ISLAMIC UNIVERSITY OF TECHNOLOGY

EEE 4702

Project Report

Project title:

Image Thresholding for Background Removal

Team Members:

Name	Student id
Shafquat Rahman	190021112
Md. Mahfuzul Islam	190021113
Fahima Shahana Rahman	190021138

Overview:

A system to remove white (or nearly white) background from an RGB image using image thresholding technique has been implemented. Image thresholding is a technique to separate regions or objects in an image based on intensity levels. In background removal, thresholding is used to distinguish between the foreground (object of interest) and the background.

The MATLAB code creates a user-defined function that removes the background from an input RGB image. The process involves several steps. First, the original image is displayed along with its grayscale version and the corresponding histogram. Then, a binary alpha channel (binary mask) is generated by setting pixels in the grayscale image with values close to the maximum to 0, effectively identifying the background and keeping the foreground pixels 1. A binary alpha channel is a component of an image where each pixel's alpha value is restricted to only two possible states, typically 0 (fully transparent) or 1 (fully opaque). This binary mask is then displayed. After that, the binary mask is applied to the original image and the resultant image is saved as a new image in PNG format using the imwrite() function. Finally, the resultant image with the transparent background is displayed in a separate figure.

MATLAB Code:

```
function Iwbg= rmbg(I)

%Displaying the original image:
figure(1)
subplot(2,2,1)
```

```
imshow(I)
title('Original image','FontSize',16)

%Grayscale images typically have pixel values in the range [0, 255]
%Converting image to grayscale and then displaying it:
Igray=rgb2gray(I);
subplot(2,2,2)
imshow(Igray)
title('Grayscale image','FontSize',16)

%Displaying histogram plot for the grayscale image:
subplot(2,2,3)
imhist(Igray)
title('Histogram of the grayscale image','FontSize',16)

%Assigning number of rows and number of columns in the image matrix to
%variables:
[r,c]=size(Igray);

%Generating binary alpha channel (binary mask) and displaying it:
Ialpha=ones(r,c); %initializing binary mask by setting all pixel values to 1
Ialpha(Igray>max(Igray)-5)=0; %setting all background pixels to 0
subplot(2,2,4)
imshow(Ialpha)
title('Binary alpha channel of the image','FontSize',16)

%Saving the image with background removed:
imwrite(I,"withoutbg.png",'Alpha',Ialpha);

%Displaying the result:
Iwbg=imread('withoutbg.png');
figure(2)
imshow(Iwbg)
title('Resultant image with transparent background','FontSize',16)
```

end

Results:

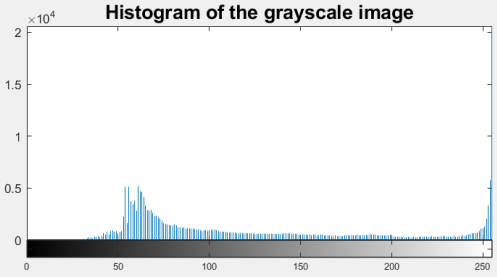
1) Input RGB image:

Outputs:

