UROP PROJECT

DEPTH BASED IMAGE SEGMENTATION

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Abstract:

Expensive task could be exhibited while sectioning a picture. The objective may be expressed as, "Extraction of item from background" or "Examining sharp edges in the picture". The objective could be any, yet the underlying data expected to picture the distinction between various fragments of picture, ought to be precisely picked and assessed. This paper discusses a particularly introductory data for example depth worth of picture pixels and gives an understanding of its significance in the field of Image division. Additionally, In this paper we are going to study Image segmentation techniques such as Segmentation based on Thresholding, Edge Detection

Introduction:

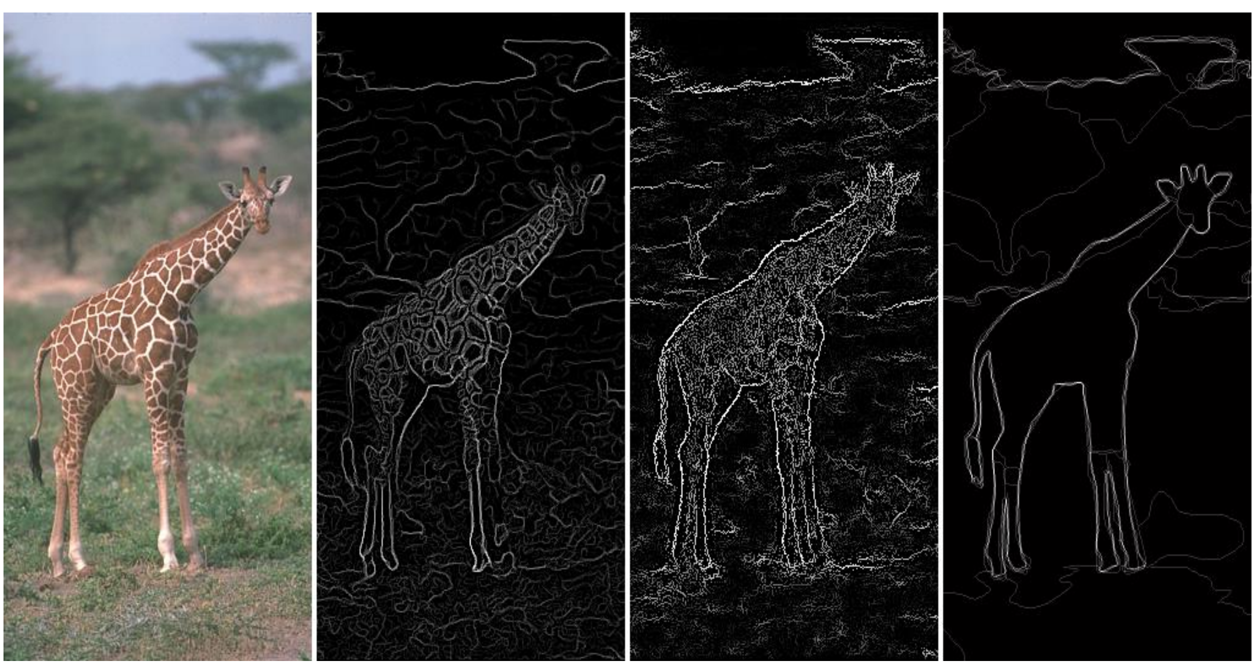
The method of partitioning a digital image into multiple segments is known as depth image segmentation. Since we're just dealing with background elimination, in this case, we'll simply divide the photos into foreground and background this is known as Depth Image segmentation. In computer vision and image analysis, Depth based image segmentation is a basic but difficult problem to solve. Many applications, such as object recognition, target detection, content-based image retrieval, and medical image processing, rely on this mechanism. The aim of image segmentation, in general, is to divide an image into a number of parts with similar characteristics (color, texture, etc.). The method of segmenting a digital image into several regions or sets of pixels. Partitions are separate features in a picture that have the same texture or colour. A series of regions that surround the entire image and a set of contours derived from the image are the image segmentation effects. In terms of colour, intensity, and shape, all of the pixels in an area are identical. When it comes to the same individuality, adjacent areas are significantly different. The various approaches are :

i. finding borders between regions based on discontinuities in intensity ratios
ii. thresholds based on the distribution of pixel properties, such as pixel values
iii. finding the issue under consideration.

