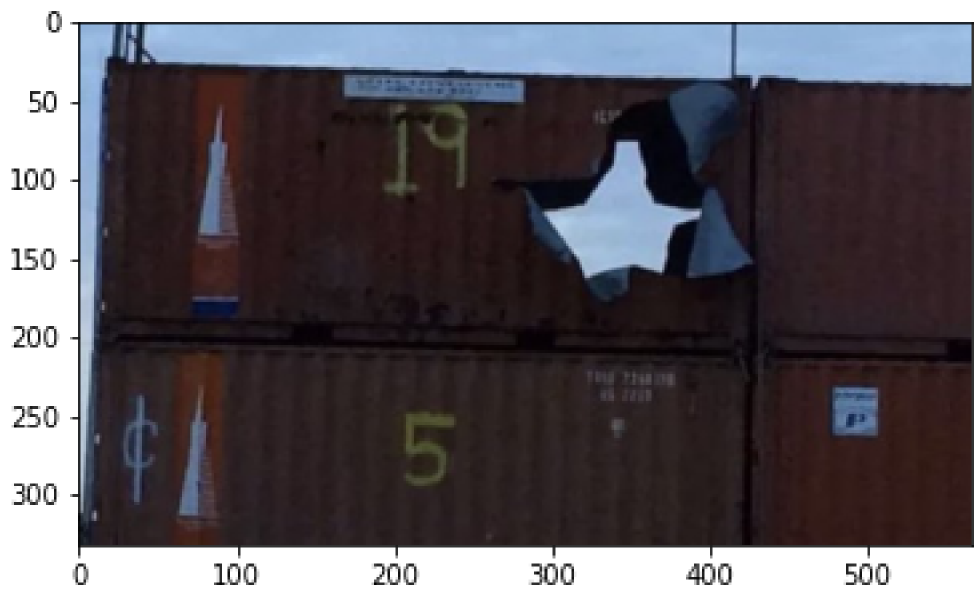
container-2

July 26, 2022

1 Detección de Agujeros en Containers

[212]:
```
# Importing necessary libraries
from skimage.io import imread, imshow
import matplotlib.pyplot as plt
import numpy as np


container = imread('images/foto28.jpg')
plt.imshow(container)
plt.show()
```

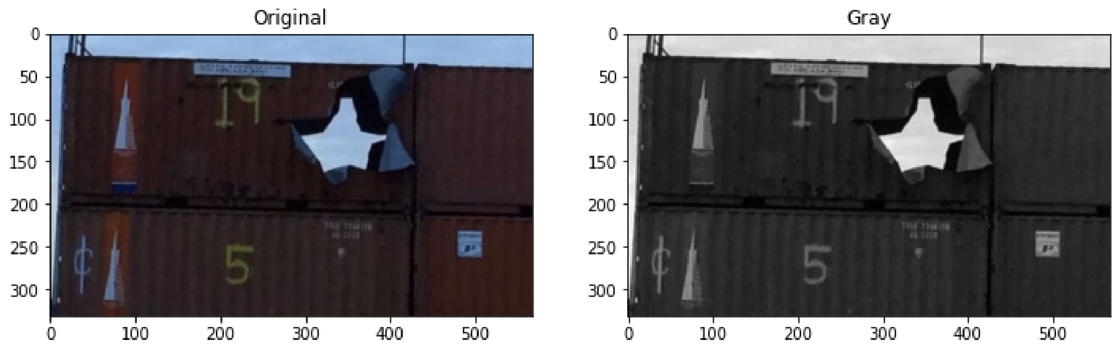


The next step is convert the image in a gray image.

[213]:
```
from skimage.color import rgb2gray

# To gray
```

```
gray_container = rgb2gray(container)

fig, ax = plt.subplots(1, 2, figsize=(12, 4))
ax[0].imshow(container)
ax[0].set_title('Original')
ax[1].imshow(gray_container, cmap='gray')
ax[1].set_title('Gray')
```

[213]: Text(0.5, 1.0, 'Gray')

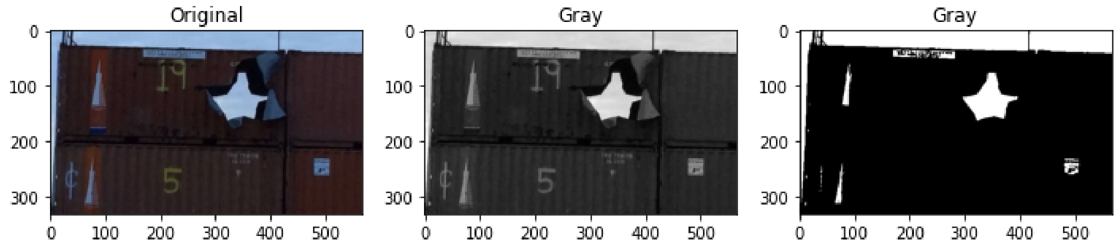


Next, we need to obtain a binarized image using a threshold value.