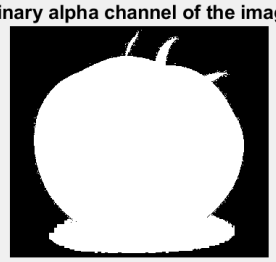
Original image

Grayscale image

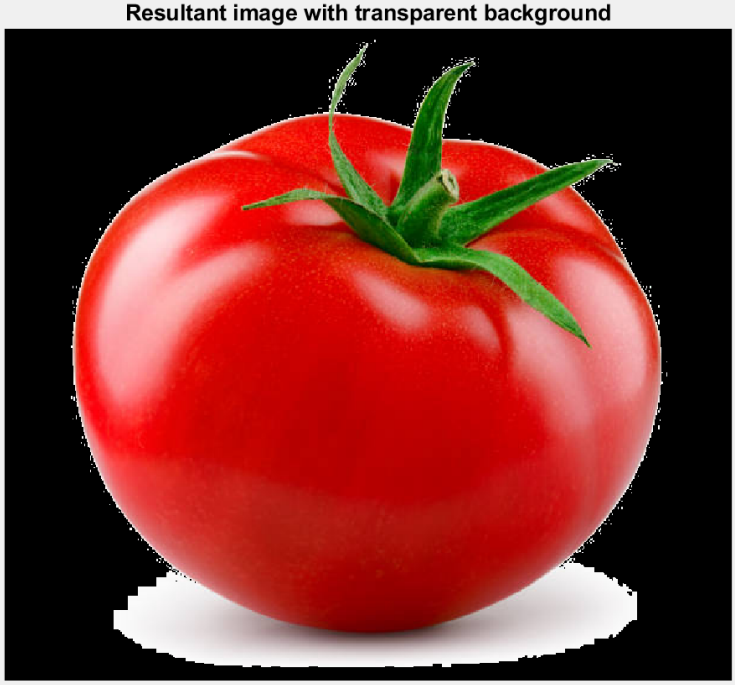
Histogram of the grayscale image



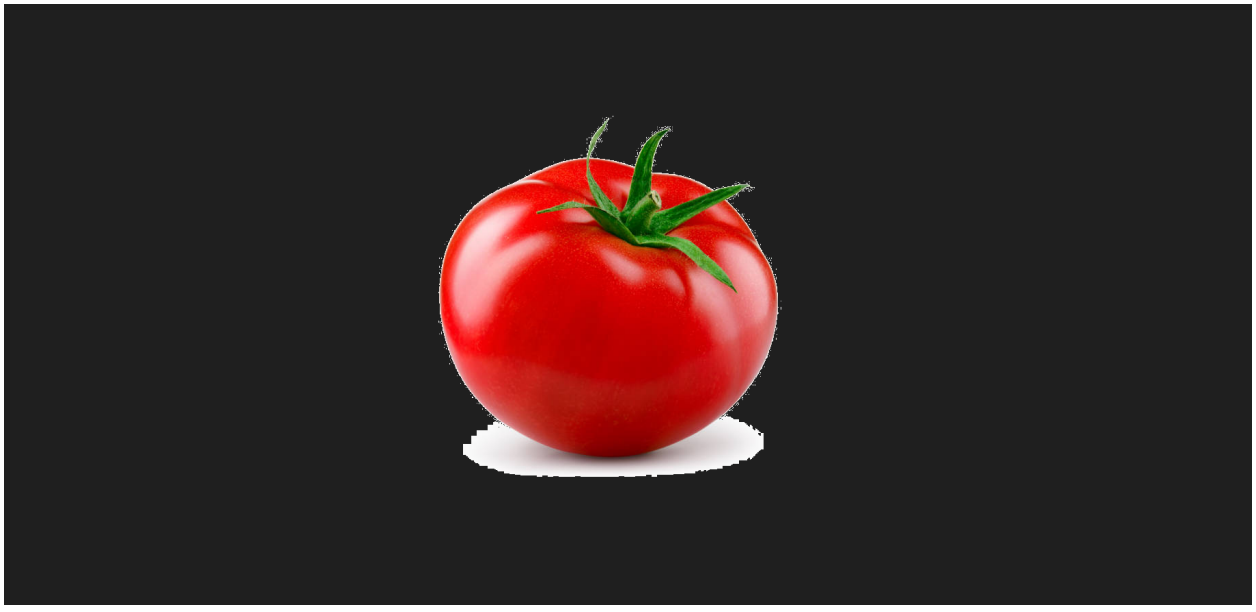
Binary alpha channel of the image