Image recognition, image encoding, image editing, etc... are the applications for segmentation.

Depth based segmentation is usually more robust and can lead to better segmentation performance. Image segmentation based only on depth information sometimes fails due to depth image noise and discard much useful appearance information.

Segmented image:



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LITERATURE REVIEW:

There are a variety of image segmentation algorithms available, some of which segment an image dependent on the object, while others will segment automatically. Due to a variety of constraints, no one can say which is the best solution today. A similarity close measure was used to identify the pixels' belonging, and then area increasing was used to obtain the object. It's difficult to tell which portion of an image can be segmented if it's an unknown image. For creating video databases based on artefacts, linking the region details and the colour histogram was suggested. The colour detail, on the other hand, must be provided first, and it is useless for a life application. The segmentation method was adapted by a genetic algorithm to changes in image characteristics triggered by changing environmental factors, but it took time to understand. The authors describe a two-step approach to image segmentation. Improved active form models, line-lanes and live-wires, intelligent scissors, core-atoms, and active appearance models were all part of the fully automatic model-based image segmentation. However, there were already two issues to be resolved. It has a heavy reliance on initialization that is close to goal, and it necessitates manual overhaul of segmentation requirements if a new segmentation issue arises. The authors suggested a graph-based approach in which the cut ratio is defined as the ratio of the corresponding sums of two different weights of edges along the cut boundary and models the mean affinity between the segments divided by the boundary per unit boundary length, in accordance with the NP-hard principle. It enables both iterated region-based and pixel-based segmentation to be done efficiently

Depth based image segmentation can be done in many ways:

