

Load the image

```
% Load the image
img = imread('image.jpg');

% Convert to grayscale if the image is in RGB
gray_img = rgb2gray(img);

% Convert to double for computation
gray_img = im2double(gray_img);

% Display the original image
imshow(gray_img);
title('Original Grayscale Image');
```

Original Grayscale Image



Implement the Kuwahara Filter

```
% Apply the Kuwahara filter to the grayscale image
```

```
window_size = 5; % You can adjust the window size
filtered_img = kuwahara_filter(gray_img, window_size);

% Display the filtered image
figure;
imshow(filtered_img);
title('Kuwahara Filtered Image');
```

Kuwahara Filtered Image



```
function kuwahara_filtered_img = kuwahara_filter(img, window_size)
    % Get the size of the image
    [rows, cols] = size(img);

    % Initialize the output image
    kuwahara_filtered_img = zeros(rows, cols);

    % Define the half window size
    half_window = floor(window_size / 2);

    % Iterate over every pixel in the image
```

```

for i = 1:rows
    for j = 1:cols
        % Initialize variables for the best region (smallest variance)
        min_variance = inf;
        best_mean = 0;

        % Iterate through four quadrants around the pixel
        for dx = [-1, 1]
            for dy = [-1, 1]
                % Define the boundaries of the region
                x_start = max(1, i + dx * half_window);
                x_end = min(rows, i + dx * (window_size - 1));
                y_start = max(1, j + dy * half_window);
                y_end = min(cols, j + dy * (window_size - 1));

                % Extract the region
                region = img(x_start:x_end, y_start:y_end);

                % Calculate the mean and variance of the region
                region_mean = mean(region(:));
                region_variance = var(region(:));

                % Check if this region has the smallest variance
                if region_variance < min_variance
                    min_variance = region_variance;
                    best_mean = region_mean;
                end
            end
        end

        % Assign the pixel value to the mean of the region with smallest variance
        kuwahara_filtered_img(i, j) = best_mean;
    end
end
end

```