Minimizing Long Vehicles Overhang Exceeding the Drivable Surface via Convex Path Optimization

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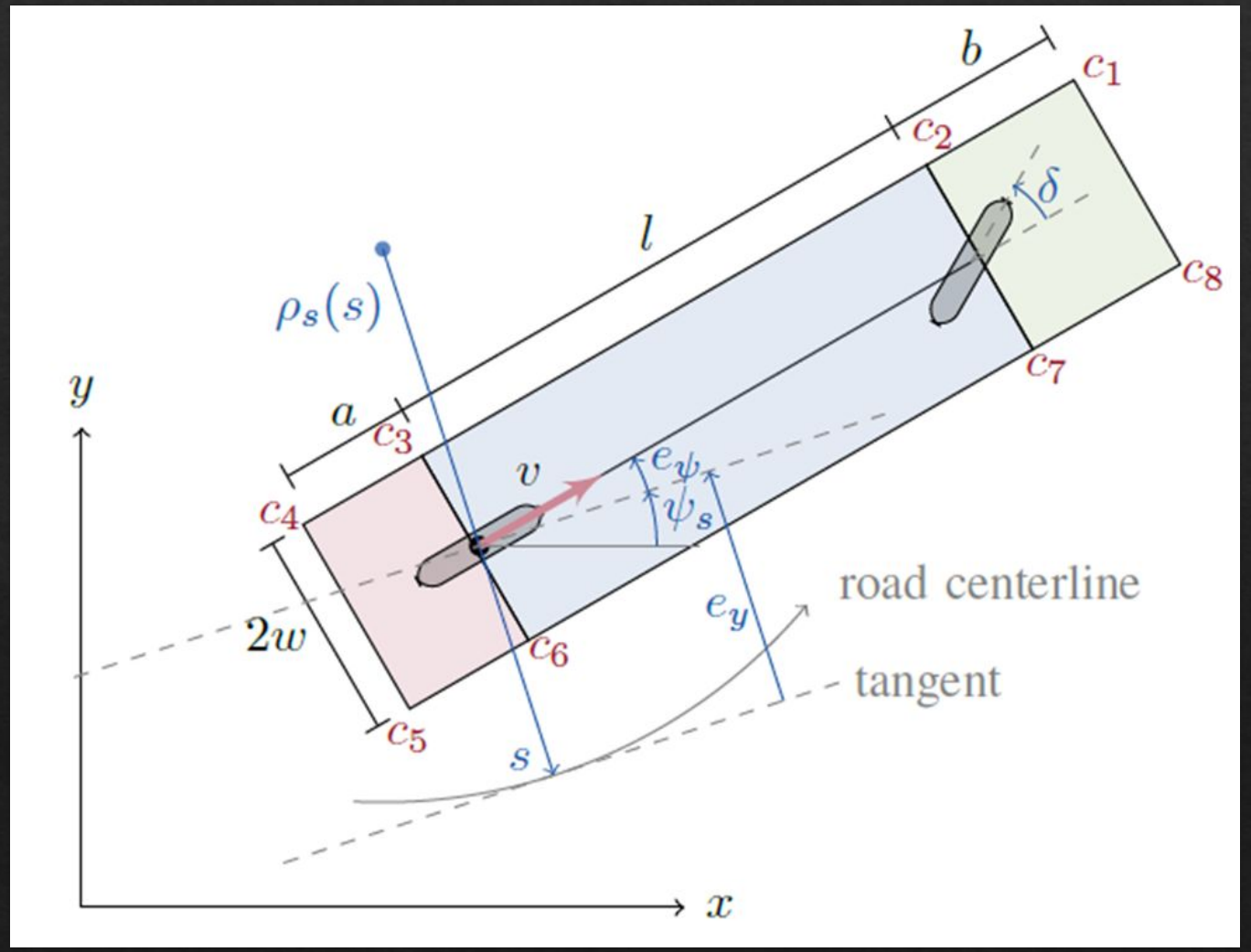
Introduction

- *Only 16% of of EU27 citizens use public transport as their main mode of transport.*
- *High ticket cost to irregular travel times.*
- *Minimizes the vehicle area that exits the lane while still ensuring that the paths are collision free with other existing road users.*

