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Signed this 10th day of October 2013

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(54) Title of the Invention: Vehicle Surroundings Monitor

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Specifications

1. Title of the Invention

Vehicle Surroundings Monitor

2. Patent Claim

A vehicle surroundings monitor characterized in having one or a plurality of cameras installed in a vehicle, means for converting images input by said cameras to other coordinates by a perspective conversion, means for combining said converted images into one image related to an image of the vehicle itself, and a display for displaying said image to the vehicle occupants.

3. Brief Description of the Invention

Objectives of the Invention

Industrial Field of the Invention

The present invention relates to a device for displaying the positions of other vehicles, the states of obstructions, and the center line, etc. as environment information of the vehicle surroundings to the driver by using television (TV) cameras (if an object that acquires images is simply referred to as a camera, then the type of camera does not matter in these Specifications).

Prior Art

A conventional vehicle monitor is as shown, for example, in Figure 5. This system has a camera 21 set up in the back of the vehicle directed towards the rear (Figure 5(a)), reverses the obtained image for left-right conversion of the image in an image signal processor 22 (Figure 5(b)), displays the image on a monitor TV 23, and obtains the so-called rearview image as in Figure 5(c) for monitoring. The driver can determine how to back up the vehicle by looking at this image.

Problems to Be Solved by the Invention

However, this type of conventional vehicle monitor is a device for simply displaying the rearview image as shown in Figure 5(c). One camera is inadequate because it is difficult to get a feel of the distance between

the vehicle and the obstructions and to understand the environment surrounding the vehicle. Even if the number of cameras is increased, and the number of monitors is increased, if there is no awareness about the relative positions of the cameras, it is difficult to sufficiently understand the environment. Therefore, a problem was that suitable driving measures could not be obtained. The present invention has the objective of providing a vehicle surroundings monitor that enables adequate awareness of the relationship between the vehicle and the surrounding environment and taking suitable driving measures to solve said problems.

Structure of the Invention

Means for Solving the Problems

To achieve the objective, the present invention has one or a plurality of cameras installed in a vehicle, means for converting images input by said cameras to other coordinates by a perspective conversion, means for combining said converted images into one image related to an image of the vehicle itself, and a display for displaying said image to the occupants.

Operation

For example, a camera image is converted to an image, in plane coordinates and is displayed so that the vehicle is at the origin in these coordinates. The driver of the vehicle understand the relationship between the traveling direction of the vehicle and the state of surroundings by looking at the display, and can take appropriate measures.

Working Examples

A working example of the present invention is described below with reference to Figures 1 to 4.

Figure 1 is a plane view of a vehicle equipped with cameras of the present invention. First, the structure is explained. A plurality of cameras 1-6 is set up so that the respective imaging ranges (field of view) 1a-6a cover the environment surrounding the vehicle as

much as possible. Specifically, two cameras are embedded in each of the front and rear bumpers, and one in each front directional indicator. Alternatively, the cameras may be set in the rear combination lamp instead of the rear bumper. If a mirror is placed in front of the lens in the camera and a reversed image is input, the camera becomes easy to install, and the degrees of freedom in modeling of the image increases. The number of cameras may be one or any number. Alternately, the cameras are positioned to give importance to the road surface and are oriented downward somewhat.

Figure 2 is a block diagram showing the structure of a processor of the images captured by the cameras in Figure 1. In an image converter 7, the images from cameras 1 to N are input and converted to other coordinates by a perspective conversion, are combined into one image by an image display unit 8, then displayed on a TV monitor 9 positioned at the driver's seat. Preferably, the image converter 7 has an internal high-speed processor capable of parallel processing of the images of only N cameras. In the image display unit 8, the vehicle's position is simultaneously drawn in a diagram. The displayed position of the vehicle is offset from the center of the image screen depending on signals corresponding to the gear position, the vehicle speed, and the operation of the directional indicator. The region of the vehicle environment to be viewed is widened. Figure 3 is an example of display results of these screens, and each is displayed in plane (road surface) coordinates. Figure 3(a) shows backing up (direction of the arrow) and is a fixed display with the vehicle 10 in the upper part in the center. The other neighboring vehicle 11 is displayed in a side view. Figure 3(b) is the operation of the right directional indicator. A lane change (arrow) to the right is assumed, and another vehicle 11 behind in the same direction can be displayed.

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