



**S. B. JAIN INSTITUTE OF TECHNOLOGY,
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Practical No. 5

Aim: Apply following image processing operation on the given image.

- i. Negative ii. Logarithmic iii. Affine iv. Cropping

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AIM: Apply following image processing operation on the given image.

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OBJECTIVE/EXPECTED LEARNING OUTCOME:

The objectives and expected learning outcome of this practical are:

- To perform different operation on image for analysis image.

THEORY:

- **Negative**

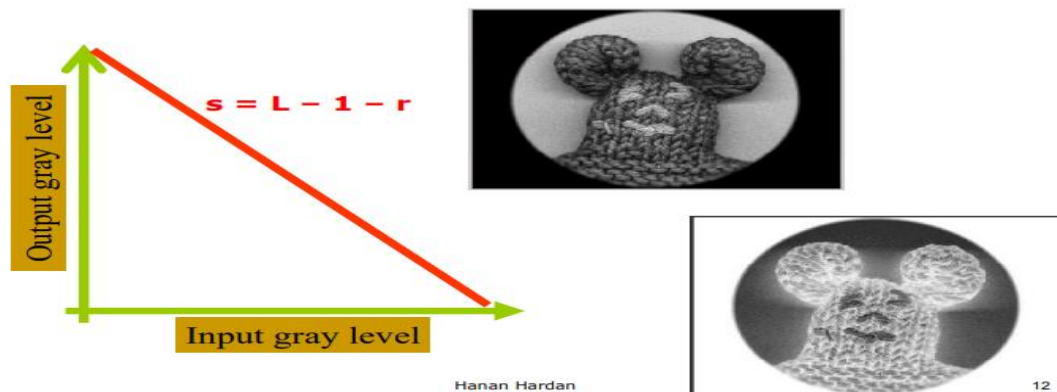
The negative of an image with gray level in the range $[0, L-1]$, where L = Largest value in an image, is obtained by using the negative transformation's expression:

$$s = L - 1 - r$$

Which reverses the intensity levels of an input image, in this manner produces the equivalent of a photographic negative. The negative transformation is suitable for enhancing white or gray detail embedded in dark regions of an image, especially when the black area is dominant in size.

Example:

Image Negatives (Negative Transformation)



Advantages of Negative image:

Advantages of negative:

- Produces an equivalent of a photographic negative.
- Enhances white or gray detail embedded in dark regions.

ALGORITHM:

CODE:

- **Logarithmic**

The general form of the log transformation:

$$s = c \log (1+r).$$

Where c is a constant, and $r \geq 0$

Log curve maps a narrow range of low gray-level values in the input image into a wider range of the output levels. Used to expand the values of dark pixels in an image while compressing the higher-level values.

It compresses the dynamic range of images with large variations in pixel values. Log functions are particularly useful when the input grey level values may have an extremely large range of values.

ALGORITHM:

CODE:

- **Affine**

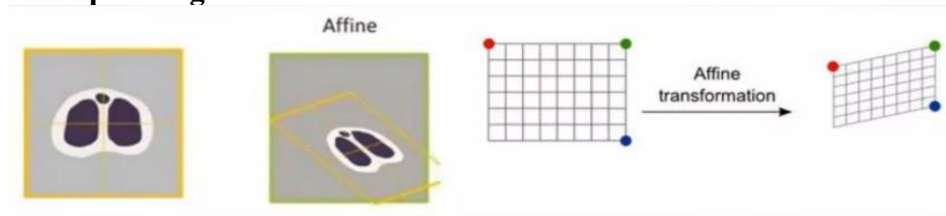
An affine transformation is a transformation that preserves co-linearity and the ratio of distances.

The parallel lines in an original image will be parallel in the output image.

Affine= Translation + Rotation + Scale + Shear

$$\begin{bmatrix} u \\ v \end{bmatrix} = \begin{bmatrix} a_0 & a_1 & a_2 \\ b_0 & b_1 & b_2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$$

Example image:



ALGORITHM:

CODE:

- **Cropping**

As the name suggests, cropping is the act of selecting and extracting the Region of Interest (or simply, ROI) and is the part of the image in which we are interested. For instance, in a face detection application, we may want to crop the face from an image.









When we crop an image, we want to remove the outer parts of the image we are not interested in. We commonly refer to this process as selecting our Region of Interest, or more simply, our ROI.

We can accomplish image cropping by using NumPy array slicing.

ALGORITHM:

CODE:

INPUT & OUTPUT:

Sr. No.	INPUT	OUTPUT
1.		
2.		
3.		
4.		

CONCLUSION:

DISCUSSION QUESTIONS:

1. Give the formula for negative and log transformation
2. What is meant by bit plane slicing?
3. What is an affine transformation in the context of image processing.
4. What is image cropping and why is it an important operation in image processing.
5. Explain the importance of maintaining the aspect ratio when applying affine transformation.

REFERENCES:

- Computer Vision: Algorithms and Applications, Richard Szeliski, 2010, Springer.
- Computer Vision - A modern Approach, D. Forsyth, J. Ponce, 2nd Edition 2011, Pearson India.
- OpenCV Computer Vision with Python, Joseph Howse, 2013, Packt Publishing.
- Dictionary of Computer Vision and Image Processing, R. B. Fisher, T. P. Breckon, K. Dawson-Howe, A. Fitzgibbon, C. Robertson, E. Trucco, C. K. I. Williams, 2nd Edition, 2014, Wiley.
- <https://www.geeksforgeeks.org/digital-image-processing-basics/>
- <https://www.javatpoint.com/digital-image-processing-tutorial>
- <https://www.simplilearn.com/image-processing-article>
- <https://www.mygreatlearning.com/blog/digital-image-processing-explained/>