Claims

1. A photogrammetry system, comprising:

photographing devices in a direction substantially vertical to a direction of movement of an object to be measured with respect to the photographing devices, the photographing devices being able to photograph the object to be measured for at least two times at a predetermined time interval to obtain at least two images, respectively; and

a data processing device, which calculates, according to a length of the object to be measured or at least one portion of the object to be measured in the images obtained by the photographing devices, a transverse movement distance of the object to be measured or the at least one portion of the object to be measured in the two images and a speed of the object to be measured with respect to the photographing devices, an actual length of the object to be measured or the at least one portion of the object to be measured;

wherein the object to be measured moves at a speed V, and the photographing devices photograph the object to be measured for two times at a time interval t, or the object to be measured is stationary, and the photographing devices move at a speed V in a direction vertical to a photographing direction and photograph the object to be measured for two times at a time interval t; and

the transverse movement distance of the object to be measured in the two images obtained by the two times of photographing is Dp, the length of the object to be measured or the at least one portion of the object to be measured in the images is Lp, and the actual length L of the object to be measured or the at least one portion of the object to be measured may be obtained by the following formula:

$$\mathbf{L = Lp \times \frac{vt}{Dp}.}$$

2. The photogrammetry system according to claim 1, characterized in that:

the photogrammetry system further comprises a speed measurement device for measuring a speed of the object to be measured in the direction of movement with respect to the photographing devices.

3. A photogrammetry system, comprising:

photographing devices in a direction substantially vertical to a direction of movement of an object to be measured with respect to the photographing devices, the

photographing devices being able to photograph the object to be measured for at least two times at a predetermined time interval to obtain at least two images, respectively; and

a data processing device, which calculates, according to a length of the object to be measured or at least one portion of the object to be measured in the images obtained by the photographing devices, a transverse movement distance of the object to be measured or the at least one portion of the object to be measured in the two images and a distance between two positions of the photographing devices to obtain the two images of the object to be measured, an actual length of the object to be measured or the at least one portion of the object to be measured;wherein the object to be measured is stationary, and the photographing devices photograph the object to be measured at two positions having a distance S therebetween to obtain two images, respectively; and

the transverse movement distance of the object to be measured in the two images is Dp, the length of the object to be measured or the at least one portion of the object to be measured in the images is Lp, and the actual length L of the object to be measured or the at least one portion of the object to be measured may be obtained by the following formula:

$$L = Lp \times \frac{S}{Dp}.$$

4. The photogrammetry system according to claim 3, characterized in that:

the two images are obtained by two photographing devices having the same parameters at two positions having a distance S therebetween.

5. A photogrammetry system, comprising:

photographing devices in a direction substantially vertical to a direction of movement of an object to be measured with respect to the photographing devices, the photographing devices being able to photograph the object to be measured for at least two times at a predetermined time interval to obtain at least two images, respectively; and

a data processing device, which calculates, according to a length of the object to be measured or at least one portion of the object to be measured in the images obtained by the photographing devices, a transverse movement distance of the object to be measured or the at least one portion of the object to be measured in the two images and a speed of the object to be measured with respect to the photographing devices, an

actual length of the object to be measured or the at least one portion of the object to be measured;

the photogrammetry system further comprises another photographing device for photographing the object to be measured in a direction different from the photographing direction of the photographing devices, and the size of the object to be measured in a third dimension is obtained according to images obtained by the another photographing device.

6. A photogrammetry system, comprising:

photographing devices in a direction substantially vertical to a direction of movement of an object to be measured with respect to the photographing devices, the photographing devices being able to photograph the object to be measured for at least two times at a predetermined time interval to obtain at least two images, respectively; and

a data processing device, which calculates, according to a length of the object to be measured or at least one portion of the object to be measured in the images obtained by the photographing devices, a transverse movement distance of the object to be measured or the at least one portion of the object to be measured in the two images and a speed of the object to be measured, an actual length of the object to be measured or the at least one portion of the object to be measured;

the photogrammetry system comprises two photographing devices, which are a first photographing device and a second photographing device successively arranged at a predetermined distance in a direction parallel to the direction of movement of the object to be measured, respectively; and

the first photographing device photographs the object to be measured, the second photographing device shoots a video of the object to be measured, the data processing device retrieves frames of the video obtained by the second photographing device to obtain a frame most approximate to the picture obtained by the first photographing device and calculates a difference between the time of taking the picture and the time of taking the frame image so as to obtain a movement speed of the object to be measured.

