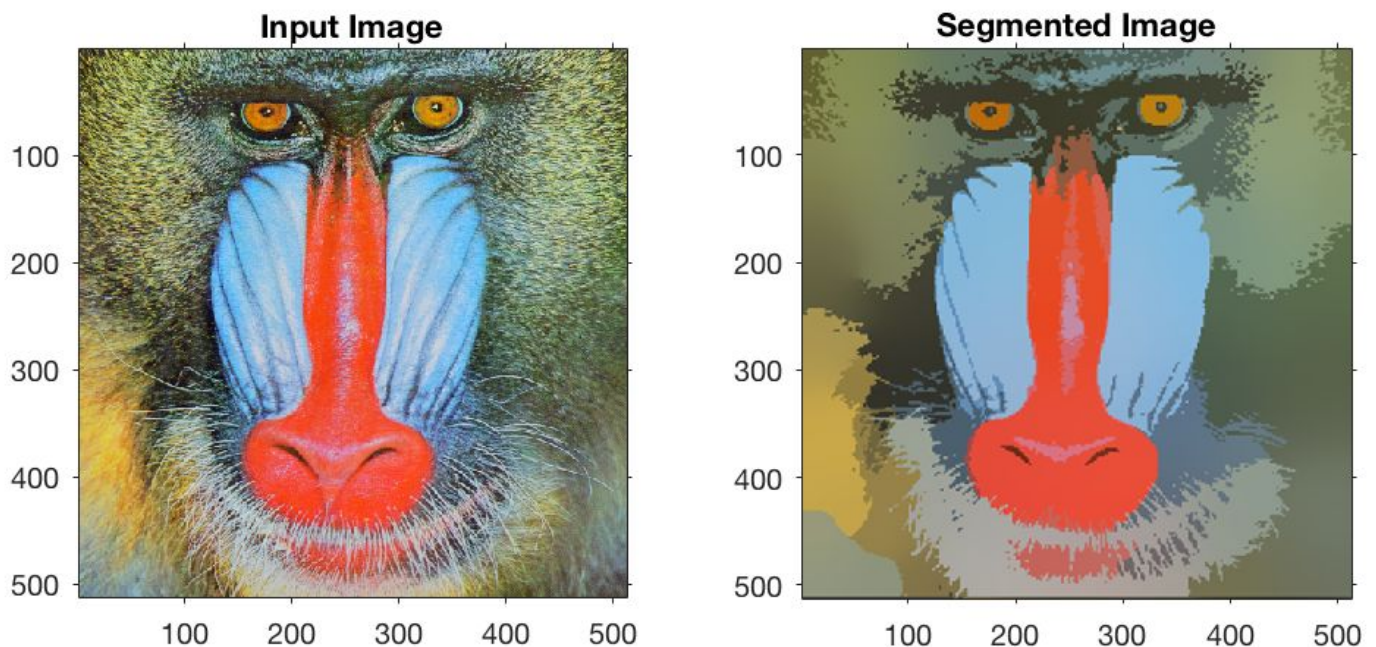


# Mean Shift Segmentation

The given image has the given input image and the mean shift segmented image. It is clearly seen that the pixel values have converged to a mean intensity value and the segments can be seen clearly in the segmented image.

The parameters used to attain this image are given as below :

- Bandwidth for color or intensity ( $\sigma_{\text{color}}$ ) = 0.1
- Bandwidth for space ( $\sigma_{\text{space}}$ ) = 10
- Number of iterations = 30
- Number of neighbours in knnsearch = 200

