CLAIMS

1. An aerial vehicle comprising:

a frame;

a camera assembly attached to the frame, the camera assembly comprising a cascaded bi-directional linear actuator and a camera attached to the cascaded bi directional linear actuator such that the camera is configured to be moved to different positions by the cascaded bi-directional linear actuator to capture a plurality of images of an object;

a processor in electrical connection to the camera such that the processor is configured to determine one or more dimensions of the object based on the plurality of images;

a flight system configured to move the aerial vehicle; and

an energy system in electrical connection to the camera assembly, the processor, and the flight system;

wherein the processor is configured to determine a depth between the camera and a reference region of the object; and

wherein the processor is further configured to determine a distance between adjacent positions of the camera to capture successive images of the plurality of images based on the depth between the camera and a reference region of the object, and a desired overlap percentage between the successive images.

2. The aerial vehicle according to claim 1,

wherein the processor is configured to stitch the plurality of images to form a stitched image.

3. The aerial vehicle according to claim 2,

wherein the processor is configured to determine one or more targeted regions in the stitched image using an image semantic segmentation neural network.

4. The aerial vehicle according to claim 3,

wherein the processor is configured to determine a depth between the camera and each targeted region of the one or more targeted regions based on images of the plurality of images capturing the one or more targeted regions.

5. The aerial vehicle according to claim 4,

wherein the processor is configured to determine one or more dimensions of the object in the stitched image;

wherein the processor is configured to determine one or more dimensions of the reference region in the stitched image; and

wherein the one or more dimensions of the object are determined based on the depth between the camera and each targeted region of the one or more targeted regions, the one or more dimensions of the object in the stitched image; the one or more dimensions of the reference region in the stitched image, one or more dimensions of the reference region in the object; and the depth between the camera and the reference region.

6. The aerial vehicle according to any one of claims 1 to 5,

wherein the flight system comprises a propulsion system configured to propel the aerial vehicle, and a flight controller configured to control the propulsion system to move in a desired direction.

7. The aerial vehicle according to any one of claims 1 to 6, further comprising:

an illumination system configured to provide illumination to the object.

8. The aerial vehicle according to any one of claims 1 to 7,

wherein the energy system comprises a power system configured to be electrically coupled to a power tethering unit.

9. The aerial vehicle according to any one of claims 1 to 8,

wherein the cascaded bi-directional linear actuator comprises a motor; and wherein the cascaded bi-directional linear actuator further comprises a rack-and- pinion system configured to move the camera linearly based on a rotational motion of the motor.

10. A method of forming an aerial vehicle, the method comprising:

attaching a camera assembly to a frame, the camera assembly comprising a cascaded bi-directional linear actuator and a camera attached to the cascaded bi directional linear actuator such that the camera is configured to be moved to different positions by the cascaded bi-directional linear actuator to capture a plurality of images of an object;

electrically connecting a processor to the camera such that the processor is configured to determine one or more dimensions of the object based on the plurality of images;

providing a flight system configured to move the aerial vehicle; and

electrically connecting an energy system to the camera assembly, the processor, and the flight system;

wherein the processor is configured to determine a depth between the camera and a reference region of the object; and

wherein the processor is further configured to determine a distance between adjacent positions of the camera to capture successive images of the plurality of images based on the depth between the camera and a reference region of the object, and a desired overlap percentage between the successive images.

11. The method according to claim 10,

wherein the processor is configured to stitch the plurality of images to form a stitched image.

12. The method according to claim 11,

wherein the processor is configured to determine one or more targeted regions in the stitched image using an image semantic segmentation neural network.

13. The method according to claim 12,

wherein the processor is configured to determine a depth between the camera and each targeted region of the one or more targeted regions based on images of the plurality of images capturing the one or more targeted regions.

14. The method according to claim 13,

wherein the processor is configured to determine one or more dimensions of the object in the stitched image;

wherein the processor is configured to determine one or more dimensions of the reference region in the stitched image; and

wherein the one or more dimensions of the object are determined based on the depth between the camera and each targeted region of the one or more targeted regions, the one or more dimensions of the object in the stitched image; the one or more dimensions of the reference region in the stitched image, one or more dimensions of the reference region in the object; and the depth between the camera and the reference region.

15. The method according to any one of claims 10 to 14,

wherein the flight system comprises a propulsion system configured to propel the aerial vehicle, and a flight controller configured to control the propulsion system to move in a desired direction.

16. The method according to any one of claims 10 to 15, further comprising:

providing an illumination system to provide illumination to the object.

17. The method according to any one of claims 10 to 16,

wherein the energy system comprises a power system configured to be electrically coupled to a power tethering unit.

18. The method according to any one of claims 10 to 17,

wherein the cascaded bi-directional linear actuator comprises a motor; and wherein the cascaded bi-directional linear actuator further comprises a rack-and- pinion system configured to move the camera linearly based on a rotational motion of the motor.

19. A method of determining one or more dimensions of an object, the method comprising:

moving an aerial vehicle towards the object using the using a flight system of the aerial vehicle, the aerial vehicle also comprising:

a frame;

a camera assembly attached to the frame, the camera assembly comprising a cascaded bi-directional linear actuator and a camera attached to the cascaded bi-directional linear actuator;

a processor in electrical connection to the camera; and an energy system in electrical connection to the camera assembly, the processor, and the flight system; and

moving the camera to different positions using the cascaded bi-directional linear actuator to capture a plurality of images of the object; and

determining one or more dimensions of the object based on the plurality of images using the processor;

wherein the processor is configured to determine a depth between the camera and a reference region of the object; and

wherein the processor is further configured to determine a distance between adjacent positions of the camera to capture successive images of the plurality of images based on the depth between the camera and a reference region of the object, and a desired overlap percentage between the successive images.

20. The method according to claim 19,

wherein the object is a rail viaduct bearing.

21. The method according to claim 20,

wherein the rail viaduct bearing is within a cavity formed by a rail viaduct and a structural pier.