

CLAIMS

1. A method of controlling a first vehicle, the method comprising:
while maneuvering the first vehicle in an autonomous driving mode, identifying, by one or more processors, a second vehicle;
identifying, by the one or more processors, geometry for a future trajectory of the first vehicle;
identifying, by the one or more processors, an initial allowable discomfort value;
attempting, by the one or more processors, to determine a speed profile for the geometry that meets the initial allowable discomfort value by determining a discomfort value for the speed profile based on a set of factors relating to at least discomfort of a passenger of the first vehicle and discomfort of a passenger of the second vehicle;
when a speed profile that meets the initial allowable discomfort value cannot be determined, adjusting, by the one or more processors, the initial allowable discomfort value until a speed profile that meets an adjusted allowable discomfort value is determined; and
using, by the one or more processors, the speed profile that meets the adjusted allowable discomfort value to control the first vehicle in the autonomous driving mode.
2. The method of claim 1, wherein the geometry includes the first vehicle attempting making a right turn in front of or behind the second vehicle.
3. The method of claim 1, wherein the geometry includes the first vehicle merging into a lane of the second vehicle in front of or behind the second vehicle.
4. The method of claim 1, wherein the geometry includes the first vehicle crossing a path in front of or behind of the second vehicle.
5. The method of claim 1, wherein the set of factors includes at least maximum amount of deceleration for the first vehicle.
6. The method of claim 1, wherein the set of factors includes at least a maximum amount of acceleration for the first vehicle.

7. The method of claim 1, wherein the set of factors includes how much the first vehicle is expected to exceed a speed limit for a lane in which the first vehicle is currently traveling.

8. The method of claim 1, wherein the set of factors includes a lateral acceleration of the first vehicle.

9. The method of claim 1, wherein the set of factors includes at least how close the first vehicle will come to the second vehicle.

10. The method of claim 1, wherein the set of factors includes how much the second vehicle is expected to need to decelerate or accelerate.

11. A method of controlling a first vehicle, the method comprising:
while maneuvering the first vehicle in an autonomous driving mode, identifying, by one or more processors, a second vehicle;
determining, by the one or more processors, that the second vehicle is a tailgating vehicle;
identifying, by the one or more processors, an initial allowable discomfort value representing expected discomfort of an occupant of the first vehicle and expected discomfort of an occupant of the second vehicle;
attempting, by the one or more processors, to determine a speed profile for a future trajectory of the first vehicle that meets the initial allowable discomfort value based on a set of factors corresponding to a reaction of the tailgating vehicle;
when a speed profile that meets the initial allowable discomfort value cannot be determined, adjusting, by the one or more processors, the initial allowable discomfort value until a speed profile that meets an adjusted allowable discomfort value is determined; and
using, by the one or more processors, the speed profile that meets the adjusted allowable discomfort value to control the first vehicle in the autonomous driving mode.

12. The method of claim 11, wherein the set of factors includes a maximum allowed deceleration for the second vehicle.

13. The method of claim 12, further comprising, when the initial allowable discomfort value is adjusted, the maximum allowed deceleration for the second vehicle is also adjusted.

14. The method of claim 13, wherein adjusting the maximum allowed deceleration includes increasing a limit on expected deceleration for the second vehicle.

15. The method of claim 11, wherein the set of factors includes a reaction time for the second vehicle.

16. The method of claim 15, further comprising, when the initial allowable discomfort value is adjusted, the reaction time for the second vehicle is also adjusted.

17. The method of claim 11, wherein the set of factors further includes a constraint for stopping the first vehicle at an intersection.

18. The method of claim 11, further comprising:

while maneuvering the first vehicle in an autonomous driving mode, identifying, by one or more processors, a third vehicle; and

determine, by the one or more processors, that the third vehicle is not a tailgating vehicle, and wherein attempting to determine the speed profile for the geometry that meets the initial allowable discomfort value is further based on a second set of factors relating to the third vehicle.

19. The method of claim 18, wherein the set of factors includes a first value for a maximum allowed deceleration for the second vehicle, and the second set of factors includes a second value for the maximum allowed deceleration for the third vehicle, and the second value is different from the first value.

20. The method of claim 18, wherein the set of factors includes a first value for a reaction time for the second vehicle, and the second set of factors includes a second value for the reaction time for the third vehicle, and the second value is different from the first value.