CLAIMS

1. A method comprising:

operating, by a computing system, a Light Detection and Ranging (LIDAR) device to emit light pulses at emission times in accordance with an emission time sequence, wherein the emission time sequence includes a time-varying dither, and to detect return light pulses in accordance with a detection time sequence, wherein the detection time sequence includes, for each emitted light pulse, a corresponding detection period for detection of a corresponding return light pulse, and wherein a detection time of a return light pulse relative to a corresponding emission time of a corresponding emitted light pulse is indicative of a range to an object that reflected the corresponding emitted light pulse;

making a determination, by the computing system, that the LIDAR device detected return light pulses during corresponding detection periods for each of two or more emitted light pulses;

in response to making the determination, determining, by the computing system, that (i) the detected return light pulses have detection times relative to corresponding emission times of a plurality of first emitted light pulses that are indicative of a first set of ranges and (ii) the detected return light pulses have detection times relative to corresponding emission times of a plurality of second emitted light pulses that are indicative of a second set of ranges;

selecting, by the computing system, between using the first set of ranges as a basis for object detection and using the second set of ranges as a basis for object detection; and

engaging, by the computing system, in object detection in accordance with the selecting.

2. The method of claim 1, wherein making a determination that the LIDAR device detected return light pulses during corresponding detection periods for each of two or more emitted light pulses comprises making a determination that the LIDAR device detected return light pulses during corresponding detection periods for each of the plurality of first emitted light pulses.

3. The method of claim 2,

wherein the LIDAR device has a nominal unambiguous detection range,

wherein ranges of the first set are within the nominal unambiguous detection range of the LIDAR device, and

wherein ranges of the second set are outside the nominal unambiguous detection range of the LIDAR device.

4. The method of claim 2, wherein ranges of the second set are greater than ranges of the first set.

5. The method of claim 1, further comprising:

determining, by the computing system, that the second set of ranges is representative of at least one known object,

wherein the selecting comprises, in response to determining that the second set of ranges is representative of at least one known object, selecting use of the second set of ranges as a basis for object detection.

6. The method of claim 1, further comprising:

determining, by the computing system, that the second set of ranges is not representative of at least one known object,

wherein the selecting comprises, in response to determining that the second set of ranges is not representative of at least one known object, selecting use of the first set of ranges as a basis for object detection.

7. The method of claim 1, further comprising:

determining, by the computing system, that ranges of the second set are substantially similar to one another,

wherein the selecting comprises, in response to determining that ranges of the second set are substantially similar to one another, selecting use of the second set of ranges as a basis for object detection.

8. The method of claim 1, further comprising:

determining, by the computing system, that ranges of the second set are not substantially similar to one another,

wherein the selecting comprises, in response to determining that ranges of the second set are not substantially similar to one another, selecting use of the first set of ranges as a basis for object detection.

9. The method of claim 1, wherein the LIDAR device is positioned on a vehicle, and wherein engaging in object detection in accordance with the selecting comprises, in accordance with the selecting, engaging in detection of objects positioned in an environment around the vehicle.

10. The method of claim 1, wherein the LIDAR device is positioned on a vehicle, and wherein the computing system is configured to operate the vehicle based at least on scans by the LIDAR device of an environment around the vehicle.

11. A computing system comprising:

one or more processors;

a non-transitory computer readable medium; and

program instructions stored on the non-transitory computer readable medium and executable by the one or more processors to:

operate a Light Detection and Ranging (LIDAR) device to emit light pulses at emission times in accordance with an emission time sequence, wherein the emission time sequence includes a time-varying dither, and to detect return light pulses in accordance with a detection time sequence, wherein the detection time sequence includes, for each emitted light pulse, a corresponding detection period for detection of a corresponding return light pulse, and wherein a detection time of a return light pulse relative to a corresponding emission time of a corresponding emitted light pulse is indicative of a range to an object that reflected the corresponding emitted light pulse;

make a determination that the LIDAR device detected return light pulses during corresponding detection periods for each of two or more emitted light pulses;

in response to making the determination, determine that (i) the detected return light pulses have detection times relative to corresponding emission times of a plurality of first emitted light pulses that are indicative of a first set of ranges and (ii) the detected return light pulses have detection times relative to corresponding emission times of a plurality of second emitted light pulses that are indicative of a second set of ranges;

select between using the first set of ranges as a basis for object detection and using the second set of ranges as a basis for object detection; and

engage in object detection in accordance with the selecting.

12. The computing system of claim 11, wherein the program instruction are further executable to:

determine that the second set of ranges is representative of at least one known object,

wherein the selecting comprises, in response to determining that the second set of ranges is representative of at least one known object, selecting use of the second set of ranges as a basis for object detection.

13. The computing system of claim 11, wherein the program instruction are further executable to:

determine that ranges of the second set are substantially similar to one another,

wherein the selecting comprises, in response to determining that ranges of the second set are substantially similar to one another, selecting use of the second set of ranges as a basis for object detection.