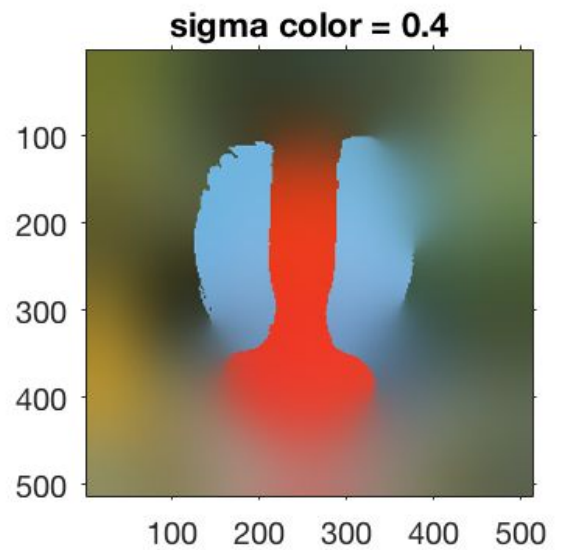
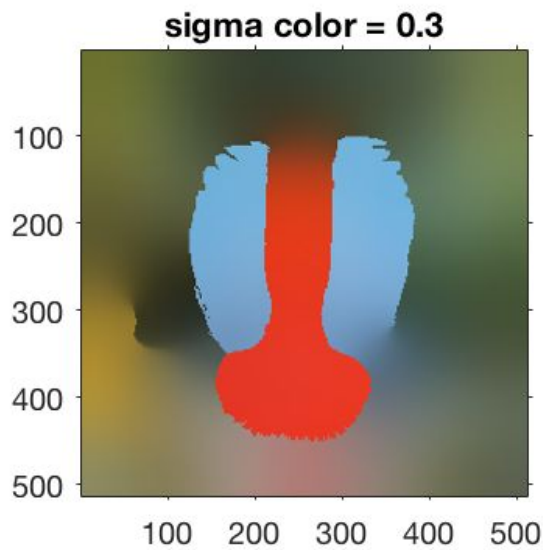
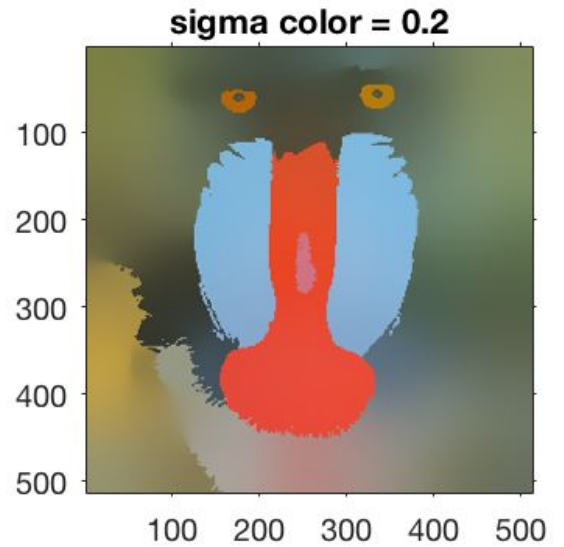
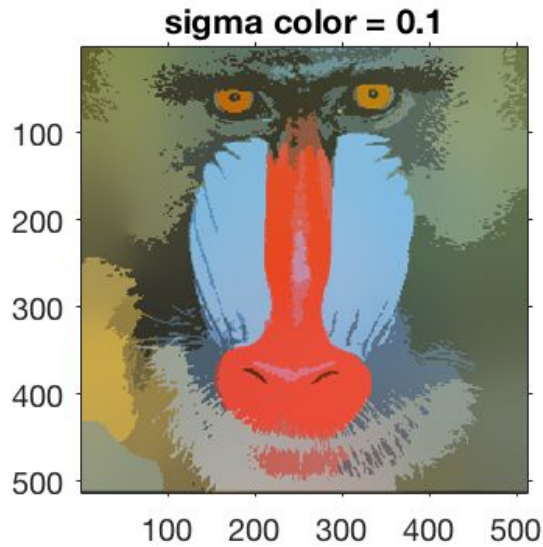


On tinkering with the parameters, it is observed that

- Segments formed decrease on increasing the bandwidth parameter of color intensity
- The image becomes smooth in segments on increasing the spatial bandwidth parameter
- Increasing the number of iterations shows better convergence

