Detecção automática de bordas em imagens através do uso de operadores diferenciais

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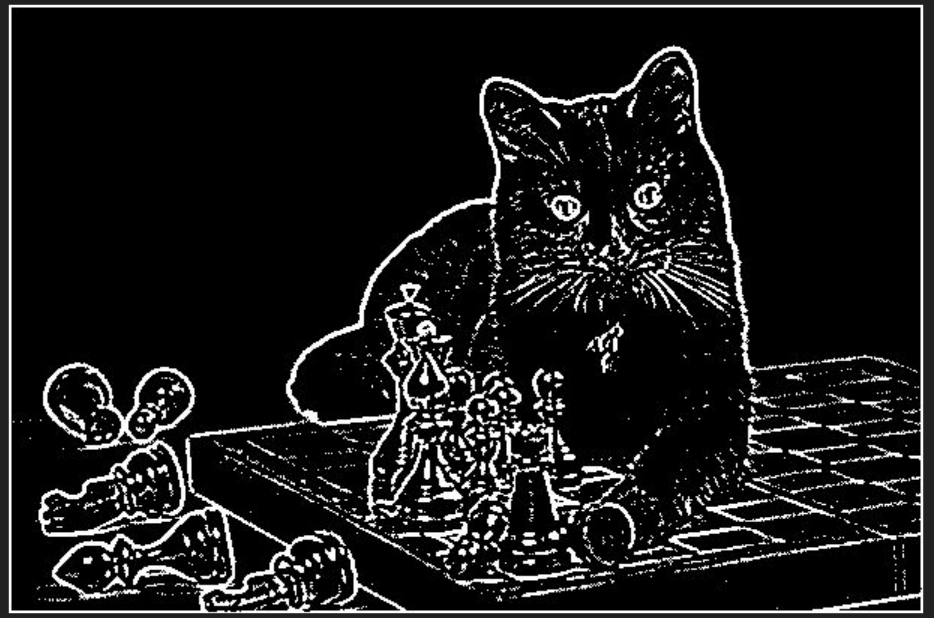
Orientador: Alexandre Luis Magalhães Levada



Como funcionam os operadores diferenciais

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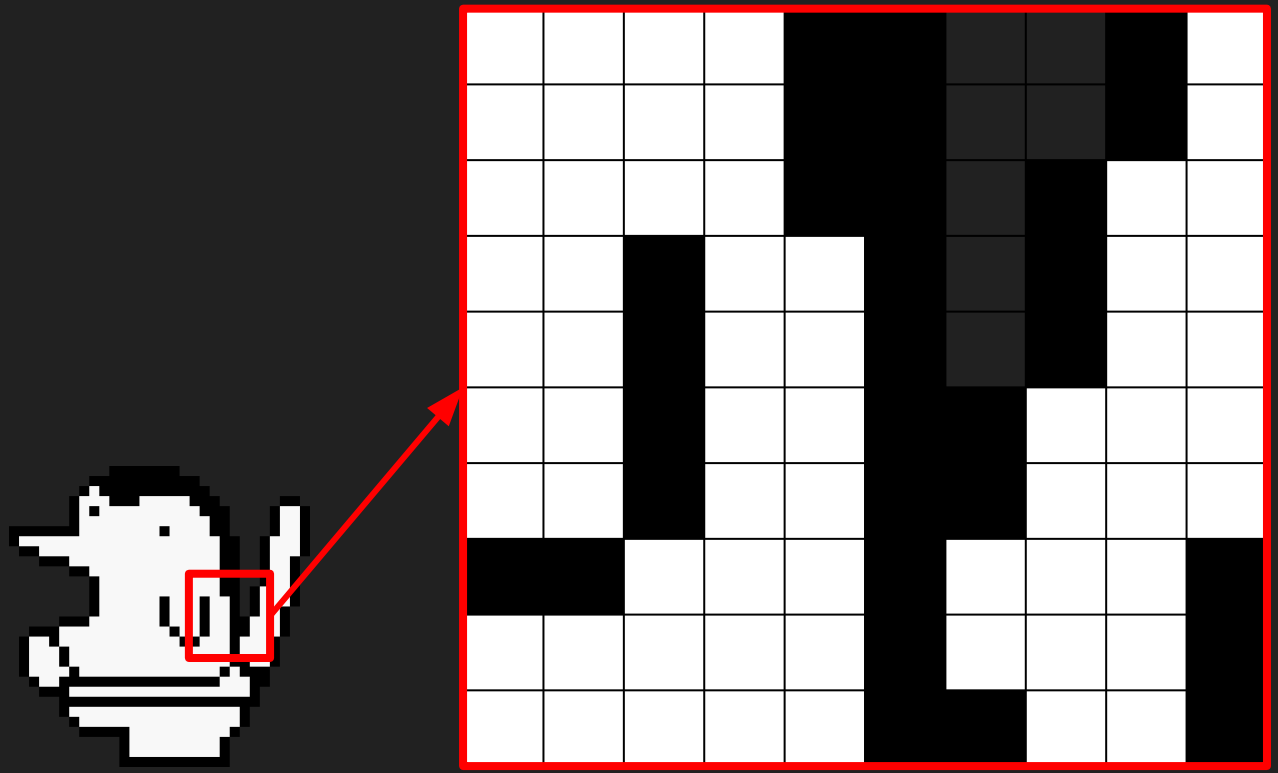


