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% Bit Plane Slicing: Visualizing Image Data at the Binary Level
% A MATLAB implementation to extract, analyze, and display individual bit planes of a
% grayscale image, providing insight into the binary representation of pixel intensities.
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```

```
clc;
clear;
close all;
```

```
% Prompt user to input image file
```

```
[filename, pathname] = uigetfile({'*.*', 'All Files (*.*)'}, 'Select an Image');
if isequal(filename, 0)
    disp('User cancelled the image selection.');
```

```
    return;
```

```
end
```

```
% Read the image
```

```
filePath = fullfile(pathname, filename);
image = imread(filePath);
```

```
% Convert to grayscale if not already
```

```
if size(image, 3) == 3
    grayImage = rgb2gray(image);
```

```
else
```

```
    grayImage = image;
```

```
end
```

```
% Display the original grayscale image
```

```
figure;
subplot(3, 3, 1);
imshow(grayImage);
title('Grayscale Image');
```

```
% Separate into bit planes and display in a single window
```

```
for k = 1:8
    bitPlane = bitget(grayImage, k); % Extract bit plane
    subplot(3, 3, k + 1); % Arrange bit planes in the grid
    imshow(bitPlane, []);
    title(['Bit Plane ', num2str(k)]);
```

```
end
```

```
% Adjust figure layout
```

```
sgtitle('Grayscale Image and Bit Planes');
```

Grayscale Image and Bit Planes

