CLAIMS

1. A method of actively looking for an assigned passenger prior to a vehicle reaching a pickup location, the method comprising:

receiving, by one or more processors, information identifying the pickup location and client device information for authenticating the assigned passenger;

receiving, by the one or more processors, sensor data from a perception system of the vehicle identifying objects in an environment of the vehicle;

when the vehicle is within a predetermined distance of the pickup location, attempting, by the one or more processors, to authenticate a client device using the client device information;

when the client device has been authenticated, using, by the one or more processors, the sensor data to determine whether a pedestrian is within a first ring around the vehicle corresponding to a first threshold distance of the vehicle;

when a pedestrian is determined to be within the first threshold distance of the vehicle, stopping, by the one or more processors, the vehicle prior to reaching the pickup location to wait for the pedestrian within the first threshold distance of the vehicle to enter the vehicle;

identifying a second ring around the vehicle corresponding to a second threshold distance, by shrinking the first ring to a size of the second ring after a predetermined period of time;

using the sensor data to determine whether a pedestrian is within the second threshold distance of the vehicle;

when a pedestrian is determined to be within the second threshold distance of the vehicle and while stopped, continuing to wait for the pedestrian within the first threshold distance of the vehicle to enter the vehicle; and

after the pedestrian enters the vehicle, maneuvering, by the one or more processors, the vehicle to a destination with the pedestrian as an occupant of the vehicle.

2. The method of claim 1, further comprising when a pedestrian is determined not to be within the second threshold distance of the vehicle, moving the vehicle towards the pickup location without a passenger.

3. A method of actively looking for an assigned passenger prior to a vehicle reaching a pickup location, the method comprising:

receiving, by one or more processors, information identifying the pickup location and client device information for authenticating the assigned passenger;

receiving, by the one or more processors, sensor data from a perception system of the vehicle identifying objects in an environment of the vehicle;

when the vehicle is within a predetermined distance of the pickup location, attempting, by the one or more processors, to authenticate a client device using the client device information;

when the client device has been authenticated, using, by the one or more processors, the sensor data to determine whether a pedestrian is within a first threshold distance of the vehicle;

when a pedestrian is determined to be within the first threshold distance of the vehicle, stopping, by the one or more processors, the vehicle prior to reaching the pickup location to wait for the pedestrian within the first threshold distance of the vehicle to enter the vehicle;

reducing a size of the first threshold distance to one or more smaller threshold distances;

determining that there is no pedestrian within the one or more smaller threshold distances;

after reducing the size of the first threshold distance to one or more smaller threshold distances and determining that there is no pedestrian within the one or more smaller threshold distance, using the sensor data to determine whether the pedestrian or a different pedestrian is within the first threshold distance of the vehicle;

after using the sensor data to determine whether the pedestrian or a different pedestrian is within the first threshold distance of the vehicle, when the pedestrian or a different pedestrian is determined to be within the first threshold distance, stopping the vehicle again to wait for the pedestrian or a different pedestrian within the first threshold distance of the vehicle to enter the vehicle; and

after the pedestrian enters the vehicle, maneuvering, by the one or more processors, the vehicle to a destination with the pedestrian as an occupant of the vehicle.

4. The method of claim 3, wherein using the sensor data to determine the pedestrian or a different pedestrian is within the first threshold distance of the vehicle is performed only after the vehicle has traveled a minimum distance since initially using the sensor data to determine whether a pedestrian is within a first threshold distance of the vehicle.

5. The method of claim 1 or 3, wherein using the sensor data to determine whether a pedestrian is within a first threshold distance of the vehicle is performed only when the vehicle is traveling below a predetermined maximum speed limit.

6. The method of claim 1 or 3, wherein using the sensor data to determine whether a pedestrian is within a first threshold distance of the vehicle is performed only when the vehicle is in a particular lane of a roadway.

7. The method of claim 1 or 3, wherein using the sensor data to determine whether a pedestrian is within a first threshold distance of the vehicle is performed only when the vehicle is traveling on a

roadway that meets a particular maximum speed limit.

8. The method of claim 1 or 3, further comprising, prior to stopping the vehicle, determining that it is not currently safe to stop the vehicle, and continuing towards the pickup location.