Como funcionam os operadores diferenciais

255	255	255	255	0	0	33	33	0	255
255	255	255	255	0	0	33	33	0	255
255	255	255	255	0	0	33	0	255	255
255	255	0	255	255	0	33	0	255	255
255	255	0	255	255	0	33	0	255	255
255	255	0	255	255	0	0	255	255	255
255	255	0	255	255	0	0	255	255	255
0	0	255	255	255	0	255	255	255	0
255	255	255	255	255	0	255	255	255	0
255	255	255	255	255	0	0	255	255	0

Como funcionam os operadores diferenciais

NÃO é borda

255	255	255	255	0	0	33	33	0	255
255	255	255	255	0	0	33	33	0	255
255	255	255	255	0	0	33	0	255	255
255	255	0	255	255	0	33	0	255	255
255	255	0	255	255	0	33	0	255	255
255	255	0	255	255	0	0	255	255	255
255	255	0	255	255	0	0	255	255	255
0	0	255	255	255	0	255	255	255	0
255	255	255	255	255	0	255	255	255	0
255	255	255	255	255	0	0	255	255	0

Como funcionam os operadores diferenciais

NÃO é borda

255	255	255	255	0	0	33	33	0	255
255	255	255	255	0	0	33	33	0	255
255	255	255	255	0	0	33	0	255	255
255	255	0	255	255	0	33	0	255	255
255	255	0	255	255	0	33	0	255	255
255	255	0	255	255	0	0	255	255	255
255	255	0	255	255	0	0	255	255	255
0	0	255	255	255	0	255	255	255	0
255	255	255	255	255	0	255	255	255	0
255	255	255	255	255	0	0	255	255	0

