

IMAGE CAPTURE APPARATUS

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BACKGROUND AND FIELD OF THE INVENTION

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This invention relates to image capture apparatus and components thereof.

A known image capture apparatus is illustrated in Figure 1 and comprises a video camera 10 having a body 15 and lens 17 which may be a closed circuit television CCD camera, a vidicon camera, a consumer video camera or other suitable camera, connected by a cable 20 to a frame grabber or image capture card 30 which is usually installed in a personal computer, the computer having image storage and display functions.

The video signal is transmitted frame by frame at either 25 frames or 30 frames per second depending on the standard used. Typically, each frame is further transmitted as two fields comprised of odd and even scanning lines, using a technique known as interlacing. This is illustrated in Figure 2 and typically there are 50 or 60 fields per second being transmitted. Each field is interspaced in time by 1/50th or 1/60th of a second. Interlacing is used so that movements of objects in the video output appear smooth and not abrupt. This technique also reduces flickering.

A typical frame grabber 30 can either capture a single field, either even or odd, or the whole frame (i.e. both fields). However, capturing both fields is only used for non-moving objects, as moving objects would generate a "double image" since the odd and even fields are interspaced in time. Hence for moving objects, images are usually captured using a single field.

Since only a single field is captured, the image displayed appears flattened. This is not desirable either for viewing or for automated image processing. Hence, typically, each line in the field is repeated and this modified images then used. This is illustrated in Figure 3 in which the original object is illustrated as the dark square 40. The captured image 50 is reduced in height by one half and this height is regained in the modified image 60 by repeating the horizontal lines.

Although the modified image now looks normal, the vertical resolution is only half that of the horizontal resolution. Since, generally, it is desired to capture an image at a minimum resolution below which details would be lost, the existing system is limited by the vertical resolution and thus provides greater than the desired resolution in the horizontal direction and is thus wasteful.

It is the object of the invention to provide an image capturing system and apparatus therefor which alleviates this problem.

SUMMARY OF THE INVENTION

According to the invention in the first aspect, there is provided an anamorphic video camera lens.

Preferably, the magnification of the lens on a first axis is a multiple of the magnification on a second axis perpendicular to the first and most preferably the multiple is two.

According to the invention in a second aspect, there is provided an image capture apparatus comprising a video camera having a lens, video frame capture and storage means connectable to the video camera, the arrangement being such that the lens increases the height of an image in a direction perpendicular to the field scanning direction of the video camera.

With a lens according to the invention fitted to a video camera forming part of an image capture apparatus, the lens, when suitably arranged, has the effect of distorting the image perpendicular to the scanning direction of the video camera to increase and preferably double the height of the video image. Thus, when the captured image is taken, using only the odd or even fields, an image having the same resolution and size in both the "horizontal" and "vertical" directions is obtained and there is no need to modify the image by repeating the horizontal line. Since the resolution in the horizontal and vertical directions is the same, it is possible for a broader

field of view to be covered by the video camera.

The invention has particular application for monitoring of highways. Typically in such an application a single camera is required per lane. However, with the invention, a single camera can monitor more than one lane due to the consistent horizontal and vertical resolutions.

The invention can form part of a complete lens or can be formed as an adaptor to be retrofitted to an existing camera lens.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a schematic view of a prior art image capture apparatus.

Figure 2 is a diagram illustrating how the video signal is transmitted from the video camera to the frame grabber of the apparatus of Figure 1.

Figure 3 is a schematic view showing how an image is processed by the apparatus of Figure 1.

Figure 4 is a schematic diagram similar to Figure 1 illustrating an embodiment of the invention.

Figure 5 is a diagram illustrating how an image is processed by the apparatus of Figure 4.

Figures 6a and 6b illustrates how the resolution capability of the embodiment of the invention compares with the prior art.

Figure 7 is a schematic view of the lens adaptor of Fig. 4.

Figure 8 is a view in the direction of arrow A of Figure 7.

Figures 9a and 9b show different lens arrangements for the video camera of Figure 4.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

An embodiment of the description is illustrated in Figure 4. In this embodiment the body 15 and (normal) lens 17 of the video camera 10, cable 20 and frame grabber 30 are the same as in the prior art of Figure 1. The only difference is that the lens 17 is provided with a lens adaptor 100. The adaptor 100 is anamorphic and distorts the image received by the video camera so that the height of the image is doubled relative to its width. The adaptor 100 is arranged relative to the body 15 of the video camera 10 so that this doubling effect lies in the direction perpendicular to the frame scanning direction.