[214]:
```
from skimage import filters

# Computing Otsu's thresholding value
threshold = filters.threshold_otsu(gray_container)
print(threshold)

# Binarized image
thresh_gray_container = (gray_container > threshold)*1

fig, ax = plt.subplots(1, 3, figsize=(12, 4))
ax[0].imshow(container)
ax[0].set_title('Original')
ax[1].imshow(gray_container, cmap='gray')
ax[1].set_title('Gray')
ax[2].imshow(thresh_gray_container, cmap='gray')
ax[2].set_title('Gray')
```

0.40399017003676474

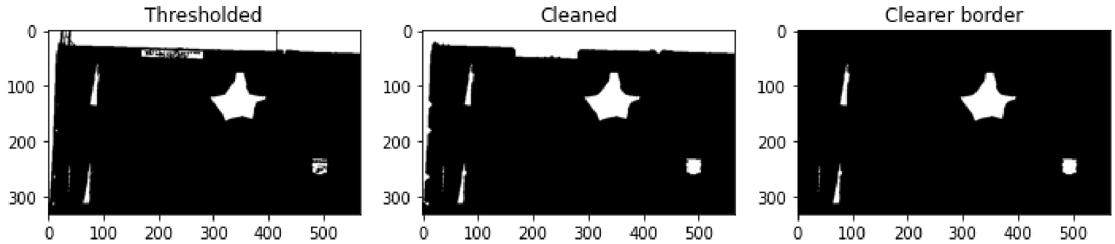
[214]: Text(0.5, 1.0, 'Gray')



Next, now we must clean the data. For that, we use ditations and erosions.

[215]:
```
from skimage import morphology
from skimage.segmentation import clear_border


def multi_dil(im, num):
    for i in range(num):
        im = morphology.binary_dilation(im)
    return im


def multi_ero(im, num):
    for i in range(num):
        im = morphology.binary_erosion(im)
    return im

# We use this chain operation to clean the image:


container_cleaned = multi_ero(multi_dil(thresh_gray_container, 5), 5)


# remove artifacts connected to image border
container_cleared = clear_border(container_cleaned)

fig, ax = plt.subplots(1, 3, figsize=(12, 4))
ax[0].imshow(thresh_gray_container, cmap='gray')
ax[0].set_title('Thresholded')
ax[1].imshow(container_cleaned, cmap='gray')
ax[1].set_title('Cleaned')
ax[2].imshow(container_cleared, cmap='gray')
ax[2].set_title('Clearer border')
```

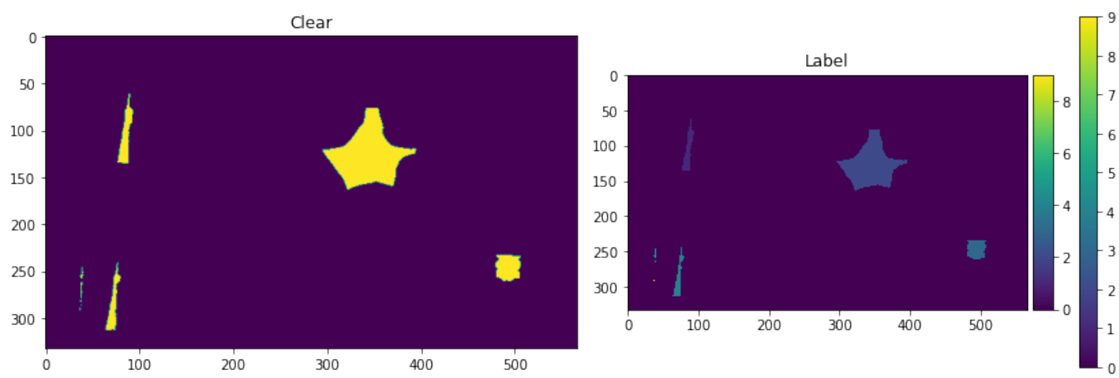
[215]:
```
Text(0.5, 1.0, 'Clearer border')
```



Next, and now that this is relatively clean, let us get the labels and properties of this last image!

[216]:
```
from skimage.measure import label

label_container = label(container_cleared)

#imshow(label_container, vmin=np.amin(label_container), vmax=np.
↪amax(label_container))

fig, ax = plt.subplots(1, 2, figsize=(12,4))
ax[0].imshow(container_cleared)
ax[0].set_title('Clear')

ax[1].imshow(label_container)
ax[1].set_title('Label')

fig.colorbar(imshow(label_container), ax=ax[1])
fig.tight_layout()
```

```
/home/juan/.virtualenvs/dl4cv/lib/python3.8/site-
packages/skimage/io/_plugins/matplotlib_plugin.py:150: UserWarning: Low image
data range; displaying image with stretched contrast.
  lo, hi, cmap = _get_display_range(image)
```



There are a lot of features that can be extracted from this labelled image. To mention a few we have:

Now, let's use regionprops and look at the following properties:

1. area
2. perimeter
3. bbox — bounding box dimensions
4. bbox_area — area of bounding box
5. centroid — coordinate of centroid
6. convex_image — convex hull of the blob
7. convex_area — area of the convex hull
8. eccentricity — measure how it fits into an ellipse (0) for circles (how elongated is your object)
9. major_axis_length — length of the major moment of the ellipse fitted
10. minor_axis_length — length of the minor moment of the ellipse fitted

Let us try to take the area of the bigger area object:

[217]:
```
from skimage.measure import regionprops



props=regionprops(label_container)

print(len(props))

for i in range(len(props)):
  print(i)
  print(props[i].area) #area (zero) 0th object in the image
  print(props[i].bbox)
```

```
9
0
536
(62, 77, 136, 94)
1
3978
(77, 296, 164, 396)
2
643
(233, 480, 261, 507)
3
421
(241, 64, 313, 81)
4
19
(246, 37, 258, 41)
5
21
(262, 38, 279, 40)
6
```

```
3
(281, 37, 283, 39)
7
1
(286, 38, 287, 39)
8
3
(289, 37, 292, 38)
```

Now, I can calculate the bigger area in the image. But I want to see some statistics from objects earlier.

[218]:
```python
from skimage.measure import regionprops_table
import pandas as pd


stats = regionprops_table(label_container,
                          properties=('centroid', 'area', 'bbox'))


pd.DataFrame(stats)
```

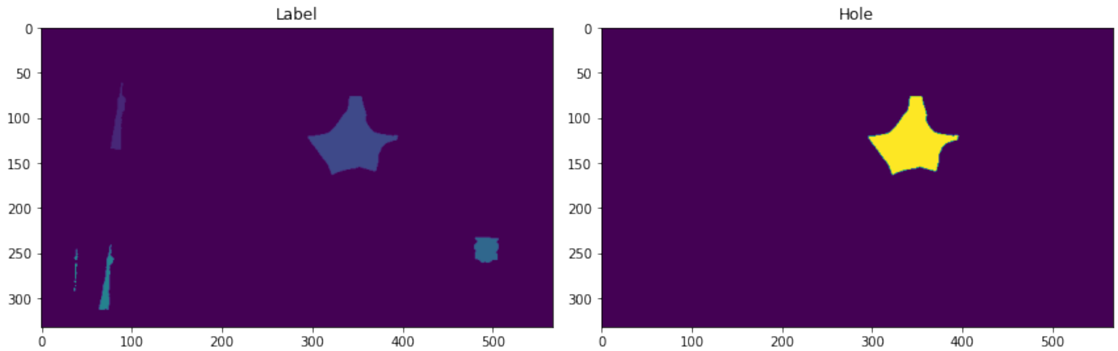
[218]:

	centroid-0	centroid-1	area	bbox-0	bbox-1	bbox-2	bbox-3
0	105.608209	85.641791	536	62	77	136	94
1	126.394419	343.692810	3978	77	296	164	396
2	245.832037	493.063764	643	233	480	261	507
3	284.912114	72.422803	421	241	64	313	81
4	252.631579	38.789474	19	246	37	258	41
5	269.095238	38.190476	21	262	38	279	40
6	281.333333	37.666667	3	281	37	283	39
7	286.000000	38.000000	1	286	38	287	39
8	290.000000	37.000000	3	289	37	292	38

First af all, i want to have all data about the main feature which is very significative for that object. In this case area.

[219]:
```python
onlyArea = [props[i].area for i in range (len(props))]

# With index_ob we can obtain any feature of the object (our hole) using
# props[index_ob].feature
index_ob = onlyArea.index(max(onlyArea))

# labels is 1 from N but index is from 0 to N-1.
hole_container = label_container == index_ob+1

fig, ax = plt.subplots(1, 2, figsize=(12,4))
ax[0].imshow(label_container)
ax[0].set_title('Label')
```

```
ax[1].imshow(hole_container)
ax[1].set_title('Hole')

#fig.colorbar(imshow(label_container), ax=ax[1])
fig.tight_layout()
```



Finally, I only have that draw the segmented object on the original figure (in gray for contrast)

[220]:
```
from skimage.color import label2rgb
import matplotlib.patches as mpatches

# label image regions
label_image = label(hole_container)
# to make the background transparent, pass the value of `bg_label`,
# and leave `bg_color` as `None` and `kind` as `overlay`
image_label_overlay = label2rgb(label_image, image=container, bg_label=0)

fig, ax = plt.subplots(figsize=(10, 6))
ax.imshow(image_label_overlay)
ax.set_axis_off()

minr, minc, maxr, maxc = props[index_ob].bbox
rect = mpatches.Rectangle((minc, minr), maxc - minc, maxr - minr,
                          fill=False, edgecolor='red', linewidth=2)
ax.add_patch(rect)
```

[220]: <matplotlib.patches.Rectangle at 0x7f2743dc9880>


19
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