[0027]

In detail, as shown in Fig. 1A, following three types of the feature points for measuring the dimension are used in measuring the width of the vehicle.

Feature point #1 for measuring the dimension: the feature point in a side surface 31 of the vehicle (strictly speaking, the feature point which is at a position along the plane of the rectangular parallelepiped 30 corresponding to the side surface 31 of the vehicle);

Feature point #2 for measuring the dimension: the feature point in a side surface 32 of the vehicle (strictly speaking, the feature point which is at a position along the plane of the rectangular parallelepiped 30 corresponding to the side surface 32 of the vehicle);

Feature point #3 for measuring the dimension: the feature point in a bottom surface 33 of the vehicle (strictly speaking, the feature point which is at a position along the plane of the rectangular parallelepiped 30 corresponding to the bottom surface 33 of the vehicle);

Note that the side surface 31 is a side surface which is opposed to a camera for measuring the vehicle which is traveling, and the side surface 32 is the other side surface. The plane of the rectangular parallelepiped 30 corresponding to the side surface 31 includes the vertices v_1 to v_4, and the plane of the rectangular parallelepiped 30 corresponding to the side surface 32 includes the vertices v_5 to ~~v_6~~v_8.

[0028]

In the present embodiment, the feature points #1, #2, #3 for measuring the dimension can be extracted from arbitrary positions, respectively as long as conditions under which the feature points #1,

indicates a start point of the feature point 42b, and reference numeral 42b-3 indicates the current point of the feature point 42b. Reference numeral 42b-2 indicates a position of the feature point 42b in a frame image between a frame image corresponding to the start point and a frame image corresponding to the current point. Further, reference numeral 42c-1 indicates the start point of the feature point 42c, and reference numeral 42c-3 indicates the current point of the feature point 42c. Reference numeral 42c-2 indicates a position of the feature point 42c in a frame image between a frame image corresponding to the start point and a frame image corresponding to the current point.

[0052]

For the feature point 42a, the judgement whether or not the magnitude of the vector connecting the start point 42a-1 to the current point 42a-3 is equal to $\mu \times N_{TRC}N_{TR}$ or more and the judgement whether or not the angle between the vector directed to the current point 42a-3 from the start point 42a-1 and the vector directed to the vanishing point 43 from the start point 42a-1 is equal to the prescribed threshold value θ_{TH1} or less are performed. Based on these judgements, whether or not the feature point 42a is extracted as the moving feature point is judged.

[0053]

Regarding the feature point 42b, 42c, similar judgements are performed. In the following, explanation will be made under the assumption that the feature points 42a, 42b, 42c have been detected as the moving feature points in step S05.

[0054]

As shown in Fig. 3A, after the detection of the moving feature point (step S05), clustering of the detected moving feature points is performed (step S06).

a near side of the vehicle (when viewed from the camera 1) among the extracted tangential lines corresponding to the lines perpendicular to the traffic lanes, and the tangential line 64 is a tangential line on a far side of the vehicle.

[0065]

In addition, the intersection point 51 of the tangential line 61 and the tangential line 63 is calculated, and the intersection point 52 of the tangential line 62 and the tangential line 64 is calculated.

[0066]

Furthermore, as shown in diagram (3) in Figs. 7A and 7B, the tangential lines corresponding to lines which are perpendicular to the road surface in the real space are extracted. Since it is information that is known in advance at what angle the lines perpendicular to the road surface in the real space are imaged in the image, it is possible to extract the tangential lines on the moving region corresponding to the lines perpendicular to the road surface ~~traffic lanes~~ in the real space using this fact. In diagram (3) in Figs. 7A and 7B, among the extracted tangential lines corresponding to the lines perpendicular to the road surface, the tangential line which is on a far side of the vehicle is indicated by reference number 65 and the tangential lines which are on a near side of the vehicle are indicated by reference numbers 66, 67. Note that the tangential line 67 is extracted as a line passing through the intersection point 51 of the tangential lines 61, 63 on the near side of the vehicle.

[0067]

In addition, as shown in diagram (3), the intersection point 53 of the tangential line 61 and the tangential line 65, the intersection point 54 of

intersection points appropriately selected from among the intersection points 52, 56, 57 may be determined as the feature points #6 for measuring the dimension.

[0076]

Method (2):

In the method (2) of detecting the feature points for measuring the dimension, after the tangential lines and the intersection points are calculated as similar to the method (1), the feature point in each surface which is easily tracked is searched by searching the feature point along a search path which is defined by the calculated tangential lines and the calculated intersection points. The feature point obtained by this search is determined as the feature point for measuring the dimension. Figs. 9A to 9C are diagrams for indicating the procedure to determine each feature point for measuring the dimension by the method (2).

[0077]

Referring to Fig. 9A, in determining the feature point #1 for measuring the dimension in the side surface 31, a path constituted by a portion of the above-mentioned calculated tangential lines in the side surface 31 is determined as the search path, and the search for the feature point is performed around this search path. In this case, the intersection points are used for obtaining the portion of the tangential lines in the side surface 31 in determining this search path. More specifically, the search for the feature point is performed around the search path constituted by the portion of the tangential line 65 between the intersection point 54 and the intersection point 53, the portion of the tangential line ~~62~~ 61 between the intersection point 53 and the intersection point 51 and the portion of the tangential line 67 between the intersection point 51 and the intersection

determined as the feature point #~~2~~3 for measuring the dimension. The number of the determined feature points #~~2~~3 for measuring the dimension may be one or more.

[0080]

Further, referring to Fig. 9B, in determining the feature point #4 for measuring the dimension in the front surface 34, a path constituted by a portion of the above-mentioned calculated tangential lines in the front surface 34 is determined as the search path, and the search for the feature point is performed around this search path. More specifically, the search for the feature point is performed around the search path constituted by the portion of the tangential line 65 between the intersection point 53 and the intersection point 54 and the portion of the tangential line 64 between the intersection point 54 and the intersection point 52. The feature point obtained by this search is determined as the feature point #4 for measuring the dimension. The number of the determined feature points #4 for measuring the dimension may be one or more.

[0081]

Further, in determining the feature point #5 for measuring the dimension in the rear surface 35, a path constituted by a portion of the calculated tangential lines in the rear surface 35 is determined as the search path, and the search for the feature point is performed around this search path. More specifically, the search for the feature point is performed around the search path constituted by the portion of the tangential line 66 between the intersection point 55 and the intersection point 56, the portion of the tangential line 68 between the intersection point 56 and the intersection point 57, the portion of the tangential line 67 between the

of the vehicle and a sixth feature point for measuring the dimension which is a feature point in a sixth plane of the rectangular parallelepiped in at least one frame image among the frame images; and

calculating a height of the vehicle based on the third feature point for measuring the dimension and the sixth feature point for measuring the dimension,

wherein the third plane is a plane of the rectangular parallelepiped corresponding to a bottom surface of the vehicle, and the sixth plane is a plane of the rectangular parallelepiped corresponding to an upper surface of the vehicle,

wherein the calculating a height ~~length~~ of the vehicle comprises:

calculating an amount of movement of the vehicle from an amount of movement of the third feature point;

calculating three-dimensional coordinates of the third feature point and the sixth feature point by performing a motion stereo process on the third feature point and the sixth feature point using the amount of movement of the vehicle; and

calculating the height of the vehicle from the calculated three-dimensional coordinates of the third feature point and the sixth feature point,

wherein a position of the third feature point detected by said detecting is arbitrary in the third plane, and

wherein a position of the sixth feature point detected by said detecting means is arbitrary in the sixth plane.