Modified Scania bus used as experimental and research platform

Road-aligned coordinate frame and spatial-based vehicle model



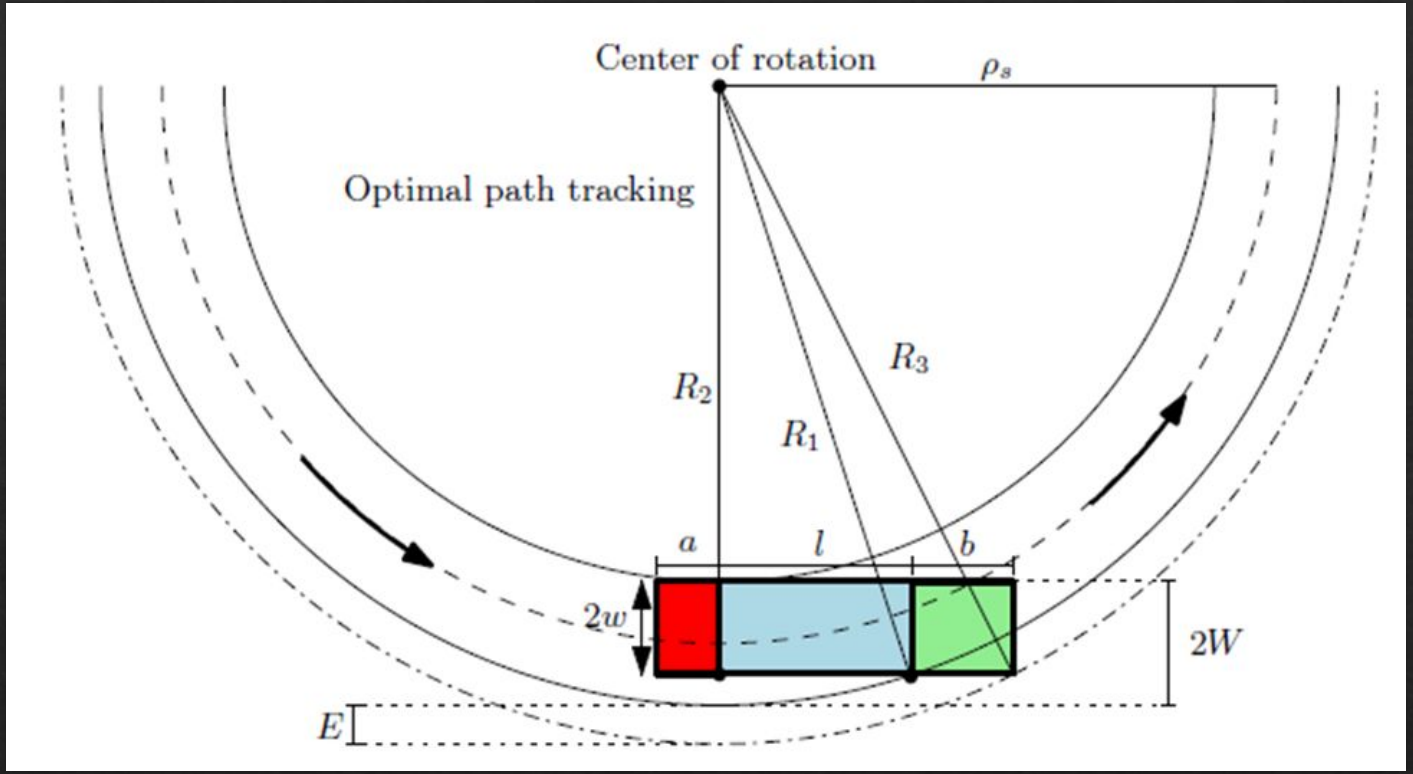
Simulation result

From the above relations, we determine the minimum road width as:

$$W = \frac{l^2 + 4w^2 + 4\rho_s w}{4(\rho_s + w)}$$

and the estimation of the amount of vehicle overhang outside the drivable surface:

$$E = R_3 - R_1$$



Geometric relations used in the computation of the minimum road width.

