CLAIMS

1. An apparatus to gather images and depth information for use in an environment, the apparatus comprising:

a first motor;

an image capture device configured to capture, while pointed in a first direction within the environment, a first plurality of images at different exposures within a field of view of the image capture device, the image capture device comprising a lens coupled to a frame of the apparatus at a first position, the first position being between a front side and a backside of the frame of the apparatus; and

a depth information capture device;

the first motor configured to rotate the depth information capture device and the image capture device about a first axis until the image capture device is pointed in a second direction, the depth information capture device configured to capture first depth information of a first portion of the environment while being rotated,

the image capture device further configured to capture, while pointed in the second direction within the environment, a second plurality of images at different exposures that at least partially overlaps one or more of the first plurality of images,

the first motor further configured to rotate the depth information capture device and the image capture device about the first axis until the image capture device is pointed in a third direction, the depth information capture device further configured to capture second depth information of a second portion of the environment while being rotated, and

the image capture device further configured to capture, while pointing at the third direction a third plurality of images at different exposures that at least partially overlaps one or more of the second plurality of images.

2. The apparatus of claim 1, wherein the depth information capture device and the image capture device are configured to be rotated by the first motor about the first axis until the image capture device is pointed in a fourth direction, and the image capture device, while pointed in the fourth direction, is configured to capture a fourth plurality of images at different exposures in a fourth direction, the fourth plurality of images at different exposures captured in the fourth direction overlapping at least partially one or more of the first and the third plurality of images.

3. The apparatus of claim 2, wherein the depth information capture device, while being rotated by the first motor about the first axis until the image capture device is pointed in the fourth direction, is configured to capture third depth information for a third portion of the environment.

4. The apparatus of claim 3, wherein the depth information capture device while being rotated, to capture depth information for the first, second, and third portions of the environment comprises the depth information capture device while being rotated, to capture depth information for a first, second, and third plurality of segments of the environment.

5. The apparatus of claim 1, further comprising:

a communication module configured to provide the one or more of the plurality of images in the first portion and the second portion, as well as a third portion of the environment into a panoramic image of the environment to a digital device, the digital device being configured to stitch together one or more of the plurality of images in the first, second, and third plurality of image into a panoramic image of the environment, and combine the depth information for the first, second, and third portions of the environment with the panoramic image of the environment to create a 3D panoramic image of the environment.

6. The apparatus of claim 5, further comprising:

the digital device further being configured to blend two or more of the first, second, and third plurality of images to generate first, second, and third blended images,

wherein the digital device configured stitch together one or more of the first, second, and third plurality of images into the panoramic image of the environment comprises stitching together the first, second, and third blended images into the panoramic image of the environment.

7. The apparatus of claim 1, the apparatus further comprising:

a second motor,

wherein the depth information capture device comprises a Light Detection and Ranging (LiDAR) device and a mirror, the second motor configured to rotate the mirror about a second axis while the LiDAR device emits a plurality of laser pulses to the mirror, the

mirror being configured to provide the plurality of laser pulses in one or more revolutions about the second axis and receive a corresponding plurality of reflected laser pulses, and the LiDAR device being further configured to receive the plurality of reflected laser pulses and generate the depth information therefrom.

8. The apparatus of claim 6, the apparatus further comprising:

a second motor,

wherein the depth information capture device comprises a Light Detection and Ranging (LiDAR) device and a mirror, the second motor configured to rotate the mirror about a second axis while the LiDAR device emits a plurality of laser pulses to the mirror, the mirror being configured to provide the plurality of laser pulses in one or more revolutions about the second axis and receive a corresponding plurality of reflected laser pulses, and the LiDAR device being further configured to receive the plurality of reflected laser pulses and generate the depth information therefrom,

wherein the first, second, and third blended images each comprise a plurality of pixels, wherein each of the plurality of pixels is associated with numerical coordinates that identify a location of the pixel of the environment, and wherein each of the reflected laser pulses is likewise associated with corresponding numerical coordinates that identify a location of the depth information generated therefrom, and

the digital device further configured to combine the depth information of the environment with the panoramic image of the environment to create the 3D panoramic image of the environment using the numerical coordinates of at least a set of the plurality of pixels and the numerical coordinates of at least a set of the depth information.

9. The apparatus of claim 1, wherein the lens is situated substantially at a no–parallax point at or near a center of the first axis such that as the first motor rotates the image capture device about the first axis to capture images while the image capture device is pointed in the first, second, and third directions, a parallax effect between the first, second, and third plurality of images is reduced or eliminated.

10. The apparatus of claim 1, the apparatus further comprising:

a second motor,

wherein the depth information capture device comprises a Light Detection and Ranging (LiDAR) device and a mirror, the second motor configured to rotate the mirror

about a second axis while the LiDAR device emits a plurality of laser pulses to the mirror, the mirror being configured to provide the plurality of laser pulses in one or more revolutions about the second axis and receive a corresponding plurality of reflected laser pulses, and the LiDAR device being further configured to receive the plurality of reflected laser pulses and generate the depth information therefrom, the apparatus being further configured such that as the image capture device and the LiDAR device are rotated by the first motor about the first axis and the mirror is rotated by the second motor about the second axis, the LiDAR device captures the depth information in three dimensions of the environment.