9. The method of claim 8, further comprising providing a notification at the vehicle that an early boarding attempt is not possible.

10. The method of claim 1 or 3, wherein stopping the vehicle includes stopping the vehicle in a current lane of the vehicle.

11. A system for actively looking for an assigned passenger prior to a vehicle reaching a pickup location, the system comprising one or more processors configured to:

receive information identifying a pickup location and client device information for authenticating the assigned passenger;

receive sensor data from a perception system of the vehicle identifying objects in an environment of the vehicle;

when the vehicle is within a predetermined distance of the pickup location, attempt to authenticate a client device using the client device information;

when the client device has been authenticated, use the sensor data to determine whether a pedestrian is within a first ring around the vehicle corresponding to a first threshold distance of the vehicle;

when a pedestrian is determined to be within the first threshold distance of the vehicle, stop the vehicle prior to reaching the pickup location to wait for the pedestrian within the first threshold distance of the vehicle to enter the vehicle;

identify a second ring around the vehicle corresponding to a second threshold distance, by shrinking the first ring to a size of the second ring after a predetermined period of time;

use the sensor data to determine whether a pedestrian is within the second threshold distance of the vehicle;

when a pedestrian is determined to be within the second threshold distance of the vehicle and while stopped, continue to wait for the pedestrian within the first threshold distance of the vehicle to enter the vehicle; and

after the pedestrian enters the vehicle, maneuver the vehicle to a destination with the pedestrian as an occupant of the vehicle.

12. The system of claim 11, wherein the one or more processors are further configured to, when a pedestrian is determined not to be within the second threshold distance of the vehicle, move the vehicle towards the pickup location without a passenger.

13.A system for actively looking for an assigned passenger prior to a vehicle reaching a pickup location, the system comprising one or more processors configured to:

receive information identifying a pickup location and client device information for authenticating the assigned passenger;

receive sensor data from a perception system of the vehicle identifying objects in an environment of the vehicle;

when the vehicle is within a predetermined distance of the pickup location, attempt to authenticate a client device using the client device information;

when the client device has been authenticated, use the sensor data to determine whether a pedestrian is within a first threshold distance of the vehicle;

when a pedestrian is determined to be within the first threshold distance of the vehicle, stop the vehicle prior to reaching the pickup location to wait for the pedestrian within the first threshold distance of the vehicle to enter the vehicle;

reduce a size of the first threshold distance to one or more smaller threshold distances;

determine that there is no pedestrian within the one or more smaller threshold distances;

after reducing the size of the first threshold distance to one or more smaller threshold distances and determining that there is no pedestrian within the one or more smaller threshold distance, use the sensor data to determine whether the pedestrian or a different pedestrian is within the first threshold distance of the vehicle;

after using the sensor data to determine whether the pedestrian or a different pedestrian is within the first threshold distance of the vehicle, when the pedestrian or a different pedestrian is determined to be within the first threshold distance, stop the vehicle again to wait for the pedestrian or a different pedestrian within the first threshold distance of the vehicle to enter the vehicle; and

after the pedestrian enters the vehicle, maneuver the vehicle to a destination with the pedestrian as an occupant of the vehicle.

14. The system of claim 13, wherein the one or more processors are further configured to use the sensor data to determine the pedestrian or a different pedestrian is within the first threshold distance of the vehicle only after the vehicle has traveled a minimum distance since initially using the sensor data to determine whether a pedestrian is within a first threshold distance of the vehicle.

15. The system of claim 11 or 13, wherein the one or more processors are further configured to use the sensor data to determine whether a pedestrian is within a first threshold distance of the vehicle only when the vehicle is traveling within a predetermined maximum speed limit.

16. The system of claim 11 or 13, wherein the one or more processors are further configured to use the sensor data to determine whether a pedestrian is within a first threshold distance of the vehicle only when the vehicle is in a particular lane of a roadway.

17. The system of claim 11 or 13, wherein the one or more processors are further configured to use the sensor data to determine whether a pedestrian is within a first threshold distance of the vehicle only when the vehicle is traveling on a roadway that meets a particular maximum speed limit.

18. The system of claim 11 or 13, further comprising the vehicle.