7. The photogrammetry system according to claim 6, characterized in that:

the data processing device extracts two frames from the video obtained by the second photographing device, and calculates a time interval t between the two frames; and

the transverse movement distance of the object to be measured in the two frames is

Dp, the length of the object to be measured or at least one portion of the object to be measured in the frame image is Lp, and the actual length L of the object to be measured or the at least one portion of the object to be measured is obtained by the following formula in combination with the obtained movement speed V of the object to be measured:

$$\mathbf{L = Lp \times \frac{vt}{Dp}}.$$

8. The photogrammetry system according to claim 6, characterized in that:

the photogrammetry system further comprises a first sensor, which is disposed downstream the first photographing device in a manner of having a predetermined distance L1 from the first photographing device in the direction of movement of the object to be measured; and, a second sensor, which is disposed downstream the second photographing device in a manner of having a predetermined distance L2 less than the predetermined distance L1 from the second photographing device in the direction of movement of the object to be measured;

the predetermined distance L2 is less than the predetermined distance L1, and the predetermined distance L2 is less than the length of the object to be measured in the direction of movement; and

the first photographing device is activated when the first sensor detects that the object to be measured arrives, and the second photographing device is activated when the second sensor detects that the object to be measured arrives.

9. The photogrammetry system according to claim 8, characterized in that:

the photogrammetry system further comprises a third sensor, which is disposed upstream the second photographing device in the direction of movement of the object to be measured; and

the second photographing device stops working when the third sensor detects that the object to be measured has passed through.

10. A photogrammetry system, comprising:

photographing devices in a direction substantially vertical to a direction of movement of an object to be measured with respect to the photographing devices, the photographing devices being able to photograph the object to be measured for at least two times at a predetermined time interval to obtain at least two images, respectively, wherein the photogrammetry system comprises two photographing devices, which are a first photographing device and a second photographing device successively arranged

at a predetermined distance in a direction parallel to the direction of movement of the object to be measured, respectively; and

a data processing device, which calculates, according to a length of the object to be measured or at least one portion of the object to be measured in the images obtained by the photographing devices, a transverse movement distance of the object to be measured or the at least one portion of the object to be measured in the two images and a distance from the first photographing device to the second photographing device, an actual length of the object to be measured or the at least one portion of the object to be measured;

wherein the first photographing device is a single-shot camera, and the second photographing device is a camera capable of photographing for continuous multiple times;

several pictures most similar to the picture obtained by the first photographing device are found from a plurality of pictures obtained by the second photographing device, and an image consistent with the picture of the first photographing device is obtained by interpolation; or the position of a portion on the several most similar images is interpolated to obtain the position of the same portion on the single-shot image, and a photographing time corresponding to an interpolation image is obtained during interpolation; the photographing time has a time difference with the photographing time of the single-shot image; and, the movement speed of the object to be measured is calculated in combination with a distance from the first photographing device to the second photographing device;

in the case where the distance from the first photographing device to the second photographing device is S, the transverse movement distance of the object to be measured in the interpolation image and the single-shot image is Dp and the length of the object to be measured or at least one portion of the object to be measured in the images is Lp, the actual length L of the object to be measured or the at least one portion of the object to be measured may be obtained by the following formula:

$$\mathbf{L = Lp \times \frac{S}{Dp}}.$$

11. A photogrammetry method, comprising the following steps:

(a) in a direction substantially vertical to a direction of movement of an object to be measured with respect to photographing devices, photographing, by the photographing devices, the object to be measured for at least two times at a

predetermined time interval to obtain at least two images, respectively; and

(b) according to a length of the object to be measured or at least one portion of the object to be measured in the images obtained by the photographing devices, a transverse movement distance of the object to be measured or the least one portion of the object to be measured in the two images and a speed of the object to be measured with respect to the photographing devices, calculating an actual length of the object to be measured or the at least one portion of the object to be measured;

