A07

ITAI 1378

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IMAGE REPRESENTATION

1	1	1	1	1
1	0	0	0	1
1	0	0	0	1
1	0	0	0	1
1	1	1	1	1

The size of picture is 5x5 in the shape of square with the color of white of outside border

DESIGN FILTER

-1	0	1
-1	0	1
-1	0	1

Vertical Edges

A filter for detection of vertical edges of an image. It gives a clearer contrast between pixels to the left and right sides of a region. It gives rise to either large positive or negative values when convolved into an image under conditions of strong vertical transitions (edges). As an example, it can detect the left and right edges of an object by subtracting the pixel values from the left side of the edge while adding the pixel values on the right.

1	1	1
0	0	0
-1	-1	-1

Horizontal Edges

In horizontal edge detection, this is a filter that strengthens change between the pixels above and below an edge in the image. The filter calculates the subtracted value of pixel values in its bottom-most row by adding and subtracting the values in its top-most row. A difference in brightness between the horizontal bands of the images will be detected by this filter by highlighting the top and bottom edges of the objects in the image.

0	1	-1
1	0	-1
-1	-1	0

Diagonal Edges

It is a filter that helps locate diagonal edges by emphasizing transitions along diagonal directions. The filter puts greater pre-eminence on the diagonal pixel alignments and detects those edges which run from the top left and from the bottom left. A preferred way to characterize an object in an image is to hold a diagonal edge- cornered or slanted line.

MANUAL CONVOLVE ->

1	1	1	1	1
1	0	0	0	1
1	0	0	0	1
1	0	0	0	1
1	1	1	1	1

We apply vertical edge to convolve it manually

-1 0 1
-1 0 1
-1 0 1

1st Operation of Convolution

1 * -1	1 * 0	1 * 1	1	1
1 * -1	0 * 0	0 * 1	0	1
1 * -1	0 * 0	0 * 1	0	1
1	0	0	0	1
1	1	1	1	1

= -1 + 0 + 1 + (-1) + 0 + 0 + (-1) + 0 + 0 = -2

2nd Operation of Convolution:
one step to the right

1	1 * -1	1 * 0	1 * 1	1
1	0 * -1	0 * 0	0 * -1	1
1	0 * -1	0 * 0	0 * -1	1
1	0	0	0	1
1	1	1	1	1

= -1 + 0 + 1 + 0 + 0 + 0 + 0 + 0 + 0 = 0

RESULT OF APPLYING MANUAL CONVOLVE WITH VERTICAL FILTER

-2	0	0	0	2
-3	0	0	0	3
-3	0	0	0	3
-3	0	0	0	3
-2	0	0	0	2

We slid the vertical edge-detection filter across each 3x3 section of the original image, performing element-wise multiplication, and then summed the results. This generated the grid given above, where high values indicate areas that the filter picked up for vertical edges."

IDENTIFY FEATURES

The convoluted grid supports the argument that the filter managed to identify the vertical edges of the square. The strong positive and negative values of 2, -2, 3, -3 appeared in the leftmost and rightmost columns. This indicates strong transitions between adjacent pixels. They correspond to the square's left and right edges in the original image, where there is a clear demarcation between 1s (the outside edge) and 0s (the inner part of the square).While the rest of the image is filled with mostly 0s, this shows a lack of vertical edges. The center of the square has contiguous pixels; therefore, there are no strong vertical transitions present to be noticed. The symmetry with which the edges are detected on both the left and right sides matches that of the square itself. This reveals that the filter has indeed just highlighted the vertical edges of the object.

The method for vertical edge detection finds the left and right edges of square by causing is convolved values on the grid to be quite high at these locations. No significant change occurred in the area around its midline, implying that the filter simply did not notice any vertical transitions across this region. Such an outcome is quite expected since the square has very clear vertical edge properties, while the center and horizontal edges are neutral."

PRESENTATION

Summary: "We constructed an elementary 5x5 grid of a square and implemented a vertical edge detection filter pixel differentiation. We convolved the image so that we could visually see and understand how a vertical edge detecting filter would detect vertical edges by similarly convolving through an image to generate new pixel values that were a result of positive or negative local change.

Conclusions

"Through the application of a convolution process with one effective vertical edge detection filter, the vertical edges of the square were detected, thereby exhibiting the preparedness of filtering operations in realizing the feature detection of image objects. This exercise essentially subdivided the mystery as to how the filters operate in computer vision tasks, particularly edge detection, revealing for the high-low purposes the specific areas of transitions of a pixel's intensity."