11. A method for an apparatus to gather images and depth information in an environment, wherein the apparatus comprises a first motor, an image capture device, and a depth information capture device, the method comprising:

capturing, by the image capture device while pointed in a first direction, a first plurality of images at different exposures of the environment, the image capture device comprises a lens coupled to a frame of the apparatus at a first position, the first position being between a front side and a backside of the frame of the apparatus;

rotating, by the first motor, the depth information capture device and the image capture device about a first axis until the image capture device is pointed in a second direction, and capturing, by the depth information capture device while being rotated, first depth information of a first portion of the environment;

capturing, by the image capture device while pointed in the second direction, a second plurality of images that partially overlaps one or more of the first plurality of images;

rotating, by the first motor, the depth information capture device and the image capture device about the first axis until the image capture device is pointed in a third direction, and capturing, by the depth information capture device while being rotated, second depth information for a second portion of the environment; and

capturing, by the image capture device while pointed in the third direction, a third plurality of images at different exposures that partially overlaps one or more of the second plurality of images.

12. The method of claim 11, further comprising:

rotating, by the first motor, the depth information capture device and the image capture device about the first axis until the image capture device is pointed in a fourth direction; and

capturing, by the image capture device while pointed in the fourth direction, a fourth plurality of images at different exposures that partially overlaps one or more of the first and the third plurality of images.

13. The method of claim 12, further comprising, while rotating, by the first motor, the depth information capture device and the image capture device about the first axis until the image capture device is pointed in the fourth direction, capturing, by the depth information capture device, third depth information for a third portion of the environment.

14. The method of claim 13, wherein capturing, by the depth information capture device, depth information for the first, second, and third portions of the environment comprises capturing, by the depth information capture device, depth information for a first, second, and third plurality of segments of the environment.

15. The method of claim 11, further comprising:

providing the first, second, and third plurality of images to a digital device;

stitching together, by the digital device, one or more of the plurality of images in the first, second, and third plurality of image into a panoramic image of the environment; and

combining, by the digital device, the first, second, and third depth information for the first portion and the second portion, as well as a third portion of the environment with the panoramic image of the environment to create a 3D panoramic image of the environment.

16. The method of claim 15, further comprising blending, by the digital device, two or more of the plurality of images of the first, second, and third plurality of images to generate first, second, and third blended images, wherein stitching together, by the digital device, the one or more of the plurality of images in the first, second, and third plurality of image into the panoramic image of the environment comprises stitching together the first, second and third blended images into the panoramic image of the environment.

17. The method of claim 11, wherein the image capture device further comprises a second motor and the depth information capture device comprises a Light Detection and Ranging (LiDAR) device and a mirror, and the method further comprising:

rotating, by the second motor, the mirror about a second axis;

emitting, by the LiDAR device, a plurality of laser pulses to the mirror;

providing, by the mirror, the plurality of laser pulses in one or more revolutions about the second axis and receiving a corresponding plurality of reflected laser pulses; and

receiving, by the LiDAR device, the plurality of reflected laser pulses and generating the depth information therefrom.

18. The method of claim 16, wherein the image capture device further comprises a second motor and the depth information capture device comprises a Light Detection and Ranging (LiDAR) device and a mirror, and the method further comprising:

rotating, by the second motor, the mirror about a second axis;

emitting, by the LiDAR device, a plurality of laser pulses to the mirror;

providing, by the mirror, the plurality of laser pulses in one or more revolutions about the second axis and receiving a corresponding plurality of reflected laser pulses; and

receiving, by the LiDAR device, the plurality of reflected laser pulses and generating the depth information therefrom;

wherein the first, second, and third blended images each comprise a plurality of pixels, wherein each of the plurality of pixels is associated with numerical coordinates that identify a location of the pixel of the environment, and

wherein each of the reflected laser pulses is likewise associated with corresponding numerical coordinates that identify a location of the depth information generated therefrom, and combining, by the digital device, the depth information for the environment with the panoramic image of the environment to create the 3D panoramic image of the environment comprises combining the depth information of a location in the environment with the panoramic image of the location in the environment to create the 3D panoramic image of the environment using the numerical coordinates of at least a set of the plurality of pixels and the numerical coordinates of at least a set of the depth information.

19. The method of claim 11, wherein the lens is situated substantially at a no–parallax point at or near a center of the first axis such that as the first motor rotates the image capture device about the first axis to capture while the image capture device is pointed in the first, second, and third directions, a parallax effect between the first, second, and third plurality of images is reduced or eliminated.

20. The method of claim 11, wherein the image capture device further comprises a second motor and the depth information capture device comprises a Light Detection and Ranging

(LiDAR) device and a mirror, and the method further comprising:

rotating, by the second motor, the mirror about a second axis;

emitting, by the LiDAR device, a plurality of laser pulses to the mirror;

providing, by the mirror, the plurality of laser pulses in one or more revolutions about the second axis and receiving a corresponding plurality of reflected laser pulses; and

receiving, by the LiDAR device, the plurality of reflected laser pulses and generating the depth information therefrom, so that as the image capture device and the LiDAR device are rotated by the first motor about the first axis and the mirror is rotated by the second motor about the second axis, the LiDAR device captures the depth information in three dimensions of the environment.