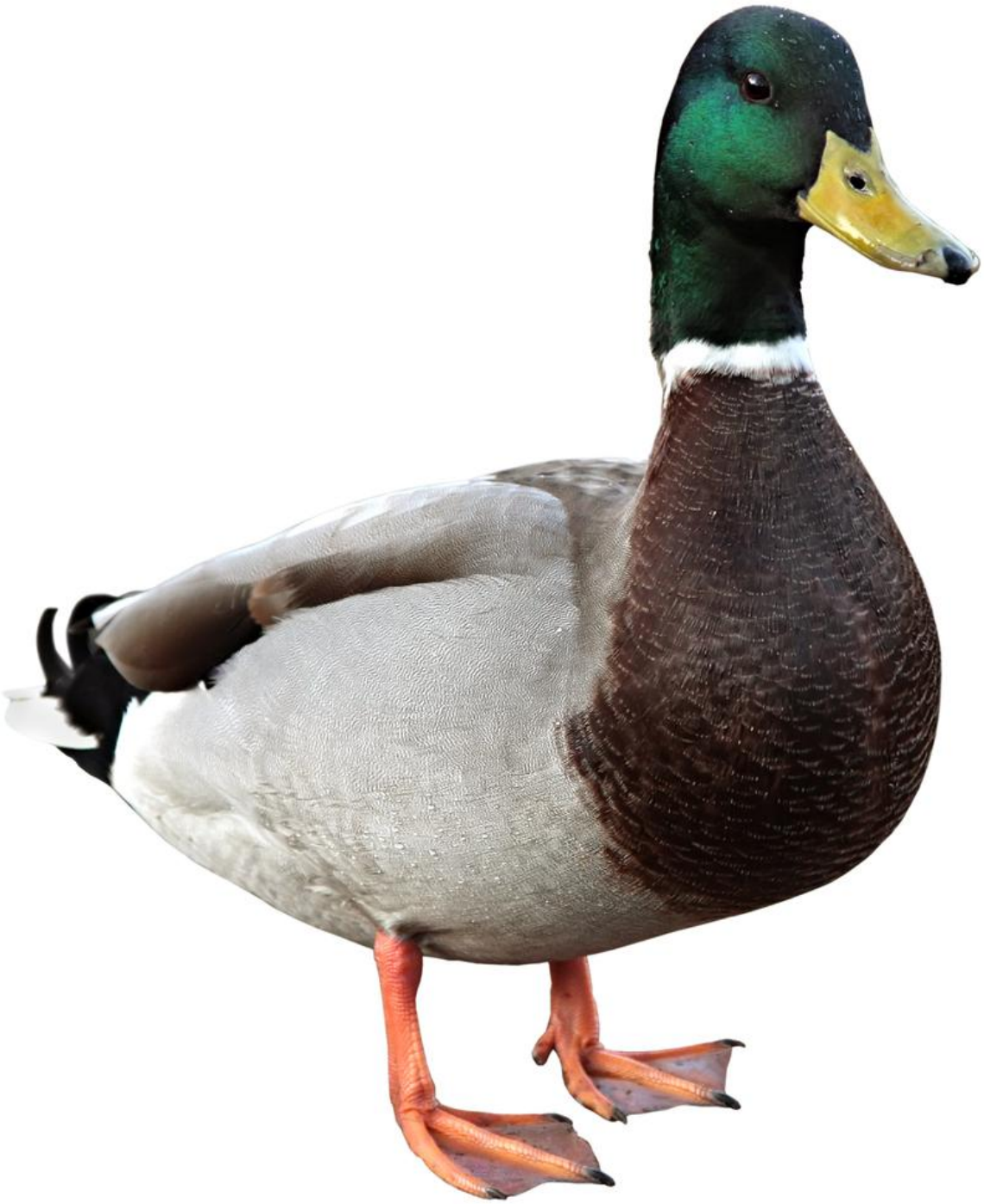
Resultant image with transparent background



Final Image:

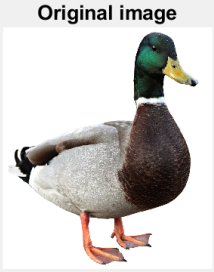


2) Input RGB Image:

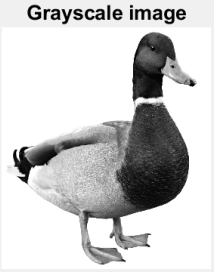


Outputs:

