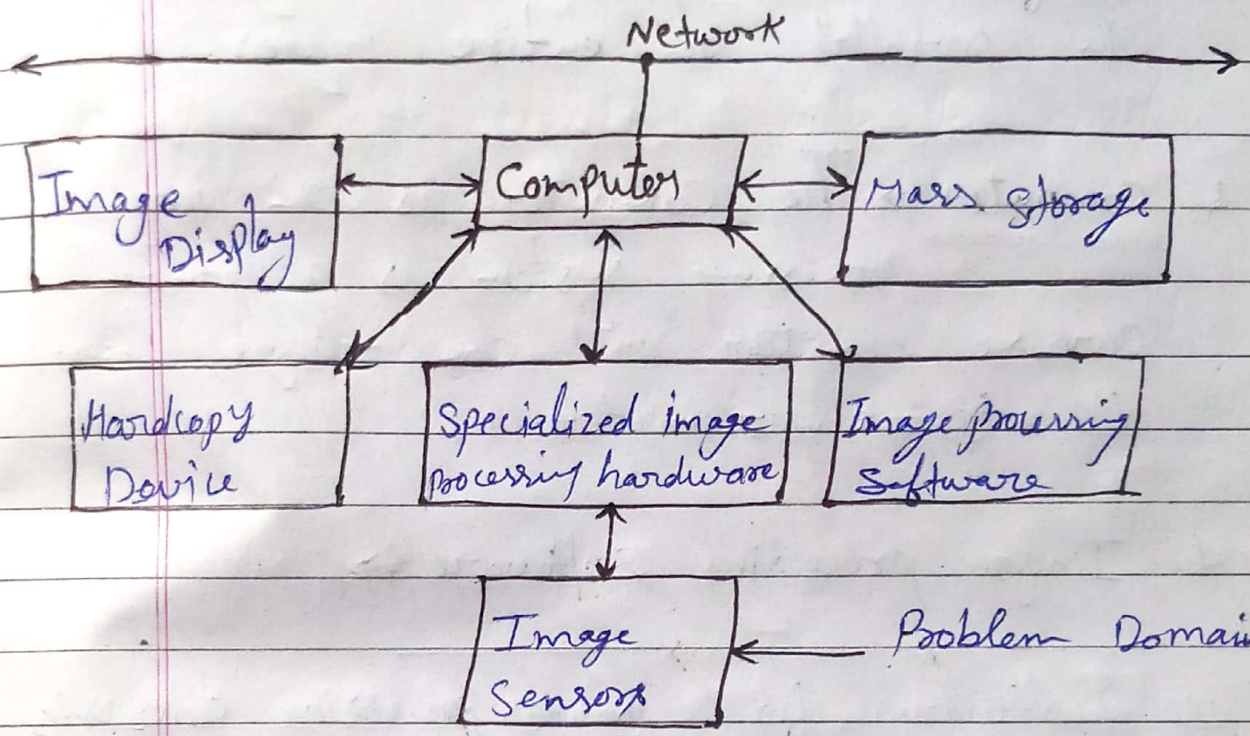
Section - 5

Q.2 → (a) Components of image processing system

↳ The basic components comprising a typical general purpose system used for digital image processing.



1) Image Sensors ⇒

i) It refers to sensing.

ii) The image sensor captures incoming light, convert it into an electric signal, measure that signal and output it to supporting electronics.

iii) Image sensor is a 2D array of light-sensitive elements that convert photons to electrons.

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2) Specilized image processing hardware ⇒

↳ It consists of the digitizer and hardware that performs primitive operations, such as an Arithmatic and logical unit (ALU), which performs arithmatic and logical operation in parallel on entire images.

3. Computer ⇒ The Computer is an image processing system is a general purpose computer and can range from a PC to supercomputer.

4. Image processing ~~Software~~ ⇒

i) Software for image processing consists of specialized modules that perform specific tasks.

ii) A well-designed pakage also includes the capability for the user to write code.

5. Mass storage ⇒ Mass storage refers to the storage of large amount of data in persisting and machine-readable fashion.

↳ Mass storage capability is must in image processing applications.

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6) Image Display ⇒

↳ Image display is the final link in the digital image processing chain.

↳ Image displays are mainly colored TV monitors.

7) Hardcopy Device ⇒

↳ Various devices for recording images are laser printers, film cameras, heat-sensitive devices, and digital units, such as optical and CD-ROM disks.

8 Networking ⇒

↳ It is required components to transmit image information over networked computer.

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* Laplacian filter ⇒

↳ First derivative does enhance the edges of the image.

We know,

$$\nabla f = \frac{\partial f}{\partial x} + \frac{\partial f}{\partial y}$$

$$\frac{\partial f}{\partial x} = f(x+1, y) - f(x, y)$$

and $$\frac{\partial f}{\partial y} = f(x, y+1) - f(x, y)$$

2. The second derivative is given by.

$$\nabla^2 F = \frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2}$$

where

$$\frac{\partial^2 f}{\partial x^2} = f(x+1, y) + f(x-1, y) - 2f(x, y)$$

$$\frac{\partial^2 f}{\partial y^2} = f(x, y+1) + f(x, y-1) - 2f(x, y)$$

$$\nabla^2 F = \frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2}$$

$$|\nabla^2 F| = [f(x+1, y) + f(x-1, y) + f(x, y+1) + f(x, y-1) - 4f(x, y)]$$

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3. Considering the 3x3 neighbourhood

	y-1	y	y+1
x-1	z_1	z_2	z_3
x	z_4	z_5	z_6
x+1	z_7	z_8	z_9

4. This equation in the discrete form reduce to

$$|\nabla^2 f| = [z_8 + z_2 + z_6 + z_4 - 4z_5]$$

5. This equation can be implemented using a mask shown as:

0	1	0
1	-4	1
0	1	0

6. This is know as the Laplacian filter.

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