8x8

Imagen Original

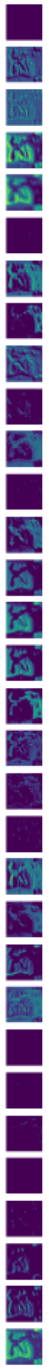
```
11111111
10000001
10111101
10100101
10100101
10111101
10000001
11111111
```

Activaciones de la Capa 1

5x5

```
1 1 1 1 1
1 0 0 0 1
1 0 1 0 1
1 0 0 0 1
1 1 1 1 1
```

Activaciones de la Capa 2



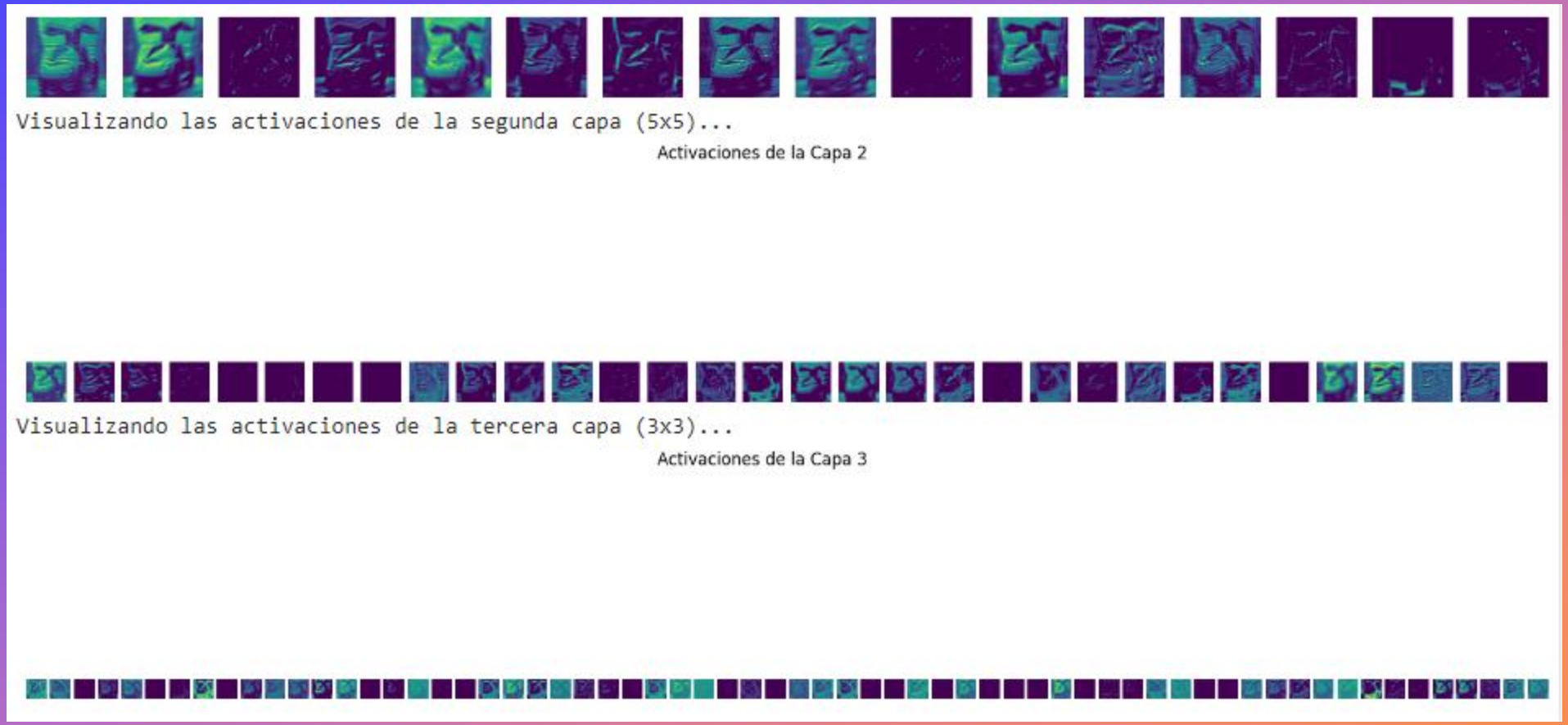
3x3

```
 1   1   1
 0   0   0
-1  -1  -1
```

Activaciones de la Capa 3

```
0  0  0  0  0
2  1  1  1  2
1  0 -1  0  1
2  1  1  1  2
0  0  0  0  0
```

Layer by Layer



Link of code that we used for show every layer.

https://colab.research.google.com/drive/10LDRbbK83Fymctbm_BeHdlpATABcaz0S?usp=sharing