The effect of the adaptor is illustrated in Figure 5 in which the original object 40 of width W and of height H becomes a distorted image 70 of width W and double the height H1. The captured image 80, which captures either the even or the odd fields as previously explained, then reduces the height H2 (=H) of the image to a normal level to provide a captured image having the same resolution in both height H and width W directions.

The image 80 is contrasted with the captured image 60 of the prior art in Figure 6.

Assuming that the minimum size of image to provide the necessary resolution is as shown in Figure 6A, with the image 60 occupying the percentage of the available frame area 65 as shown, since the horizontal resolution is now the same as the vertical resolution in the captured image 80 using the embodiment of the invention, it is possible to double the width of the viewing area 85 while providing the same degree of horizontal resolution. Typically, the aspect ratio of the prior art would be 4 : 3, with the aspect ratio using the embodiment of the invention being 8 : 3.

The embodiment of the invention has particular application where a long horizontal aspect ratio is required, such as in monitoring highways where it is desired, for example, to capture the image of a vehicle number plate in a lane. Assuming that a system is chosen to capture the image 60 in the

prior art in the single lane. Using the apparatus of the embodiment of the invention, it is possible to move the video camera away from the target so as to capture more horizontal information, so that, for example, a single camera can be used to monitor two lanes rather than one. Thus reducing the number of cameras and the computing resources necessary to join and align images digitally from adjacent cameras contiguously monitoring a large area. The invention is also particularly applicable for overhead monitoring of roads, for traffic flow purposes and for rectangular integrated circuit inspection.

The adaptor 100 is shown in more detail in Figures 7 and 8. As shown in Figure 7, glass optical elements 200, 210, 220, 230 are so shaped in the direction corresponding to the height direction H, to magnify the image to be twice that of the perpendicular direction W shown in Figure 8, in which the elements 200 - 230 are so shaped to provide an undistorted image on image plane 240.

Preferably the effective focal length of the lens in the plane shown in Figure 7 is 12.5 mm whereas the effective focal length in the plane shown in Figure 8 is 6.25 mm.

Although the embodiment of the invention has been described with reference to a lens adaptor 100 placed in front of an existing lens 17 of a video camera 10, an adaptor 110 may be provided on the image side of an existing lens 17 as illustrated in Figure 9a. Alternatively, an anamorphic lens 120 replacing completely the original lens 17 may be used as

shown in Fig. 9b.

Although the embodiment of the invention has been described with reference to a video camera lens/lens adaptor which doubles the size of the image in a given direction, this is not to be construed as limitative. For example, other lens/adaptor which provide a similar anamorphic effect may be used which, instead of doubling the size of the image in one direction, increase the size by a different amount, although doubling of the image size is preferred in the described embodiment since this provides a captured image having equivalent horizontal and vertical resolutions, for the image capture system described.

CLAIMS

1. Image capture apparatus comprising a video camera having lens means, video frame capture and storage means
5 connectable to the video camera, the arrangement being such that the lens means increases the height of an image in a direction perpendicular to the field scanning direction of the video camera.
- 10 2. Apparatus as claimed in claim 1 wherein the lens means comprises an anamorphic video camera lens or lens adaptor.
3. Apparatus as claimed in Claim 1 wherein the magnification of the lens or adaptor in a first direction is a multiple of the
15 magnification in a second direction perpendicular to the first.
4. Apparatus as claimed in Claim 2 wherein the multiple is two.
5. Apparatus as claimed in any one of claims 2 to 4 wherein the
20 lens means comprises a lens adaptor and is adapted to connected to a non-anamorphic video camera lens.

6. Monitoring apparatus including image capture apparatus as claimed in any one of the preceding claims.
- 5 7. Monitoring apparatus as claimed in Claim 6 adapted for monitoring of vehicles.
8. Monitoring apparatus as claimed in Claim 6 adapted for integrated circuit inspection.
- 10 9. An anamorphic video camera lens or lens adaptor adapted to be used in the apparatus of any one of the preceding claims.