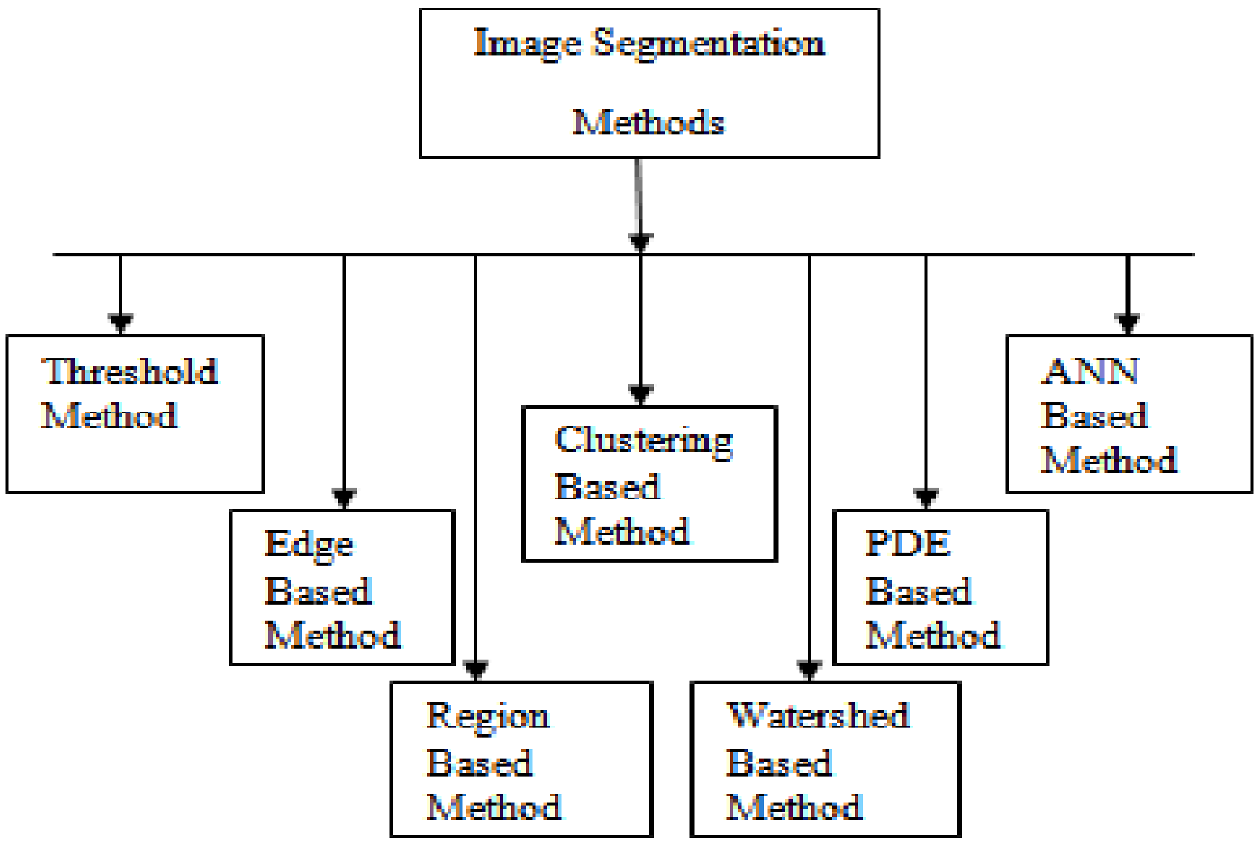


Image segmentation techniques

In this project, we had done depth-based image segmentation by

- **Thresholding technique**
- **Clustering k means technique**

Thresholding technique

Threshold technique is one of the important techniques in image segmentation.

<u>There are five steps in this technique:</u>

1. Create a grayscale version of the image.

2. Adjust the image's threshold.

3. Locate the contours of the image (edges).

4. Using the biggest contour, create a mask.

5. To delete the shadow, use the mask on the original image.

Image to gray image

Converting the color image to gray image as shown in below example

Thresholding

Thresholding techniques are classified as bellow

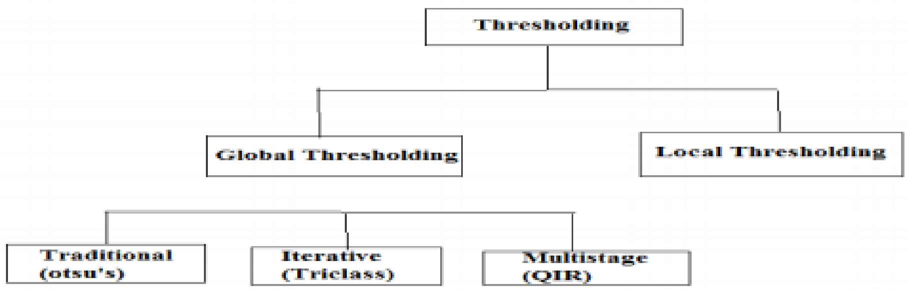


Figure 1. Thresholding Techniques

To transform a grayscale image to black and white pixels, local adaptive thresholding is used. Local adaptive thresholding, unlike global thresholding, selects separate threshold values for each pixel in the image depending on its neighbours.This technique can be expressed as:

$$T=T[x, y, p(x, y), f(x, y]$$

The threshold value is T. The coordinates of the threshold value point are x, y. p(x,y) and f(x,y) are the grey level image pixels' points. It is possible to describe the threshold image g(x,y).

```
ret,thresh1 = cv2.threshold(grayimage,127,255,cv.THRESH_BINARY)
```

The source image, which should be a grayscale image, is the first argument. The threshold value is the second argument, and it is used to classify the pixel values.

The maximum value applied to pixel values exceeding the threshold is the third argument.

The threshold value in simple thresholding is global, means it is the same for all pixels in the image. Adaptive thresholding is a way of calculating the threshold value for smaller regions, resulting in differing threshold values for different regions.

```
adaptiveThreshold(src,dst,max,adaptiveMethod,thresholdType,blockSize,C)
```

- thresholdType is an integer attribute that represents the type of threshold that will be used.
- The size of the pixelneighborhood used to measure the threshold value is represented by blockSize, an integer variable.
- C is a variable of double type representing the constant used in the both methods (subtracted from the mean or weighted mean)

Apply thresholding to an image using the skimage functions. Thresholding is an image segmentation technique in which we adjust the pixels in an image to make it easier to analyse. Thresholding is the process of converting a colour or grayscale image into a binary image, which is essentially black and white. Thresholding is most commonly used to select areas of interest in an image.