wherein the object to be measured moves at a speed V, and, in step (a), the photographing devices photograph the object to be measured for two times at a time interval t, or the object to be measured is stationary, and, in step (a), the photographing devices move at a speed V in a direction vertical to a photographing direction and photograph the object to be measured for two times at a time interval t; and

in step (b), the transverse movement distance Dp of the object to be measured in the two images obtained by the two times of photographing and the length Lp of the object to be measured or the at least one portion of the object to be measured in the images are obtained, and then the actual length L of the object to be measured or the at least one portion of the object to be measured is obtained by the following formula:

$$L - Lp \times \frac{Vt}{Dp}.$$

12. A photogrammetry method, comprising the following steps:

(a) in a direction substantially vertical to a direction of movement of an object to be measured with respect to photographing devices, photographing, by the photographing devices, the object to be measured for at least two times at a predetermined time interval to obtain at least two images, respectively; and

(b) according to a length of the object to be measured or at least one portion of the object to be measured in the images obtained by the photographing devices, a transverse movement distance of the object to be measured or the least one portion of the object to be measured in the two images and a distance between two positions of the photographing devices to obtain the two images of the object to be measured, calculating an actual length of the object to be measured or the at least one portion of the object to be measured;

wherein the object to be measured is stationary, and, in step (a), the photographing devices photograph the object to be measured at two positions having a distance S

therebetween to obtain two images, respectively; and

in step (b), the transverse movement distance Dp of the object to be measured in the two images and the length Lp of the object to be measured or the at least one portion of the object to be measured in the images are obtained, and then the actual length L of the object to be measured or the at least one portion of the object to be measured is obtained by the following formula:

$$L = Lp \times \frac{S}{Dp}.$$

13. A photogrammetry method, comprising the following steps:

(a) in a direction substantially vertical to a direction of movement of an object to be measured with respect to photographing devices, photographing, by the photographing devices, the object to be measured for at least two times at a predetermined time interval to obtain at least two images, respectively; and

(b) according to a length of the object to be measured or at least one portion of the object to be measured in the images obtained by the photographing devices, a transverse movement distance of the object to be measured or the least one portion of the object to be measured in the two images and a speed of the object to be measured, calculating an actual length of the object to be measured or the at least one portion of the object to be measured;

in the photogrammetry method, a first photographing device and a second photographing device successively arranged at a predetermined distance in a direction parallel to the direction of movement of the object to be measured are used; and

in step (a), the first photographing device photographs the object to be measured, and the second photographing device shoots a video of the object to be measured; in step (b), frames of the video obtained by the second photographing device are retrieved to obtain a frame most approximate to the picture obtained by the first photographing device, and a difference between the time of taking the picture and the time of taking the frame image is calculated so as to obtain a movement speed of the object to be measured;

in step (b), two frames are extracted from the video obtained by the second photographing device, a time interval t between the two frames is calculated, the transverse movement distance Dp of the object to be measured in the two frames and the length Lp of the object to be measured or at least one portion of the object to be measured in the frame image are measured, and the actual length L of the object to be

measured or the at least one portion of the object to be measured is obtained by the following formula in combination with the obtained movement speed V of the object to be measured:

$$L = Lp \times \frac{Vt}{Dp}.$$

14. A photogrammetry system, comprising:

photographing devices in a direction substantially vertical to a direction of movement of an object to be measured with respect to the photographing devices, the photographing devices being able to photograph the object to be measured for at least two times at a predetermined time interval to obtain at least two images, respectively; and

a data processing device, which calculates, according to a length of the object to be measured or at least one portion of the object to be measured in the images obtained by the photographing devices, a transverse movement distance of the object to be measured or the at least one portion of the object to be measured in the two images and an actual length of the object to be measured or the at least one portion of the object to be measured, a speed of the object to be measured.

15. The photogrammetry system according to claim 14, characterized in that:

in the case where the actual length of the object to be measured or the at least one portion of the object to be measured is L, the length of the object to be measured or the at least one portion of the object to be measured in the images obtained by the photographing devices is Lp, the transverse movement distance of the object to be measured or the at least one portion of the object to be measured in the two images is Dp and the time interval of the two times of photographing is t,

the data processing device calculates the movement speed V of the object to be measured according to the following formula:

V＝(L×Dp)/(Lp×t).