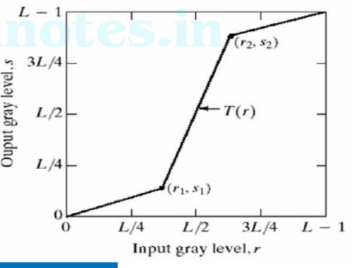
Module 5

**Contrast stretching**

Aims to increase (expand) the dynamic range of an image. It transforms the gray level in the range {0,1,…L-1} by a piecewise linear function the figure below shows a typical transformation used for contrast stretching 

The Locations of points (r1,s1) and (r2,s2) control the shape of the transformation function

**Histogram Equalization**

**Histogram**

The histogram of an image is a plot of the number of occurrences of gray levels in the image against the gray level values

**Histogram Equalization**

Histogram equalization is a process that attempts to improve the contrast by spreading out the gray levels in an image using probability density function so that they are evenly distributed across the image

The intensity levels in an image may be viewed as random variables in the interval [0,L-1]. Let Pr(r) and Ps(s) denote the probability density function of random variables r and s

**Steps for histogram equalization for a discrete grayscale image**

1 tabulate the grey levels (Rk) and number of pixels (Pk) in each level

2Compute the cumulative frequency distribution or running sum.

3 Divide the running sum by total number of pixels (MxN) and multiply the result by maximum gra level value (L-1)

4 Round the result of step 3 to the closest integer to get the equalized values

5 Map the equalized values to the original grey levels and then equalize the image by changing its values accordingly

Module 4

**Image sampling and Quantization:**

To create a digital image, we need to convert the continuous sensed data into digital form. This involves two processes.

Sampling and

Quantization

A continuous image, f(x, y), is to be converted to digital form. An image may be continuous with respect to the x- and y- coordinates, and also in amplitude. To convert it to digital form, we have to sample the function in both coordinates and in amplitude.

. Digitizing the coordinates values is called Sampling. Digitizing the amplitude values is called Quantization

Module 1

**Computer Graphics**

• Computer Graphics includes all aspects of creating or synthesizing images using a computer.

Creation of images, Storage, Modelling of geometric objects and Projecting 3D models onto 2D plane (Rendering) are part of Computer Graphics. • Displaying these images on computer screen or other hardcopy output devices like printers, plotters etc. is also part of Computer Graphics.

**Applications of CG**

**1 Computer aided design**

CAD involves using computer graphics to design products, structures, and systems.  **Applications:** **Engineering Design:** Creating detailed 2D or 3D models of vehicles, machinery, and electronics. **Architecture:** Visualizing building plans, interiors, and landscapes. **Manufacturing:** Designing tools, molds, and prototypes for production. **Benefits:** Provides precision, allows testing and simulation, and reduces prototyping costs.

**2 Presentation Graphics**

**Definition:** Creating visual aids to present information in a clear and engaging way. **Applications:**

**Business Presentations:** Designing slideshows with charts, graphs, and animations. **Education:** Using visuals for lectures or workshops.

**Marketing:** Developing infographics, reports, and pitch decks. **Benefits:** Enhances communication, simplifies complex data, and captivates the audience.

**3 Computer Art**

**Definition:** Using computers to create digital artwork, illustrations, and animations. **Applications:**

**Digital Painting and Sculpting:** Creating 2D or 3D art using tools like Photoshop or Blender.

**Animation:** Designing characters, storyboards, and environments for movies and videos.

**Augmented Reality (AR):** Producing interactive art installations.

**Benefits:** Provides versatility, cost-efficiency, and the ability to achieve effects not possible with traditional media.

**4 Entertainment (Animation, Games, etc.)**

**Definition:** Computer graphics are pivotal in producing entertainment content. **Applications:**

**Movies and VFX:** Creating realistic special effects, 3D models, and immersive scenes **Video Games:** Designing interactive environments, characters, and dynamic simulations. **Virtual Reality (VR):** Providing immersive experiences for gaming and simulations. **Benefits:** Enhances storytelling, creates new forms of engagement, and drives technological innovation.

**5 Education and Training**

**Definition:** Graphics are used to make learning and training more interactive and effective.

**Applications:** **Simulations:** Flight simulators for pilots, or surgery simulators for medical professionals **E-Learning Tools:** Interactive graphics in apps, presentations, and virtual classrooms. **Skill Development:** Gamified learning experiences for students and professionals. **Benefits:** Improves retention, provides hands-on experience, and enables learning in a risk-free environment.