Contours

Contours are clearly described as a curve that connects all continuous points (along a boundary) that are of the same colour or intensity. The contours are useful tool for shape analysis as well as object identification and recognition.

- Using binary images with greater precision. Apply threshold or canny edge detection before looking for contours.
- findContours() now returns a transformed image as the first of three return parameters, rather than the original image.
- Finding contours is similar to locating a white object on a black background. So keep in mind that the item you're looking for should be white, and the background should be black.

Edge Detection

Edge recognition is a strategy for deciding the limits of items bourders a picture. It works by detecting brightness discontinuities. In image processing, computer vision, and machine vision, edge detection is used for image segmentation and data extraction.

```
edge = cv2.Canny(image,minval,maxval)
```

Our input image is the first argument. Our minVal and maxVal are our second and third arguments, respectively. Aperture size is the third argument. It refers to the size of the Sobel kernel that is used to locate image gradients. It is set to 3 by default. The last argument is L2gradient, which defines the gradient magnitude equation. If True, the above equation is used, which is more accurate; otherwise, this function is used.

Mask

A mask is a filter. Idea of veiling is otherwise calledas spatial filtering. Masking is also known as filtering.

```
ret,mask = cv2.threshold(edges,10,255, 1)
```

Applying mask to the image is simply an image where some of the pixel intensity values are zero, and others are non-zero.

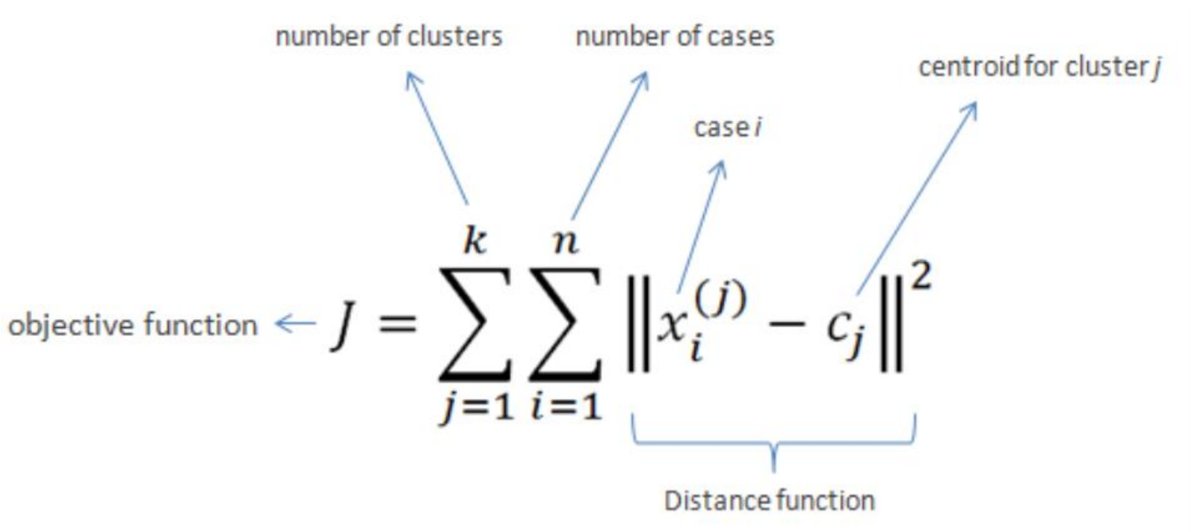
Clustering k means technique

Clustering :- It is utilized to recognize various classes within the given information dependent on how comparable the data is. Data focuses in a similar gathering are more like other Data focuses in that equivalent gathering than those in different gatherings. K-means clustering is quite possibly the most generally utilized cluster calculations

K-Means clustering algorithm is an unsupervised algorithm and it is used to portion(segment) the interest area from the background. It clusters(bunches), or segments the given data into K-clusters

The algorithm is utilized when you have unlabeled information. The objective is to discover the certain gatherings dependent on some sort of closeness in the information with the quantity of gatherings addressed by K.