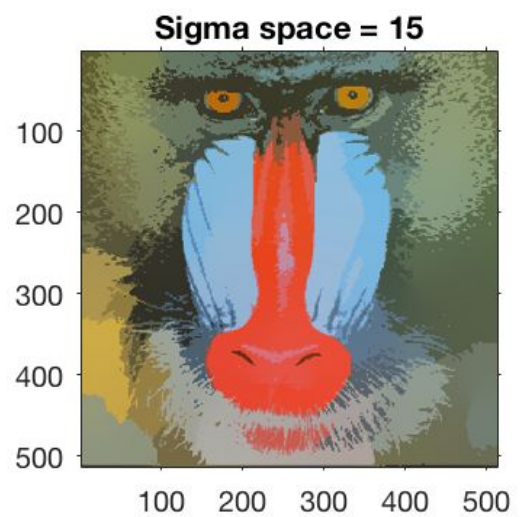
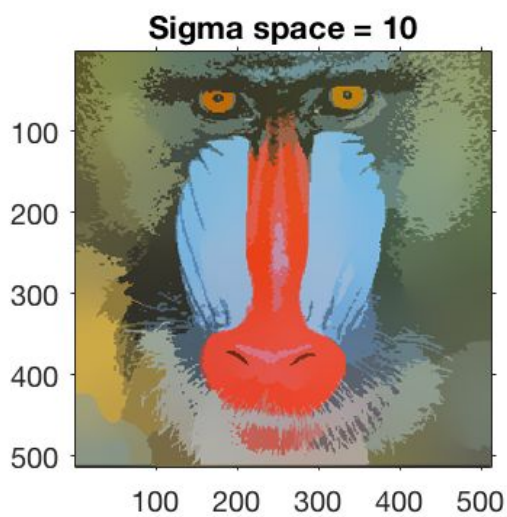
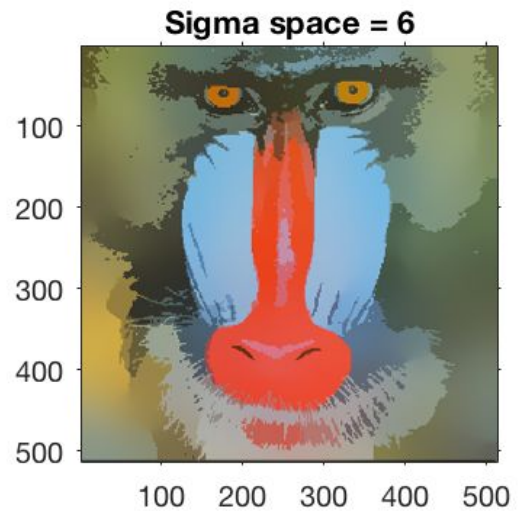
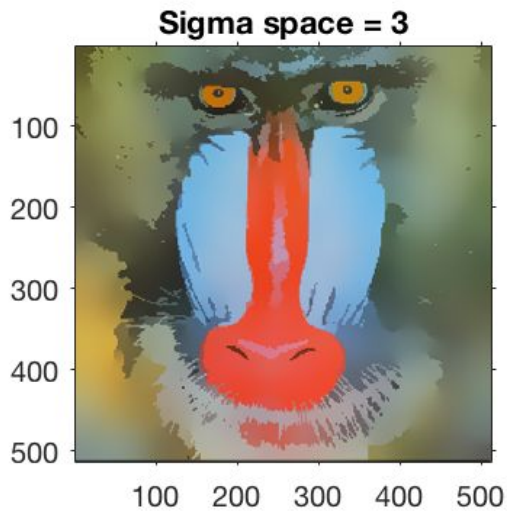
The above observations can be proved using the results of the simulations below :  
Note that the other parameters are those from the best segmented image. The changed parameters are written for each image.

## Increasing the bandwidth parameter of color intensity :



It is clearly seen that the segments are decreasing on increasing the sigma colour value. The first image has fine segments due to a smaller value of sigma space which allows a finer window for the intensity convergence and better colour mixing.

