successive segments of the video data comprising six rows and six columns are read out. Specifically, the magnitude of each charge packet in each six-by-six segment of data passing beneath the array **32** is sensed by sensing the electrical potential of each individual sensing gate electrode in the array **32**. Each time data is clocked sequentially from left to right by one pixel through the register **32**, a new segment of video data is read out from the array **32** and fed to a corresponding one of **21'** of the correlation peak detectors **21**. This occurs once each CCD clock cycle. The process continues, pixel by pixel, until the entire image has been processed. Operation of charge coupled device transversal filters of this sort is well known in the art and will not be described further. Charge coupled device image processing with transversal filters and CCD sense electrode arrays is described, for example, in: Nudd et al, "A CCD Image Processor for Smart Sensor Applications", *Proceedings of the Society of Photo-Optical Instrumentation Engineers,* San Diego, Calif., 1978, Vol. 155, pages 15–22.

Convolution and Correlation

A simplified description of the convolution and correlation processes for a particular one of the image primitives of FIG. **6***a* will now be given with reference to FIG. **6***b*. Each image primitive of FIG. **5** is quantized into an array of n columns and n rows of data words, V_{ij}. A graphic representation of the array corresponding to the image primitive **100** of FIG. **5** is illustrated in FIG. **6***b*. An exemplary aperture point spread function P_{xy} is illustrated in FIG. **6***c*. It may be digitized into an array of m rows and m columns of data words corresponding to the number of rows and columns of subpixels in a complete multiple-registered frame. The result is a matrix P_{ij} of m columns and m rows of data words, comprising the point spread function matrix **200** indicated in FIG. **6***b*. The following is a partial representation of an exemplary point spread function matrix:

$$
\begin{array}{cccccccc}
 & \bullet & & +.01 & & & \bullet & \\
 & & \bullet & -.2 & & \bullet & & \\
 & & -.6 & -.7 & -.6 & & & \\
= & +.01 & -.2 & -.7 \quad 1 & -.7 & -.2 & +01 & \bullet \\
 & & -.6 & -.7 & -.6 & & & \\
 & & \bullet & -.2 & & \bullet & & \\
 & \bullet & & +.01 & & & \bullet & \\
 & & & \bullet & & & &
\end{array}
$$

In order to generate a blurred "version" of each image primitive such as the primitive **100** in FIG. **6***b*, the primitive **100** is convolved with the point spread function matrix **200**, yielding the blurred primitive **100'**, as indicated in FIG. **6***b*. Each data word V'_{ij} in the ith row and the jth column of the blurred primitive **100'** is computed from the point spread function data words P_{ij} and the unblurred primitive data words V_{ij} as follows:

$$V'_{i,j} = \sum_k \sum_l P_{k-i,l-j} V_{kl}.$$

The blurred primitive **100'** is then used as an array or matched filter **19'** of n×n subpixels of data words. The plurality of matched filters **19** comprises, for example, each of the image primitives of FIG. **5** convolved with the point spread function **200**, in accordance with FIG. **6***b*.

The n×n matched filter **19'** is correlated with each n×n image segment sensed by the array **32**, the correlation surface is operated on by the two-dimensional correlation peak detector **21'**. If the detector **21'** senses a peak correlation, the primitive generator **23'** is enabled by the detector **21'** to generate a block of n-rows and n-columns of data words corresponding to the unblurred image primitive **100**. The data from the generator **23'** is stored in the memory **25'** in an address specified by the address generator **27'**. The address generator **27'** directs the image primitive block of data in the memory **25'** to the location corresponding to the original location of the correlated data segment of the blurred video frame stored in the memory **17'**.

Computation of the correlation by the detector **21'** is performed in accordance with well-known correlation techniques in signal processing theory and, therefore, will not be described herein in detail.

The synthesized image stored in the memory **25** comprises a mosaic of selected image primitives and has a better resolution then any one of the video frames originally generated by the camera **5**. It is contemplated that the performance may be enhanced by the use of a more complete set of image primitives than that illustrated in FIG. **5**.

What is claimed is:

1. In an imaging system comprising an imager which may view a scene through an aperture characterized by a point spread function and means responding to said imager for generating successive frames of video data words characterized by a first sampling rate, a system for enhancing image resolution, comprising:

means for converting said video data words into a synthesized video frame of video data words, said synthesized video frame characterized by a second higher sampling rate;

a plurality of image primitives, each of said image primitives comprising a matrix of video data words;

means for convolving each of said image primitives with said point spread function to generate a set of blurred image primitives;

means for computing the correlation between each of said blurred image primitives and a segment of said synthesized video frame and detecting a peak correlation therefrom wherein said segment is a selected portion of said synthesized video frame;

a memory for storing a mosaic of selected image primitives; and

means, responsive whenever said correlation means detects a two-dimensional peak correlation between a particular one of said blurred image primitives and one segment of said synthesized video frame, for writing a particular one of the unblurred ones of said image primitives into said image primitive mosaic storage memory at a location corresponding to the original location of said particular synthesized video frame segment in said synthesized video frame.

2. The system of claim **1** wherein said means for converting into a synthesized video frame comprises multiple image registration means for forming a mosaic of displaced ones of said successive video frames generated by said imager and said selected portion of said synthesized video frame is similar in size to the blurred primitives with which it is compared for purposes of computing correlation therebetween.

3. The system of claim **1** wherein said means for converting into a synthesized video frame comprises means