No.	Grey Scale Boundaries	Correlation
P-a	{0, 68, 91, 112, 141, 169, 190, 255}	0.7570
P-b	{0, 66, 84, 116, 143, 166, 189, 255}	0.7537
P-c	{0, 65, 104, 128, 152, 168, 191, 255}	0.7720
P-d	{0, 40, 78, 114, 140, 164, 191, 255}	0.7543
Q-a	{0, 82, 90, 125, 133, 163, 169, 255}	0.6919
Q-b	{0, 81, 82, 124, 126, 159, 162, 255}	0.6464
Q-c	{0, 76, 82, 108, 114, 147, 150, 255}	0.6754
Q-c	{0, 85, 86, 125, 132, 164, 173, 255}	0.6673

Table 2:Output result of gray Baboon Image

The output images are shown in the figure 6.4.3 and 6.4.4. figure 6.4.3 (a) represents the output image corresponding the set of serial no P-a. Figure 6.4.3(b) represents the output image corresponding the set of serial no P-b and so on. Similerly figure 6.4.4 (a) represents the output image corresponding the set of serial no Q-a and figure 6.4.5 (b) represents the output image corresponding the set of serial no Qbb and so on.

RGB Image:-

Lena Image:-

Input Image:

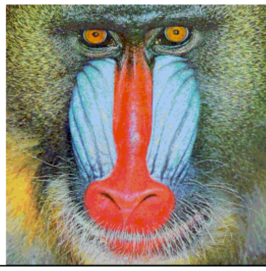
No	Bounderies	Correleation
P-a	R={43, 89, 156, 160, 172, 213, 237, 255}	0.9052
	G={0, 34, 67, 110, 151, 155, 187, 255}	
	B ={32, 67, 91, 107, 126, 164, 186, 238}	
P-b	R={43, 70, 120, 130, 150, 170, 190, 255	0.9035
	G={0, 20, 140, 180, 190, 210, 230, 255}	
	B ={32, 45, 77, 85, 115, 145, 175, 238}	
P-c	R={43, 104, 129, 134, 155, 165, 183, 255}	0.9041
	G={0, 13, 57, 147, 160, 207, 221, 255}	
	B={32, 66, 89, 118, 143, 167, 190, 238}	
P-d	R={43, 121, 129, 144, 196, 214, 233, 255}	0.9082
	G={0, 30, 51, 120, 134, 138, 204, 255}	
	B ={32, 65, 77, 101, 123, 154, 187, 238}	
Q-a	R={43, 80, 90, 110, 120, 190, 200, 255}	0.9111
	G={0, 30, 75, 80, 100, 160, 220, 255}	
	B ={32, 50, 70, 90, 110, 150, 170, 238}	
Q-b	R={43, 96, 109, 128, 141, 153, 206, 255}	0.9055
	G={0, 51, 61, 116, 141, 176, 186, 255}	
	B={32, 70, 81, 94, 120, 153, 181, 238}	
Q-c	R={43, 70, 108, 116, 126, 151, 165, 255}	0.9046
	G={0, 41, 111, 157, 166, 180, 200, 255}	
	B={32, 53, 74, 88, 128, 145, 162, 238}	
Q-d	R={43, 58, 72, 140, 172, 210, 232, 255}	0.8947
	G={0, 15, 48, 110, 142, 178, 220, 255}	
	B={32, 55, 87, 112, 136, 140, 215, 238}	

Table 3:Output result of color Lena Image

The output images are shown in the figure 6.4.5 and 6.4.6. figure 6.4.5 (a) represents the output image corresponding the set of serial no P-a. Figure 6.4.5(b) represents the output image corresponding the set of serial no P-b and so on. Similerly figure 6.4.6 (a) represents the output image corresponding the set of serial no Q-a and figure 6.4.6 (b) represents the output image corresponding the set of serial no Q-b and so on.

Baboon Image:-

Input Image:-



No	Bounderies	Correlation
P-a	R={0, 17, 52, 73, 83, 116, 204, 255}	0.8579
	G={0, 27, 102, 152, 153, 180, 254, 255}	
	B ={0, 48, 89, 117, 136, 177, 230, 255}	
P-b	R={0, 82, 85, 159, 163, 210, 214, 255}	0.8541
	G={0, 84, 96, 114, 163, 194, 207, 255}	
	B={0, 30, 69, 100, 124, 153, 211, 255}	
P-c	R={0, 94, 106, 146, 173, 186, 203, 255}	0.8481
	G={0, 39, 69, 74, 88, 111, 147, 255}	
	B={0, 52, 75, 90, 127, 162, 219, 255}	
P-d	R={0, 50, 60, 90, 100, 110, 150, 255}	0.8044
	G={0, 60, 110, 160, 170, 185, 200, 255}	
	B ={0, 10, 20, 60, 80, 150, 220, 255}	
Q-a	R={0, 57, 59, 79, 100, 244, 251, 255}	0.7875
	G={0, 15, 41, 108, 169, 178, 196, 255}	
	B={0, 47, 51, 111, 115, 221, 233, 255}	
Q-b	R={0, 91, 106, 125, 142, 143, 170, 255}	0.8631
	G={0, 52, 54, 75, 83, 86, 167, 255}	
	B={0, 52, 70,90, 126, 160, 223, 255}	
Q-c	R={0, 45, 55, 75, 95, 225, 245, 255}	0.7897
	G={0, 10, 35, 95, 155, 175, 195, 255}	
	B={0, 35, 45, 105, 110, 215, 230, 255}	
Q-d	R={0, 78, 110, 134, 186, 210, 233, 255}	0.8715
	G={0, 42, 68, 92, 120, 162, 240, 255}	
	B={0, 65, 114, 148, 167, 195, 230, 255}	

Table 4:Output result of color Baboon Image

The output images are shown in the figure 6.4.7 and 6.4.8. figure 6.4.7 (a) represents the output image corresponding the set of serial no P-a. Figure 6.4.7(b) represents the output image corresponding the set of serial no P-b and so on. Similerly figure 6.4.8 (a) represents the output image corresponding the set of serial no Q-a and figure 6.4.8 (b) represents the output image corresponding the set of serial no Q-b and so on.