The primary goal of K-Means clustering is to limit the amount of squared distances between all focuses and the cluster centres



$$J = \sum_{j=1}^{k} \sum_{i=1}^{n} \underbrace{\left\| x_i^{(j)} - c_j \right\|^2}_{\text{Distance function}}$$

Steps in K-Means algorithm:-

→pic the quantity of clusters K.

→Select at random K points, the centroids.

→ Process and spot the centroid of each and every cluster

→Reassign every information point to the new closest centroid. If any assignment . took place, head to step 4, otherwise, the model is prepared

Where as progressing to our project , Once completion of importation libraries and uploading of color image in to RGB area

*change image to BGR image .

*provide function for the color clustering through.

```
center=cv2.kmeans(vectorized,K,None,criteria,attempts,cv2.KMEANS_PP_CENTERS)
```

vectorized : it’s nothing but sample which should be in float 32 bit data type .

criteria : It’s the iteration termination criteria. Once this criterion is satisfied, the rule iteration stops.

flags: This flag is utilized to indicate how introductory centers are taken. ordinarily two flags are used .

until here the algorithm has categorised our original image into “k” dominant colors.

```
edges = cv2.Canny(img,150,200)
```

The first argument is our input image. Second and third arguments are our min and max limit separately.

The functions discovers edges inside the information image(8-bit input picture) and checks them inside the yield map edges utilizing the Canny algorithm.

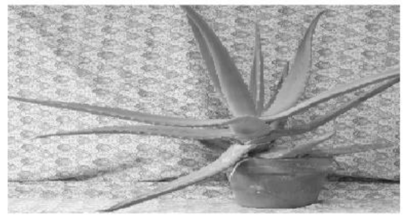
Conclusion:

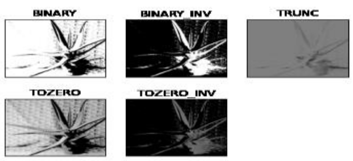
It seems if depth results and image result is combined will give better results

Result: Thresholding outputs

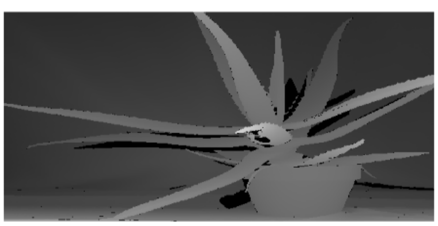
Image 1 :

Here We input the orignal image





Here we input the depth image



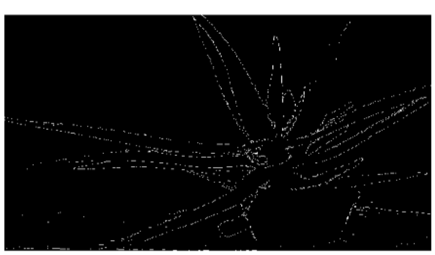
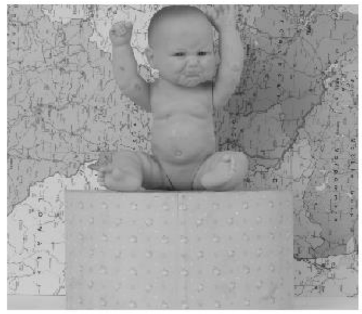
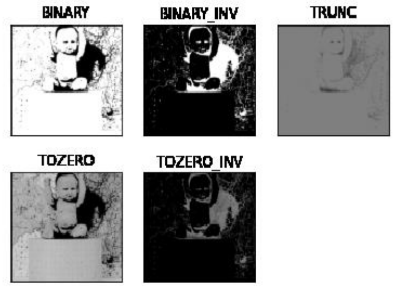
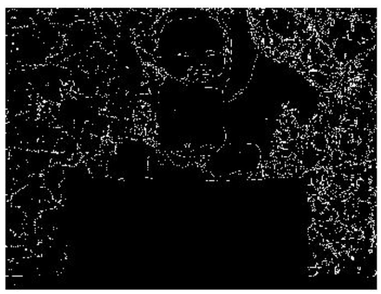