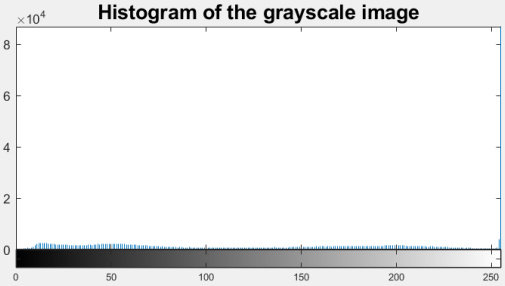
Original image



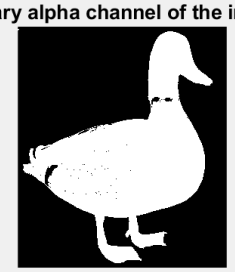
Grayscale image



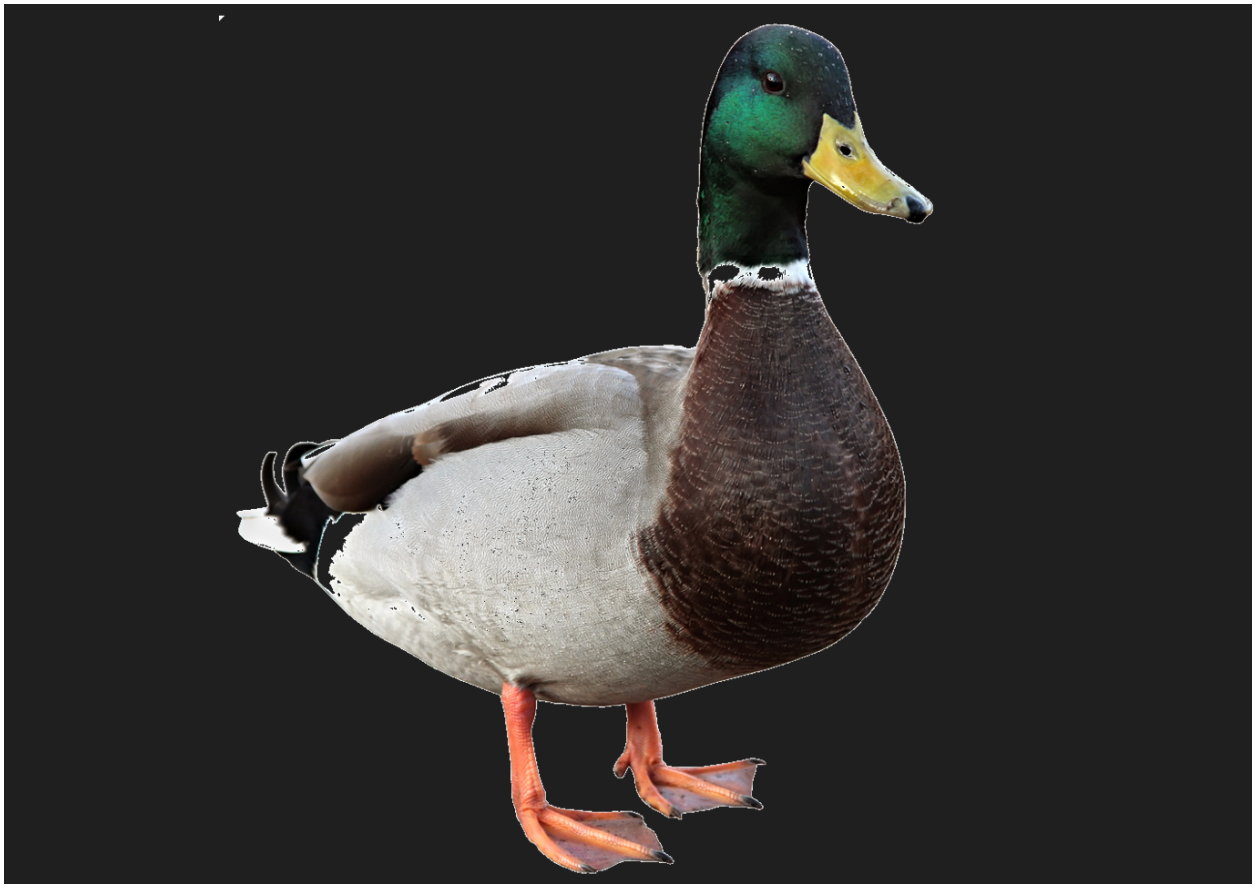
