**Lung Water Level Analysis using MATLAB**

**OBJECTIVE:**

* This project aims to develop an automated lung water level detection system using MATLAB.
* By analyzing X-ray images, the system can identify fluid accumulation, calculate water levels, and compare them with a threshold to determine if the patient is affected.

**Tools & Technologies Used**

* + **Software:** MATLAB R2024b
  + **Techniques:** Image Processing, Segmentation, Thresholding

### ****Workflow or Methodology****

* 1. Image Acquisition
  2. Preprocessing (Grayscale, Filtering)
  3. Segmentation
  4. Fluid Detection and Percentage Estimation
  5. Output Visualization

**CODE:**

clc; clear; close all;

% Load X-ray image (Replace 'lung\_xray.jpg' with actual image)

img = imread('C:\RUPIKA\_ECE\_C\lungs1.jpeg');

img = imresize(img, [256, 256]); % Resize for uniform processing

% Convert to grayscale

gray\_img = rgb2gray(img);

% Apply Gaussian filter to remove noise

filtered\_img = imgaussfilt(gray\_img, 1);

% Enhance contrast using adaptive histogram equalization

enhanced\_img = adapthisteq(filtered\_img);

% Display images

subplot(2,3,1); imshow(img); title('Original X-ray');

subplot(2,3,2); imshow(gray\_img); title('Grayscale');

subplot(2,3,3); imshow(enhanced\_img); title('Enhanced Image');

% Apply Edge Detection (Canny Method)

edges = edge(enhanced\_img, 'canny');

% Apply Otsu’s Thresholding for segmentation

threshold\_level = graythresh(enhanced\_img);

binary\_img = imbinarize(enhanced\_img, threshold\_level);

% Morphological operations to remove noise

cleaned\_img = imopen(binary\_img, strel('disk', 3));

% Display segmentation results

subplot(2,3,4); imshow(edges); title('Edge Detection');

subplot(2,3,5); imshow(binary\_img); title('Thresholded Image');

subplot(2,3,6); imshow(cleaned\_img); title('Cleaned Binary Image');

% Label connected components in the binary image

stats = regionprops(cleaned\_img, 'Area', 'BoundingBox');

% Calculate the total lung area

total\_area = numel(cleaned\_img);

% Calculate the fluid-affected area

fluid\_area = sum([stats.Area]);

% Calculate fluid level percentage

fluid\_percentage = (fluid\_area / total\_area) \* 100;

fprintf('Detected Fluid Level in Lungs: %.2f%%\n', fluid\_percentage);

% Define threshold for lung water level (Adjust based on medical data)

fluid\_threshold = 20; % Above 20% is considered high

% Classify patient condition

if fluid\_percentage > fluid\_threshold

disp('WARNING: High Water Level Detected! Patient is Affected.');

else

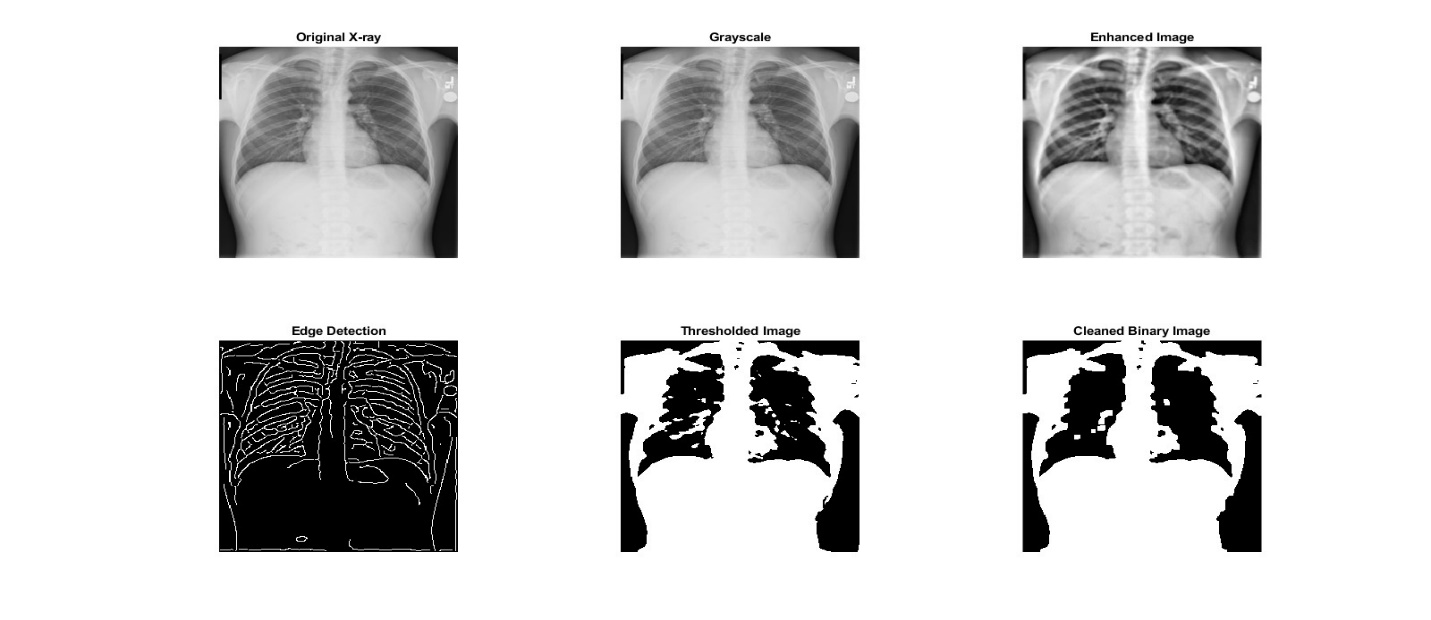
disp(' Normal Condition: No Excess Water Detected.');

end

**How to Run the Code:**

1. Open MATLAB
2. Load the .m file
3. Run the script and choose an X-ray image
4. View results in Command Window

**SAMPLE INPUT:**



**OUTPUT:**

