WHAT IS CLAIMED IS:

1. A controller for a vehicle, the controller comprising:

a processor configured to repeatedly perform, at each predetermined control iteration among a plurality of predetermined control iterations along a path of the vehicle from a start location to a target location, operations including

based on a current state of the vehicle, generating a travel plan for a remainder of the path from a current position of the vehicle to the target location, by solving an optimization problem, and

controlling a motoring and braking system of the vehicle to execute the generated travel plan until a next predetermined control iteration among the plurality of predetermined control iterations.

2. The controller of claim 1, wherein

the processor is configured to solve the optimization problem based on

the current state of the vehicle,

at least one control objective, and

at least one constraint.

3. The controller of claim 1, wherein

the optimization problem includes a convex second order cone problem.

4. The controller of claim 2, wherein

the processor is configured to change, in real-time while the vehicle is travelling on the path, one or more of

the at least one control objective, and

the at least one constraint.

5. The controller of claim 2, wherein

the at least one constraint comprises a first brake constraint and a second brake constraint, the second brake constraint corresponding to a harder brake operation than the first brake constraint,

the processor is configured to

solve the optimization problem constrained by the first brake constraint,

in response to a determination that the optimization problem constrained by the first brake constraint is feasible, control the motoring and braking system of the vehicle based on a solution of the optimization problem,

in response to a determination that the optimization problem constrained by the first brake constraint is infeasible, solve the optimization problem constrained by the second brake constraint corresponding to the harder brake operation.

6. The controller of claim 5, wherein

the optimization problem includes a convex second order cone problem, and the processor is configured to determine whether the convex second order cone problem is feasible or not in a single control iteration.

7. The controller of claim 1, further comprising:

a communication circuit configured to perform communication with a further controller of a trailing vehicle that follows the vehicle with the controller on the path from the start location through the plurality of predetermined control iterations to the target location,

wherein the processor is further configured to repeatedly perform, at each predetermined control iteration among the plurality of predetermined control iterations along the path between the start location and the target location,

causing the communication circuit to transmit a driving profile corresponding to the travel plan generated in said predetermined control iteration to the further controller of the trailing vehicle to be used by the further controller as a constraint in generating a further travel plan for the trailing vehicle.

8. The controller of claim 1, further comprising:

a communication circuit configured to perform communication with a further controller of a leading vehicle that the vehicle with the controller follows on the path

from the start location through the plurality of predetermined control iterations to the target location,

wherein the processor is further configured to repeatedly perform, at each predetermined control iteration among the plurality of predetermined control iterations along the path between the start location and the target location,

causing the communication circuit to receive, from the further controller, a further travel plan of the leading vehicle, and

using the received further travel plan of the leading vehicle as a constraint in said generating, the vehicle with the controller, the travel plan for the remainder of the path from the current position of the vehicle with the controller to the target location.

9. The controller of claim 1, wherein

the processor is further configured to repeatedly perform, at each predetermined control iteration among the plurality of predetermined control iterations along the path from the start location through the plurality of predetermined control iterations to the target location,

estimating a parameter of the vehicle, and

using the estimated parameter in said generating the travel plan for the remainder of the path from the current position of the vehicle to the target location for the vehicle.

10. The controller of claim 1, wherein

the processor is further configured to perform said generating the travel plan for the remainder of the path from the current position of the vehicle to the target location by

determining, between the current position and the target location, a predicted position of the vehicle corresponding to a delay of the motoring and braking system,

solving the optimization problem to determine a first part of the travel plan between the predicted position and the target location, and

determining, based on the first part of the travel plan, a second part of the travel plan between the current position and the predicted position.

11. A system for controlling a plurality of predetermined vehicles along a common path from a start location to a target location, the system comprising:

a first controller associated with a leading vehicle among the plurality of vehicles, the first controller configured to

generate a first driving profile, and

control movement of the leading vehicle along the path based on the generated first driving profile; and

a second controller associated with a trailing vehicle among the plurality of vehicles, the second controller configured to

receive the first driving profile generated by the first controller,

generate a second driving profile based on the received first driving profile, and

control movement of the trailing vehicle along the path and following the leading vehicle based on the generated second driving profile,

wherein each of the first and second controllers is configured to repeatedly perform, at each predetermined control iteration among a plurality of predetermined control iterations along the path between the start location and the target location, operations including

based on a current state of the corresponding leading or trailing vehicle, generating a travel plan for the corresponding leading or trailing vehicle on a remainder of the path from a current position of the corresponding leading or trailing vehicle to the target location, and

controlling a motoring and braking system of the corresponding leading or trailing vehicle to execute the generated travel plan until a next predetermined control iteration among the plurality of predetermined control iterations.

12. The system of claim 11, wherein

the first and second controllers further comprise first and second communication circuits, respectively, configured to perform one-way communication with each other to transmit the first driving profile from the first controller to the second controller.

13. The system of claim 11, wherein

the second controller is further configured to perform said generating, for the trailing vehicle, the travel plan for the remainder of the path from the current position of the trailing vehicle to the target location, based on the first driving profile received from the first controller, and

the first and second driving profiles correspond to the travel plans generated by the first and second controllers, respectively, for the leading vehicle and the trailing vehicle, respectively.

14. The system of claim 11, wherein

the second controller is configured to generate the second driving profile by solving an optimization problem using the received first driving profile as a constraint.

15. The system of claim 14, wherein

the first controller is configured to generate the first driving profile by solving a further optimization problem, and

the optimization problem solved by the second controller and the further optimization problem solved by the first controller have at least one common control objective.

16. The system of claim 14, wherein

the first controller is configured to generate the first driving profile by solving a further optimization problem, and

the optimization problem solved by the second controller and the further optimization problem solved by the first controller have different control objectives.

17. The system of claim 11, further comprising:

a third controller associated with a further trailing vehicle among the plurality of vehicles, the further trailing vehicle following the trailing vehicle,

wherein the third controller is configured to

receive the second driving profile generated by the second controller,

generate a third driving profile based on the received second driving profile, and

control movement of the further trailing vehicle along the path and following the trailing vehicle based on the generated third driving profile.

18. A method of controlling a vehicle, the method comprising:

defining a plurality of predetermined discretization nodes on a path between a start location and a target location; and

repeatedly performing, at each predetermined discretization node among the plurality of predetermined discretization nodes,

convex optimization, based on a current state of the vehicle, to generate a control vector including control elements corresponding to predetermined discretization nodes remaining on the path from a current position of the vehicle to the target location, and

controlling a motoring and braking system of the vehicle to execute a first control element among the control elements of the generated control vector to move the vehicle to a next predetermined discretization node among the predetermined discretization nodes remaining on the path,

wherein said defining comprises distributing the plurality of predetermined discretization nodes

at a predetermined distance from each other, or

at a predetermined time interval from each other, and

wherein the convex optimization comprises a second order cone problem.