Image 2:

We input the orignal image







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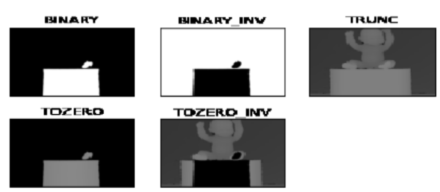


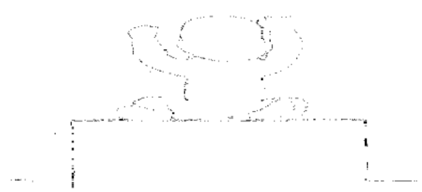
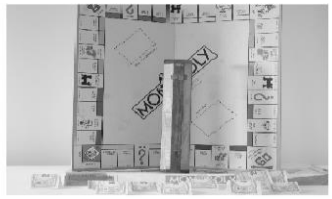
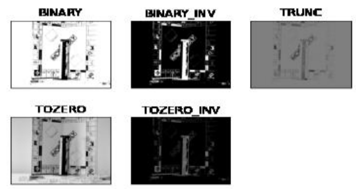
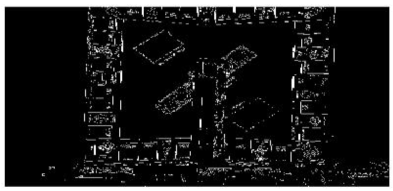


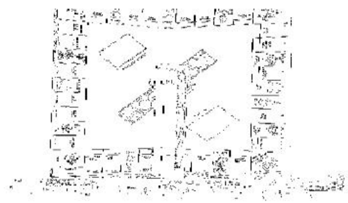
Image 3:

We input the orignal image









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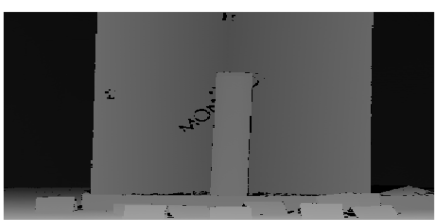
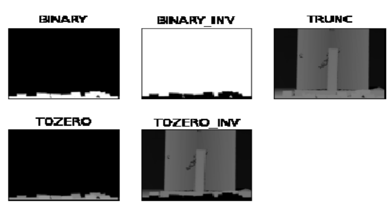




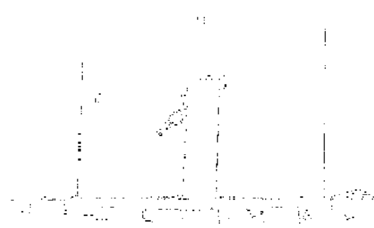
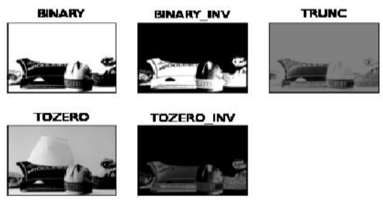
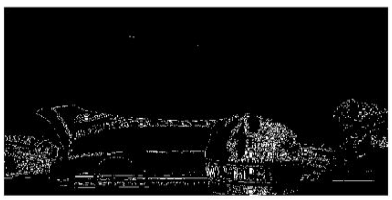
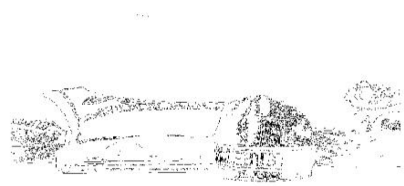