é borda

Como funcionam os operadores diferenciais

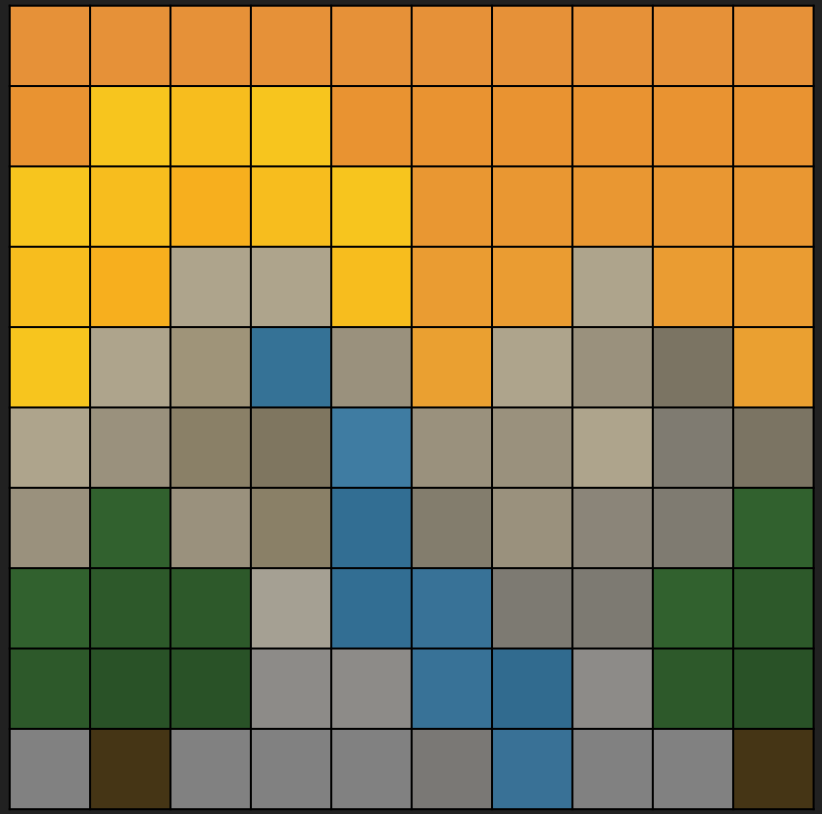
255	255	255	255	0	0	33	33	0	255
255	255	255	255	0	0	33	33	0	255
255	255	255	255	0	0	33	0	255	255
255	255	0	255	255	0	33	0	255	255
255	255	0	255	255	0	33	0	255	255