Histogram of the grayscale image



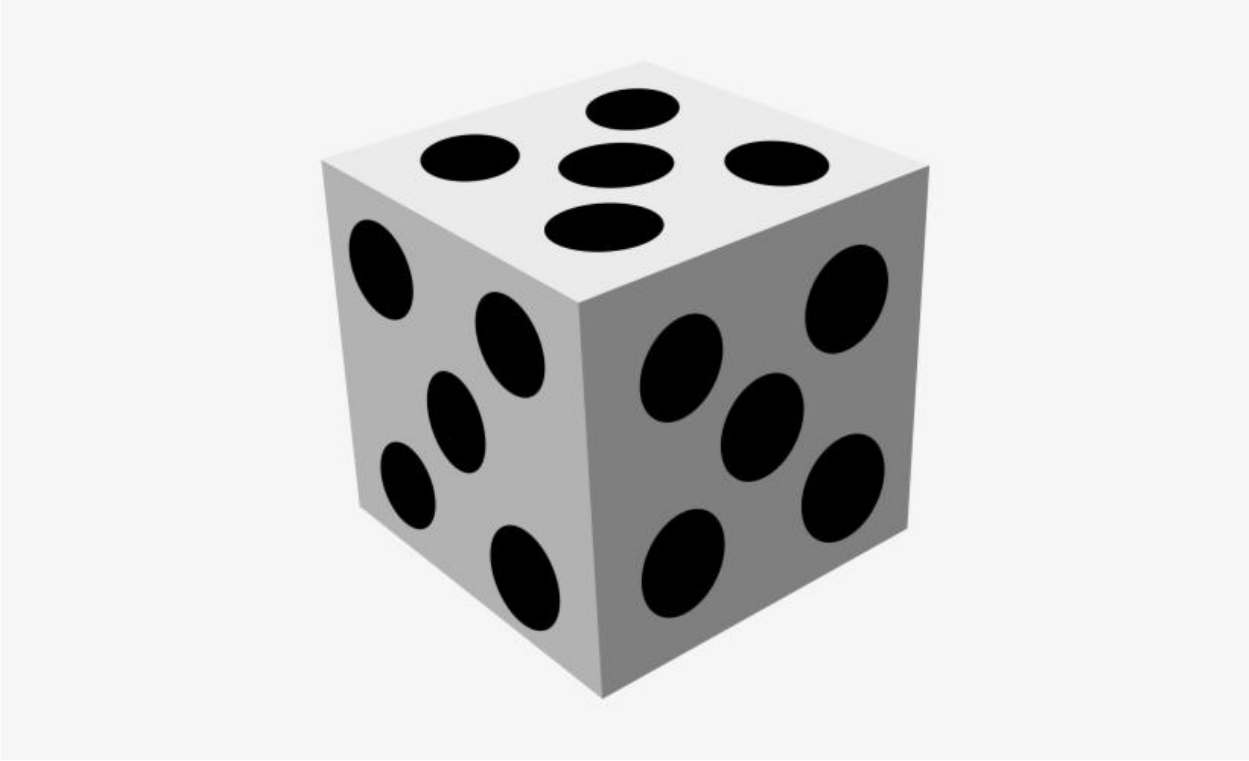
Binary alpha channel of the image



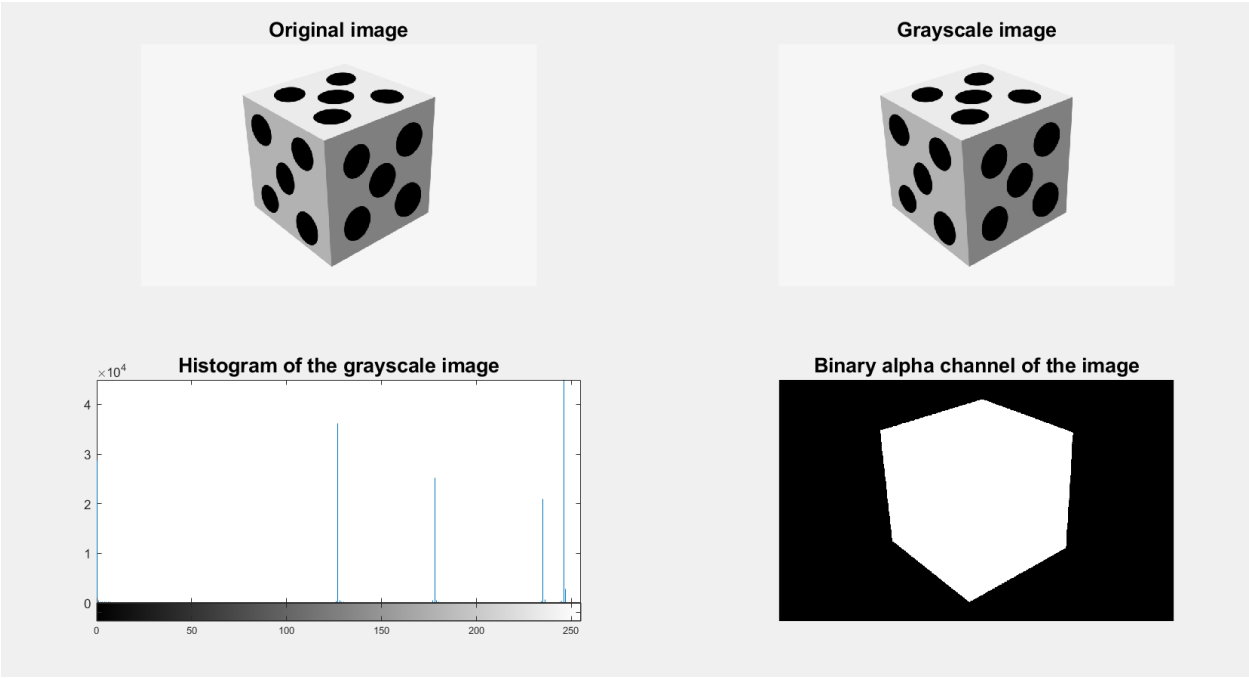
Final Image:



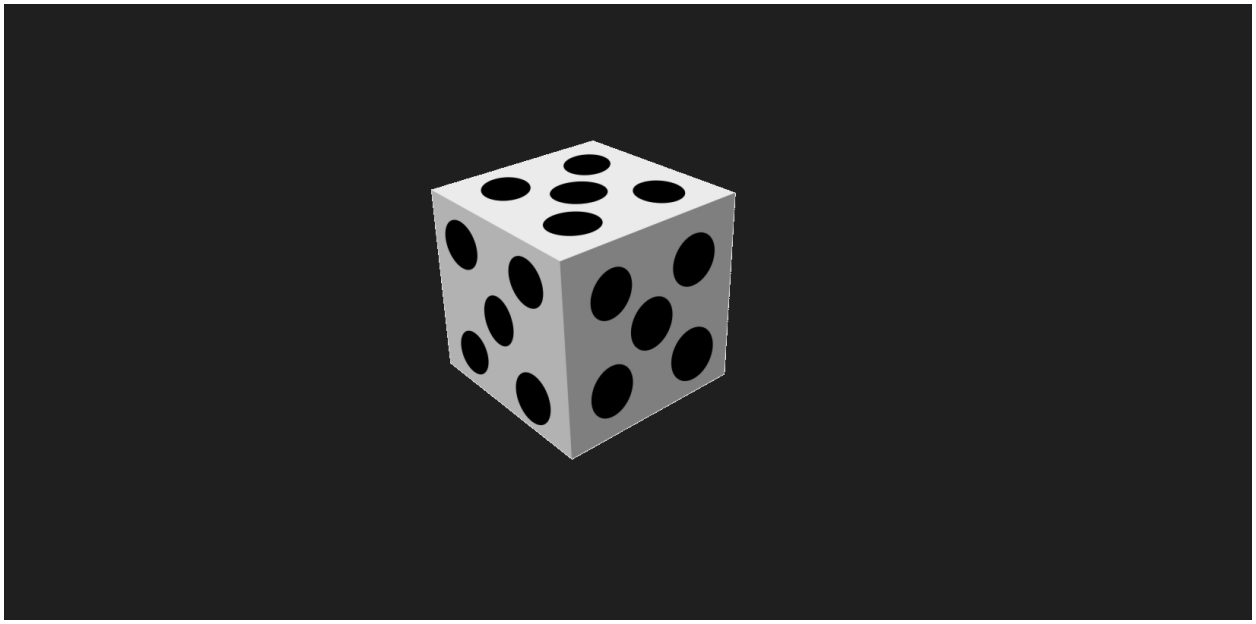
3) Input RGB Image:



Outputs:



Final Image:



Limitations:

- Only pixels with maximum and nearly maximum values can be set as background pixels. Therefore, only white or nearly white backgrounds can be removed.
- Pixels in the foreground with values equal to background pixels will also be removed (made 0).
- The shadows of objects will be treated as a foreground and hence will remain in the resultant images.