Image 4

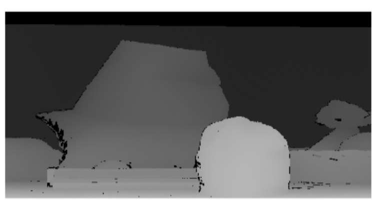
We input the orignal image







Here we input the depth image



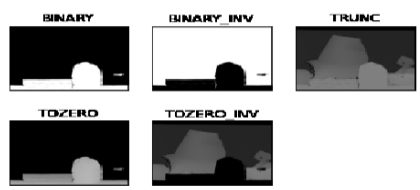
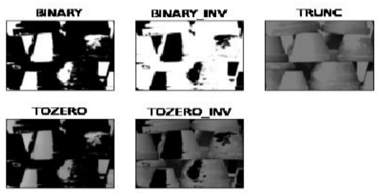
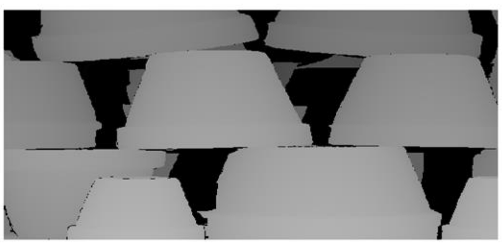


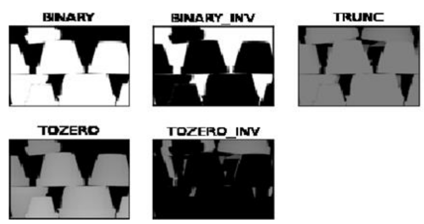
Image 5:

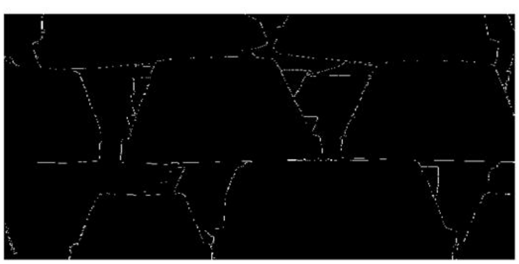
We input the orignal image



Here we input the depth image







Result : k means

Image 1 :

Here we input the orignal image

Here we input the depth image

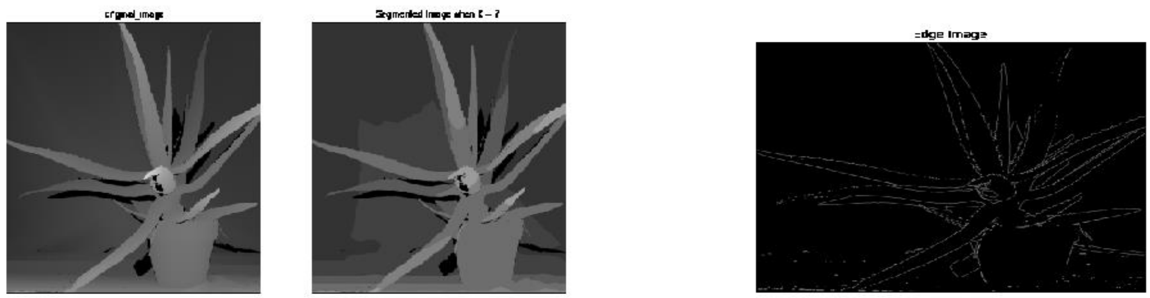


Image 2:

Here we input the orignal image

Here we input the depth image

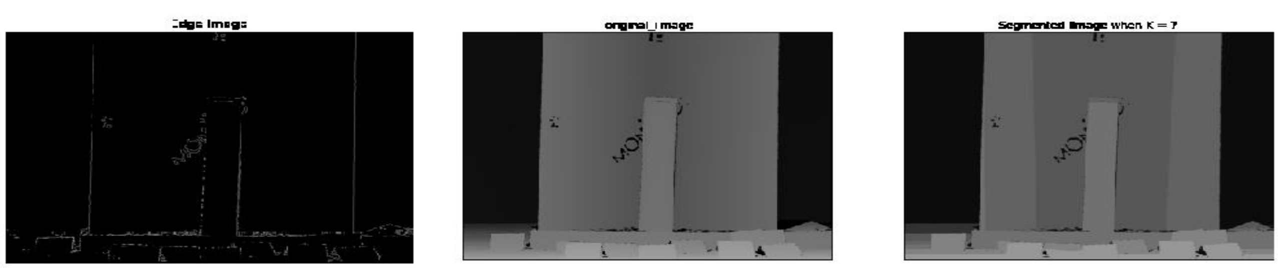


Image 3 :