255	255	0	255	255	0	0	255	255	255
255	255	0	255	255	0	0	255	255	255
0	0	255	255	255	0	255	255	255	0
255	255	255	255	255	0	255	255	255	0
255	255	255	255	255	0	0	255	255	0

NÃO é borda

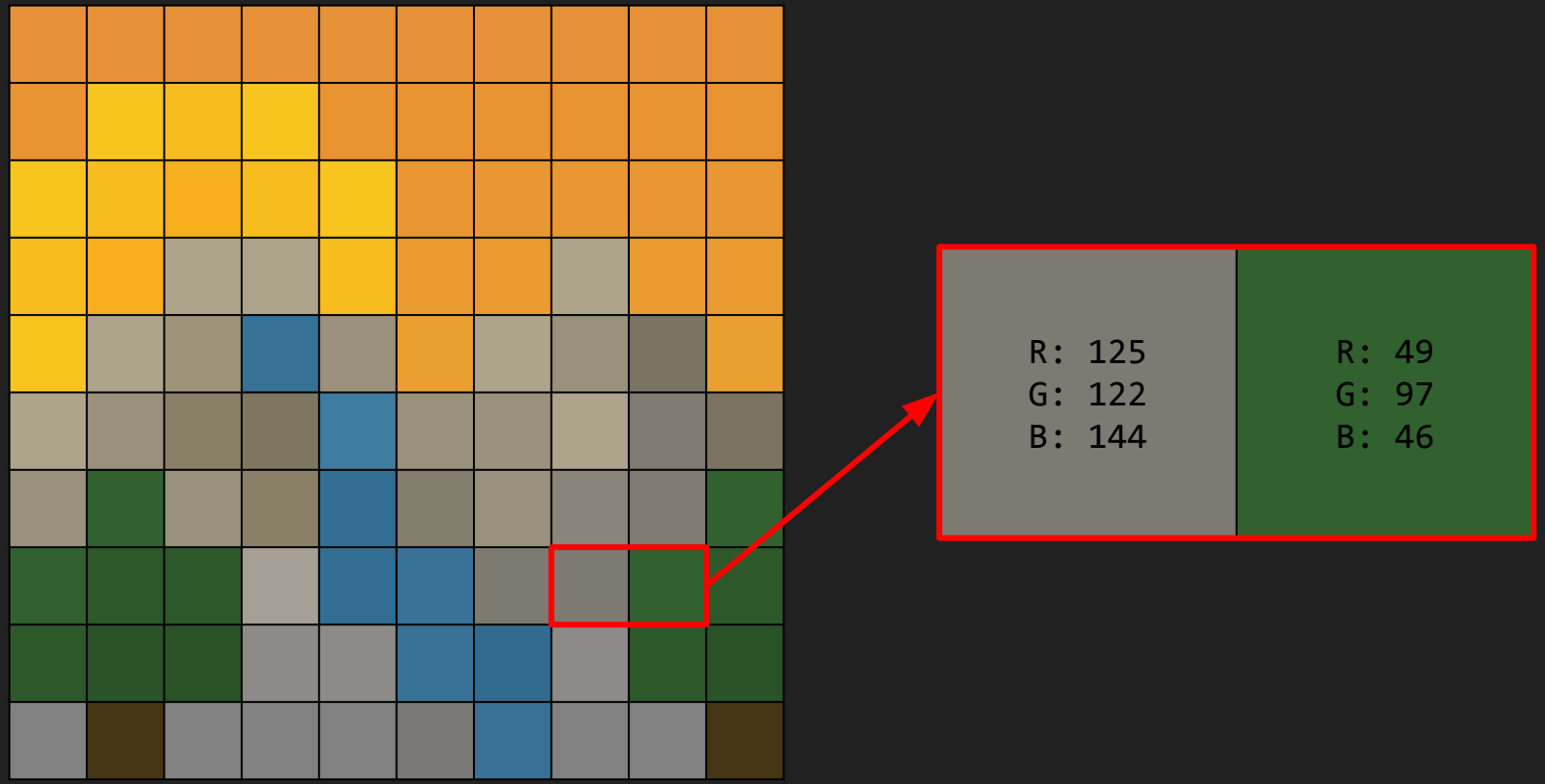
talvez?

