```
I = imread('butterful.png');
if size(I, 3) == 3
    I = rgb2gray(I);
end
I = double(I) / 255;
levels = 32;
I_quantized = round(I * (levels - 1));
scale_factor = 0.1;
I_resized = imresize(I_quantized, scale_factor, 'nearest');
I_quantized_resized = imresize(I_resized, size(I), 'nearest');
I_quantized_resized = uint8(I_quantized_resized * (255 / (levels - 1)));
figure;
subplot(1, 2, 1), imshow(uint8(I * 255)), title('Original Image');
subplot(1, 2, 2), imshow(I_quantized_resized), title('Quantized Image (32
Levels)');
```

Original Image

Quantized Image (32 Levels)

1. **Load the Image and Convert to Grayscale**:First, read the image file. If it's a color image, convert it to grayscale, so you're working with shades of gray.
2. **Normalize the Pixel Values**:Change the image data to a `double` type and divide by 255 to scale the pixel values to a range between 0 and 1. This step makes the data easier to work with for quantization.

3. **Quantize to 32 Levels**:Multiply the image by 31 (since we want 32 levels, and the range goes from 0 to 31), then round the values to the nearest whole number. Now, each pixel has one of 32 possible grayscale levels.
4. **Reduce the Image Size**:Use the `imresize` function to shrink the image down by 90% (scale it by 0.1) using 'nearest' interpolation, which preserves the quantized levels without adding new ones.
5. **Restore the Original Size**:Resize the image back to its original dimensions, again using 'nearest' interpolation, to maintain the 32 levels created earlier.
6. **Convert Back to 8-bit Grayscale**:Scale the pixel values back to the full grayscale range (0 to 255) and convert the image to `uint8`, so it's ready for display.
7. **Display Both Images**:Finally, use `subplot` to show the original image and the quantized 32-level version side by side. This allows you to compare the detailed grayscale with the simplified 32-level version.

This process effectively reduces the grayscale complexity of the image, showing only 32 shades of gray, which gives a more posterized or stylized look while keeping the image structure intact.