obtaining a reconstructed background image ($I_r(x)$) by applying estimations of point spread functions associated with the filtered data and the optical system to the filtered data; and

low pass filtering the noisy blurred scene data containing the object to be reconstructed (D**1**) and eliminating the background data from said image data by using the reconstructed background image ($I_r(x)$), to obtain a reconstructed image of the object with increased spatial resolution.

15. The method according to claim **14** wherein the optical system is diffraction limited.

16. In an optical system having a detector means and processor means in which image data is obtained comprising noisy blurred scene data containing an object to be reconstructed (D**1**), and noisy blurred background data (D**2**) of the same scene, an improved apparatus for increasing the spatial resolution of the image data produced by the optical system, the improvement therewith comprising:

means for filtering the noisy blurred background data (D**2**) of the same scene to obtain noise suppressed data:

means for applying estimations of point spread functions associated with the noise suppressed data and optical system to the noise suppressed data to obtain a reconstructed background image ($I_r(X)$); and

means for low pass filtering the noisy blurred scene data containing the object to be reconstructed and using the reconstructed background image to eliminate the background data from the image data to obtain a reconstructed image of the object with increased spatial resolution.

17. The apparatus of claim **16** wherein said optical system has a numerical aperture and said detector means has at least five detectors spread across the central lobe of the diffraction pattern determined by said aperture.

18. The apparatus of claim **17** wherein the optical system is diffraction limited.

19. The apparatus of claim **16**, wherein the reconstructed background $I_r(x)$ is obtained using a means for implementing the Richardson-Lucy reconstruction technique.

20. In an optical system having a detector means and processor means in which image data is obtained comprising noisy blurred scene data containing an object to be reconstructed (D**1**), and noisy blurred background data (D**2**) of the same scene, an improved apparatus for increasing the spatial resolution of the image data produced by the optical system, the improvement therewith comprising:

means for filtering the noisy blurred background data (D**2**) of the same scene to obtain noise suppressed data:

means for applying estimations of point spread functions associated with the noise suppressed data and optical system to the noise suppressed data to obtain a reconstructed background image ($I_r(X)$; and

means for low pass filtering the noisy blurred scene data containing the object to be reconstructed and using the reconstructed background image to eliminate the background data from the image data to obtain a reconstructed image of the object with increased spatial resolution;

wherein the means for filtering to remove noise from D2 comprises means for using the modified method of sieves to remove said noise, using the equations:

$$I(x)=\Sigma_y h_0(x-y)D\mathbf{2}(y)$$

$$D\mathbf{3}(x)=\Sigma_y h_3(x-y)D\mathbf{2}(y)$$

$$D\mathbf{4}=\Sigma_y h_4(x-y)D\mathbf{2}(y)$$

where h_3 and h_4 are two and three pixel wide point spread functions for removing noise by averaging adjacent pixels together, and where h_0 represents the optical system point spread function.

21. The apparatus of claim **20**, further comprising means for constructing new point spread functions (h_{3T}, h_{4T}) to account for the combined effect of the method of sieves two and three pixel wide point spread functions, and the optical system point spread functions.

22. The apparatus of claim **21**, wherein said means to obtain the reconstructed background $I_r(x)$ further comprises:

(a) means for blurring the estimate of the true background scene data;

(b) means for dividing on a pixel by pixel basis the noisy scene data (D**3**, D**4**) by the blurred estimate of the true background scene data to create a new array (T**3**, T**4**);

(c) means for correlating said new array with the complete method of sieves and optical system point spread functions and multiplying the result on a pixel by pixel basis with the current estimate of the true background scene data to provide a new estimate of said true background scene Z(x); and

(d) means for taking a new estimate of the true background scene to be the reconstructed background scene $I_r(x)$.

23. The apparatus of claim **22**, further comprising means for determining whether a threshold number of iterations has been met and repeating the steps of claim **22** until said threshold is achieved.

24. The apparatus of claim **22** wherein the optical system is diffraction limited.

25. The apparatus of claim **24** wherein said optical system has a numerical aperture and said detector means has at least five detectors spread across the central lobe of the diffraction pattern determined by said aperture.

26. The apparatus of claim **22**, wherein the noise suppressed values D3 and D4 are used as the first estimate of the true background scene.

27. The apparatus of claim **22**, wherein the means for correlating the new array to obtain a new estimate of the true background scene further comprises means for using said new point spread functions, h_{3T} and h_{4T}, where

$$Z\mathbf{3}(x)=\Sigma_y T\mathbf{3}(y)h_{3T}(y-x)$$

$$Z\mathbf{4}(x)=\Sigma_y T\mathbf{4}(y)h_{4T}(y-x)$$

$$Z(x)=I_n(x)[Z\mathbf{3}(x)+Z\mathbf{4}(x]/2.$$

28. In an optical system having a detector means and processor means in which image data is obtained comprising noisy blurred scene data containing an object to be reconstructed (D**1**), and noisy blurred background data (D**2**) of the same scene, an improved apparatus for increasing the spatial resolution of the image data produced by the optical system, the improvement therewith comprising:

means for filtering the noisy blurred background data (D**2**) of the same scene to obtain noise suppressed data:

means for applying estimations of point spread functions associated with the noise suppressed data and optical system to the noise suppressed data to obtain a reconstructed background image ($I_r(X)$; and

means for low pass filtering the noisy blurred scene data containing the object to be reconstructed and using the reconstructed background image to eliminate the background data from the image data to obtain a reconstructed image of the object with increased spatial resolution;