é borda

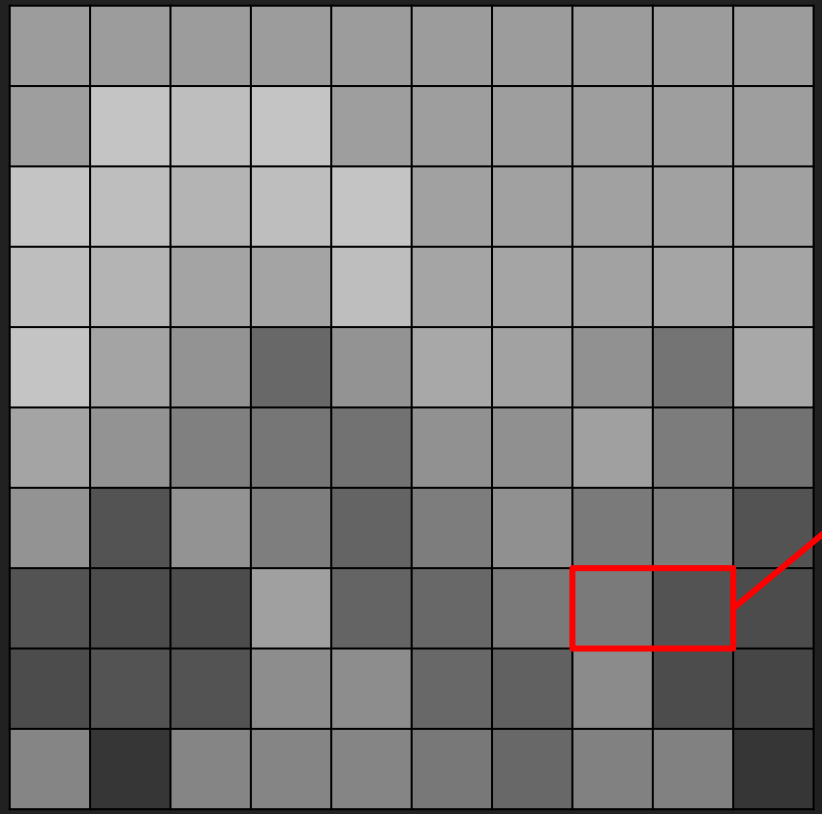
Transformando em escala de cinza

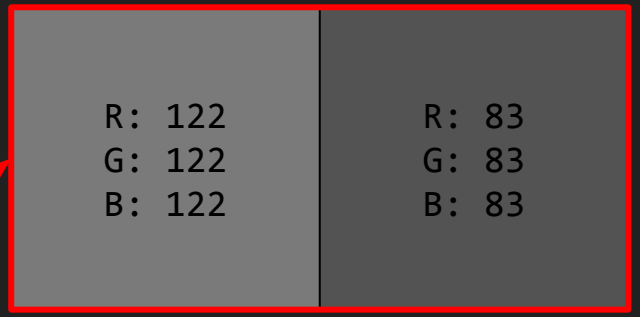


Transformando em escala de cinza



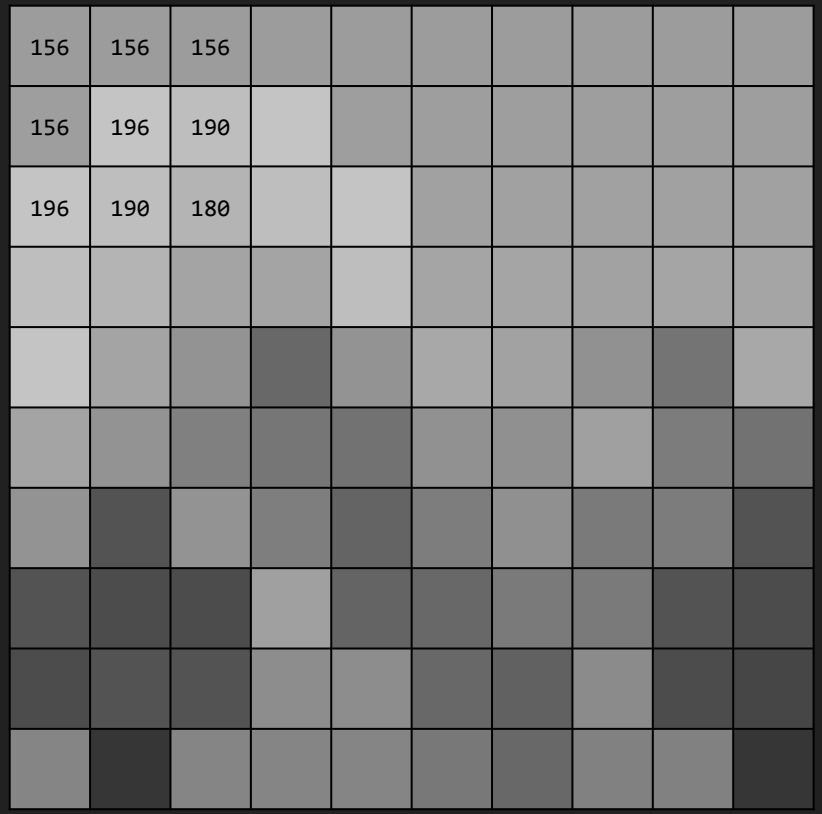
Transformando em escala de cinza



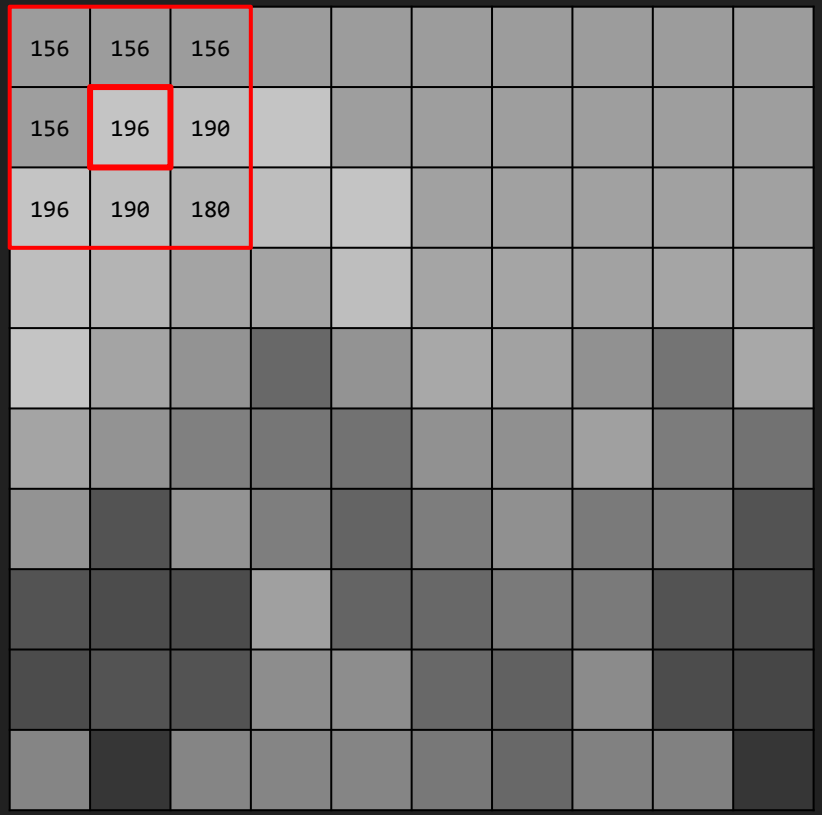


(0,2126 * R) + (0,7152 * G) + (0,0722 * B) =