Here we input the orignal image

Here we input the depth image

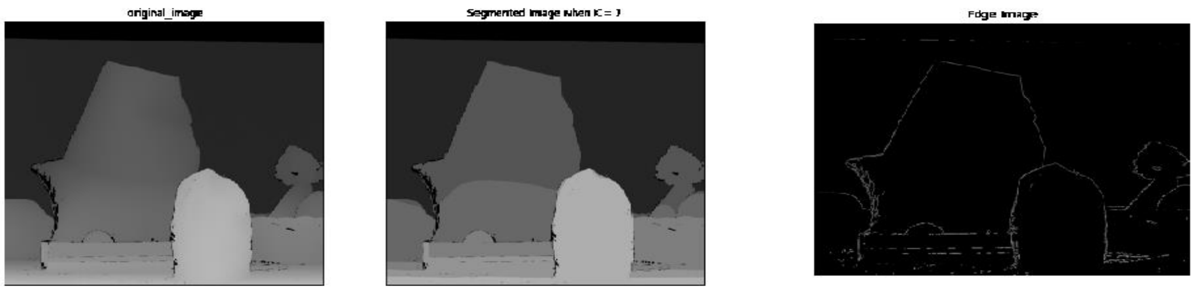


Image 4 :

Here we input the orignal image

Here we input the depth image

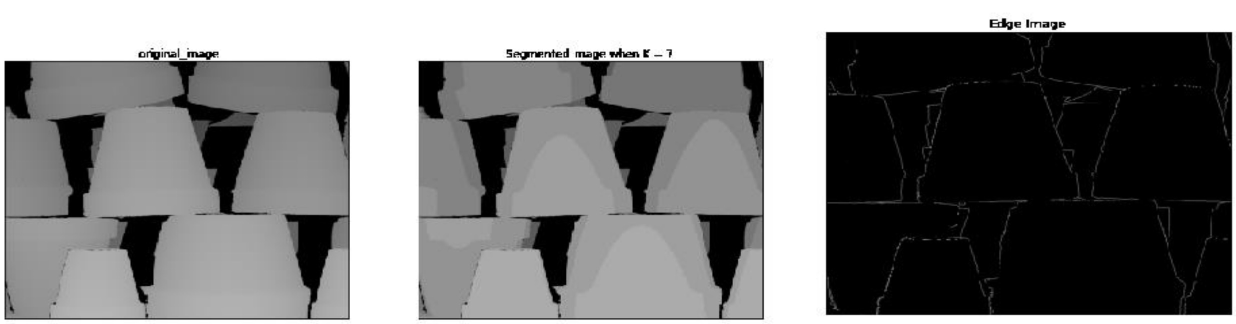
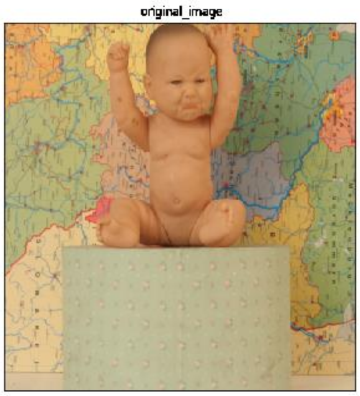
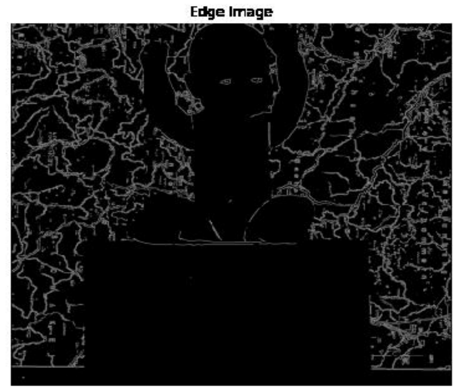


Image 5 :

Here we input the orignal image





Here we input the depth image