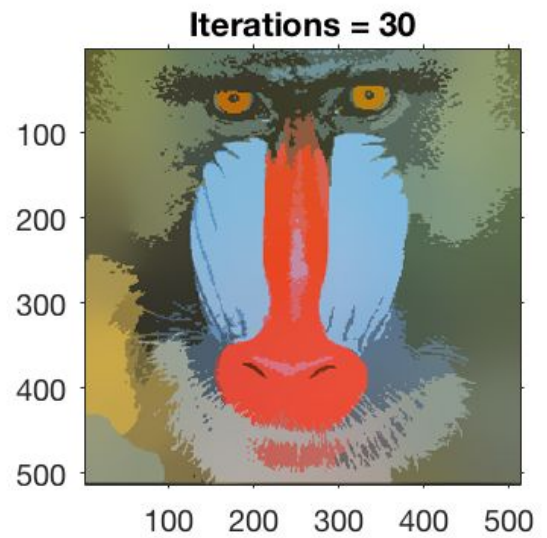
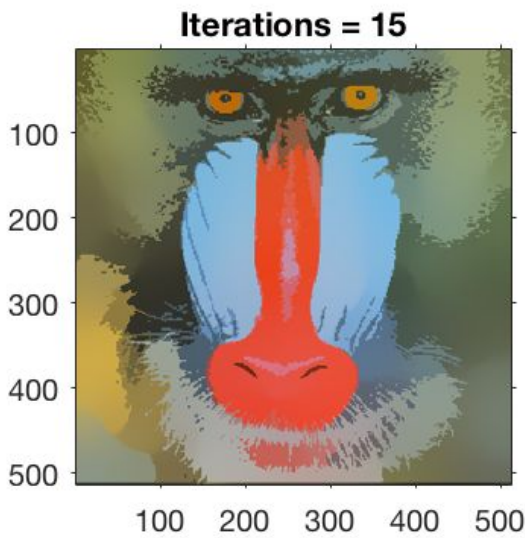
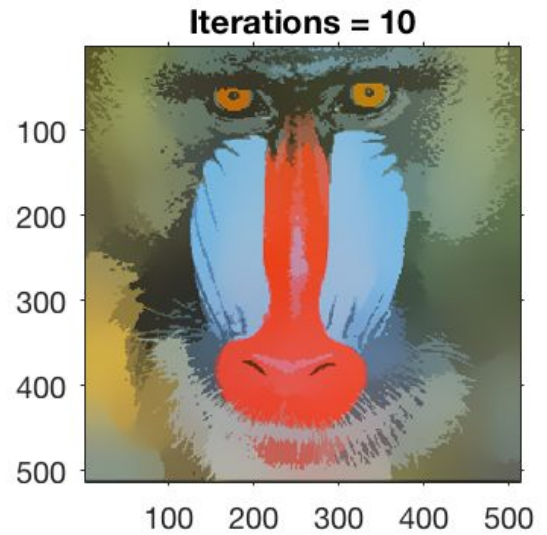
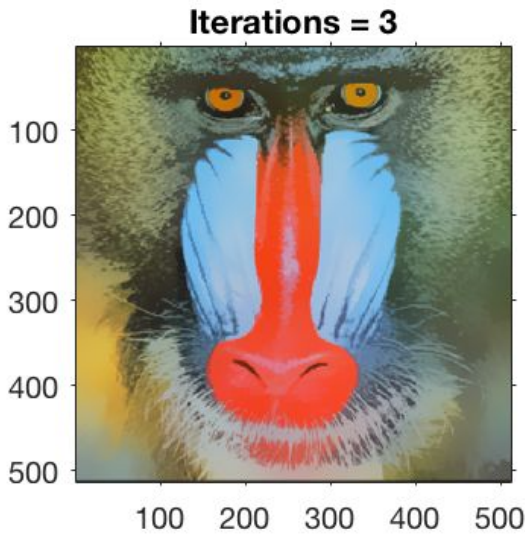
## Variation of the sigma space of bandwidth of space :



It is observed that the number of segments increase and are very fine in spatial domain as the bandwidth of space increases.



## Increasing the number of iterations :



As clearly seen, on increasing the number of iterations, the segments are formed better and there is a larger convergence seen due to the increased number of steps in gradient ascent and better convergence to the mean.