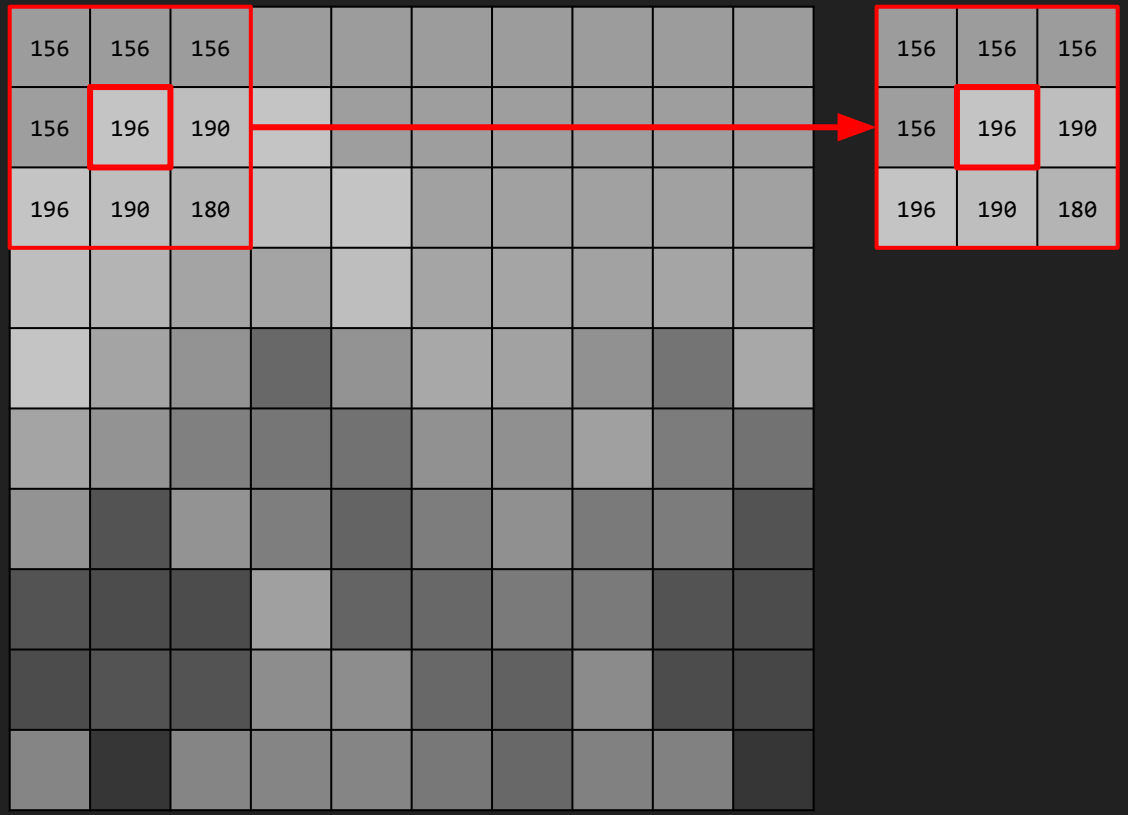
Convolucionando



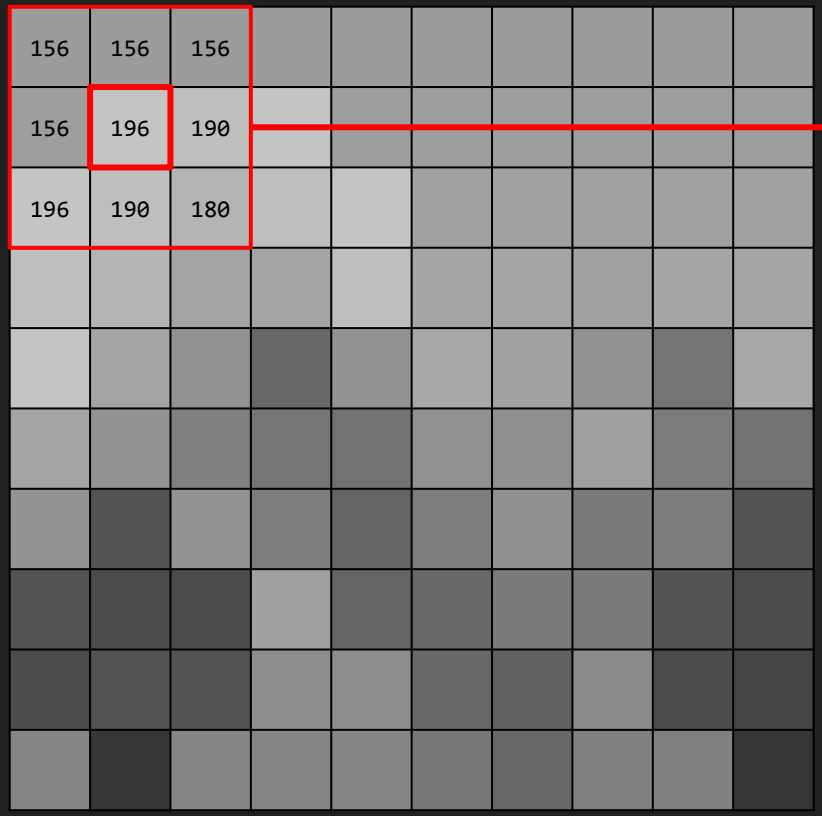
Convolucionando



Convolucionando



Convolucionando



156	156	156
156	196	190
196	190	180

```
156 +
156 +
156 +
156 +
196 +
190 +
196 +
190 +
180 =
1420
```

156	156	156
156	157	190
196	190	180

1420 / 9 = 157

Matriz de pesos

1	2	1
2	4	2
1	2	1

Matriz de pesos

1	2	1
2	4	2
1	2	1

isso é um operador diferencial!
(kernel)

Operadores

+1	0	-1
+2	0	-2
+1	0	-1

Sobel
(horizontal)

+1	+2	+1
0	0	0
-1	-2	-1

Sobel
(vertical)

+1	+4	+7	+4	+1
+4	+16	+26	+16	+4
+7	+26	+41	+26	+7
+4	+16	+26	+16	+4
+1	+4	+7	+4	+1

Laplacian of
Gaussian

Demonstração

https://xandjiji.github.io/edge-detection/