Figure 6.4.1: class segmented test images (gray Lena) with optimized class boundaries referring to Table 1.
(a) Represents image for the boundery P-a, (b) represents image for the boundery P-b,
(c) Represents image for the boundery P-c, (d) represents image for the boundery P-d.

Figure 6.4.2: class segmented test images (gray Lena) with optimized class boundaries referring to Table 1.
(a) Represents image for the boundery Q-a, (b) represents image for the boundery Q-b,
(c) Represents image for the boundery Q-c, (d) represents image for the boundery Q-d.

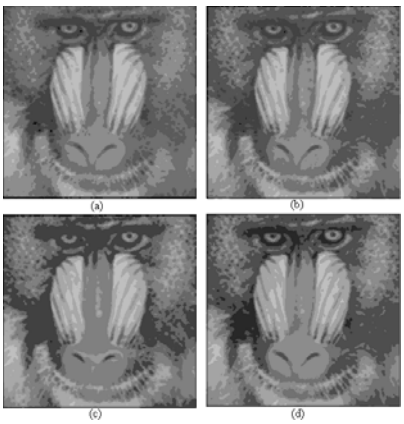


Figure 6.4.3: class segmented test images (gray Baboon) with optimized class boundaries referring Table 2.
(a) Represents the image for boundery P-a, (b) represents the image for boundery P-b,
(c) Represents the image for boundery P-c, (d) represents the image for boundery P-d.

Figure 6.4.4: class segmented test images (gray Baboon) with optimized class boundaries referring Table 2.
(a) Represents image for the boundery Q-a, (b) represents image for the boundery Q-b,
(c) Represents image for the boundery Q-c, (d) represents image for the boundery Q-d.

Figure 6.4.5: class segmented test images (Color Lena) with optimized class boundaries referring Table 3.
(a) Represents the image for boundery P-a, (b) represents the image for boundery P-b,
(c) Represents the image for boundery P-c, (d) represents the image for boundery P-d.

Figure 6.4.6: class segmented test images (Color Lena) with optimized class boundaries referring Table 3.
(a) Represents image for the boundery Q-a, (b) represents image for the boundery Q-b,
(c) Represents image for the boundery Q-c, (d) represents image for the boundery Q-d.

Figure 6.4.7: class segmented test images (Color Baboon) with optimized class boundaries referring Table 4.
(a) Represents the image for boundery P-a, (b) represents the image for boundery P-b,
(c) Represents the image for boundery P-c, (d) represents the image for boundery P-d.

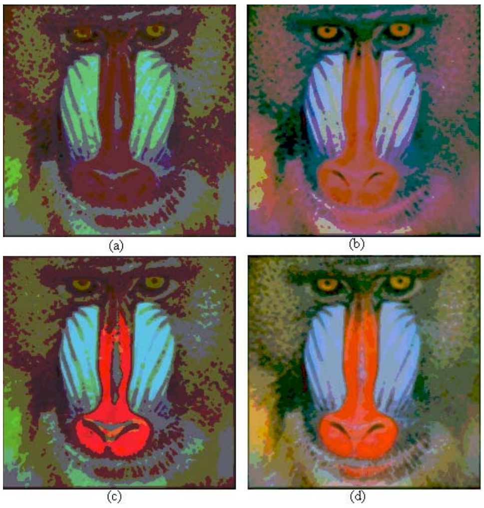


Figure 6.4.8: class segmented test images (Color Baboon) with optimized class boundaries referring Table 4.
(a) Represents image for the boundery Q-a, (b) represents image for the boundery Q-b,
(c) Represents image for the boundery Q-c, (d) represents image for the boundery Q-d.

7. CONCLUSION

The neural network has not been used for the first time to segment an image. Previously image segmentation has been done using the Multi Layer Self-Organizing Neural Network (MLSONN) architecture, which is efficient in binary object extraction from a noisy image through the process of self organization of inputs. The MLSONN architecture has some draw backs. As in this architecture in the back propagation phase there is a recurrent loop connecting the output layer to the input layer which basically increase the complexity. To overcome this draw back Bi-Directional Self-Organizing Neural Network (BDSONN) architecture was introduced [1], in which the output is feed backed to the intermediate layer for minimizing the error. It reduces so many computation burdens as much possible. Image segmentation has been dome using this architecture previously using beta function. But in this project Multi Level Sigmoidal (MUSIG) function has been used as activation function. The main goal of this project was to have a study that MUSIG activation function is efficient or not in case of image segmentation using BDSONN architecture.

However the comparatively study has not been done with the beta function and the MUSIG function.Though the output result shows that MUSIG function is efficient for segmenting an image using BDSONN architecture. So it can be concluded that in coming future MUSIG function will be used widely and will be improved enough for having a better image segmentation using BDSONN architecture.

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