14. The computing system of claim 11, wherein the LIDAR device is positioned on a vehicle, wherein engaging in object detection in accordance with the further determination comprises, in accordance with the selecting, engaging in detection of objects positioned in an environment around the vehicle, and wherein the program instruction are further executable to operate the vehicle based at least on the detection of objects positioned in the environment around the vehicle.

15. A method comprising:

operating, by a computing system, a Light Detection and Ranging (LIDAR) device to emit light pulses at emission times in accordance with an emission time sequence, wherein the emission time sequence includes a time-varying dither, and to detect return light pulses in accordance with a detection time sequence, wherein the detection time sequence includes, for each emitted light pulse, a corresponding detection period for detection of a corresponding return light pulse, and wherein a detection time of a return light pulse relative to a corresponding emission time of a corresponding emitted light pulse is indicative of a range to an object that reflected the corresponding emitted light pulse;

determining, by the computing system, that the LIDAR device detected a set of multiple return light pulses during corresponding detection periods for each of a plurality of first emitted light pulses, wherein each set of multiple return light pulses includes at least a respective first return light pulse and a respective second return light pulse;

making a determination, by the computing system, that the first return light pulses correspond to the plurality of first emitted light pulses and that the second return light pulses potentially correspond to a plurality of second emitted light pulses;

in response to making the determination, determining, by the computing system, that the second return light pulses have detection times relative to corresponding emission times of the plurality of second emitted light pulses that are indicative of a particular set of ranges;

making a further determination, by the computing system, of whether or not to use the particular set of ranges as a basis for object detection; and

engaging, by the computing system, in object detection in accordance with the further determination.

16. The method of claim 15, wherein making the further determination comprises:

determining whether or not the particular set of ranges is representative of at least one known object;

if the computing system determines that the particular set of ranges is representative of at least one known object, then responsively determining that the particular set of ranges is to be used as a basis for object detection; and

if the computing system determines that the particular set is not representative of at least one known object, then responsively determining that the particular set of ranges is not to be used as a basis for object detection.

17. A method comprising:

operating, by a computing system, a Light Detection and Ranging (LIDAR) device to emit light pulses at emission times in accordance with an emission time sequence, wherein the emission time sequence includes a time-varying dither, and to detect return light pulses in accordance with a detection time sequence, wherein the detection time sequence includes, for each emitted light pulse, a corresponding detection period for detection of a corresponding return light pulse, and wherein a detection time of a return light pulse relative to a corresponding emission time of a corresponding emitted light pulse is indicative of a range to an object that reflected the corresponding emitted light pulse;

determining, by the computing system, that the LIDAR device detected a set of multiple return light pulses during corresponding detection periods for each of a plurality of first emitted light pulses, wherein each set of multiple return light pulses includes at least a respective first return light pulse and a respective second return light pulse;

determining, by the computing system, that (i) the first return light pulses have detection times relative to corresponding emission times of the plurality of first emitted light pulses that are indicative of a first set of ranges, (ii) the second return light pulses have detection times relative to corresponding emission times of the plurality of first emitted light pulses that are indicative of a second set of ranges, and (iii) the second return light pulses have detection times relative to corresponding emission times of a plurality of second emitted light pulses that are indicative of a third set of ranges;

based on the third set of ranges, selecting, by the computing system, between using the first set of ranges as a basis for object detection and using the second set of ranges as a basis for object detection; and

engaging, by the computing system, in object detection in accordance with the selecting.

18. The method of claim 17, wherein selecting based on the third set of ranges comprises:

making a determination of whether or not the third set of ranges is representative of at least one known object;

if the determination is that the third set of ranges is representative of at least one known object, then, responsive to making the determination, selecting use of the first set of ranges as a basis for object detection; and

if the determination is that the third set of ranges is not representative of at least one known object, then, responsive to making the determination, selecting use of the second set of ranges as a basis for object detection.

19. A method for operating an autonomous vehicle, comprising:

receiving a signal associated with a reflection, by an object, of a light pulse emitted by a LIDAR device of the autonomous vehicle, wherein the reflection is detected by the LIDAR device at a detection time;

calculating a first distance to the object based on the detection time and a first time, the first time corresponding to a prior light pulse emitted by the LIDAR device of the autonomous vehicle;

calculating a second distance to the object based on the detection time and a second time, the second time corresponding to a different prior light pulse emitted by the LIDAR device of the autonomous vehicle; and

operating the autonomous vehicle based on a selection between the first distance and second distance.

20. The method of claim 19, wherein the selection between the first distance and second distance is based on a plurality of received signals associated with respective reflections, by the object, of a plurality of light pulses emitted by the LIDAR device and wherein one or more of the plurality of light pulses are emitted according to a timing that deviates from a periodicity by a pseudo-random duration.