Optimization

The space discretization is chosen to be 0,25 m. The maximum path curvature is $0{:}117m^{-1}$, corresponds to a minimum lane width of 2,19 m.

The dimensions are:

a = 2,66 m,

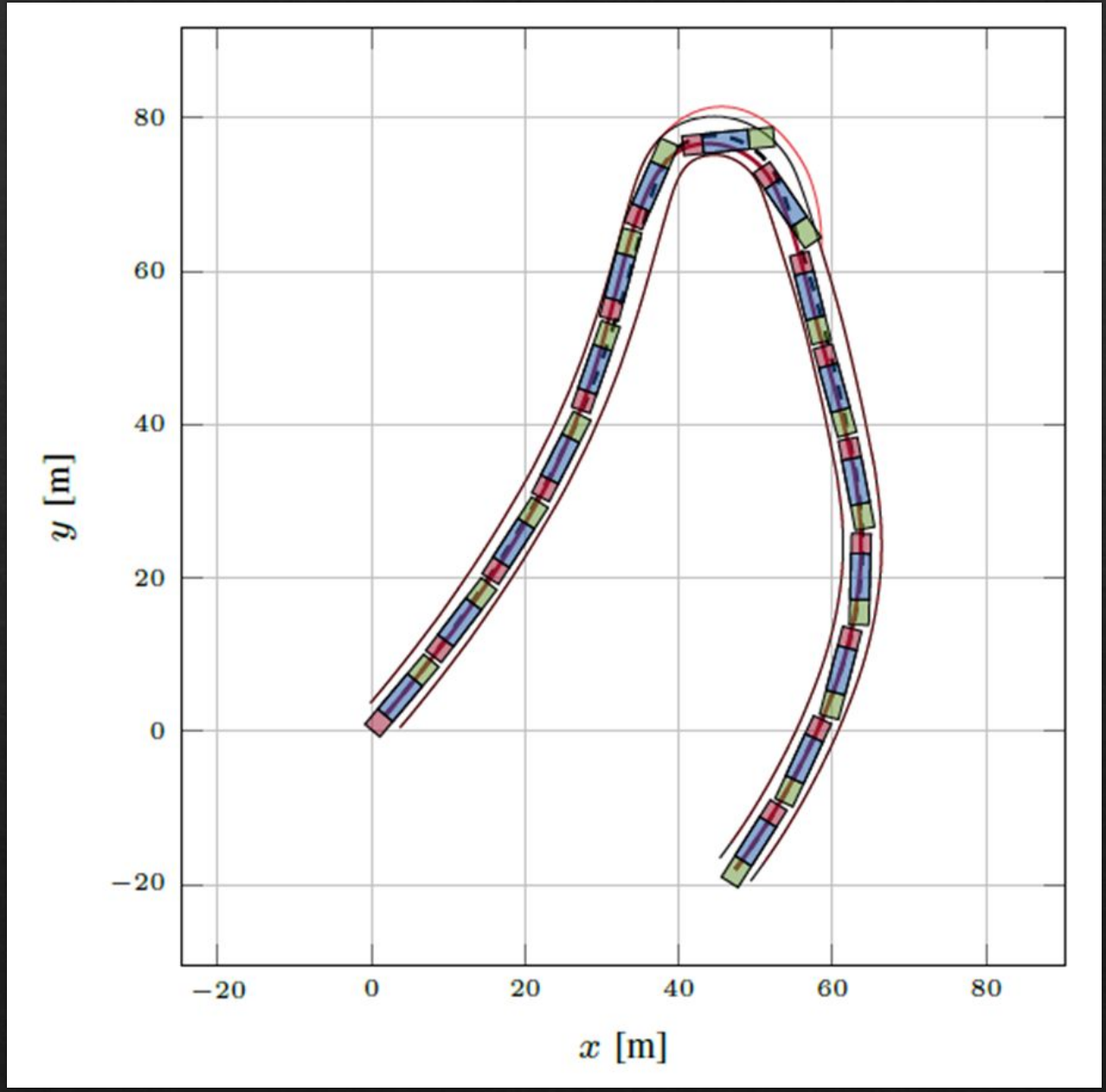
b = 3,34 m, l = 6 m,

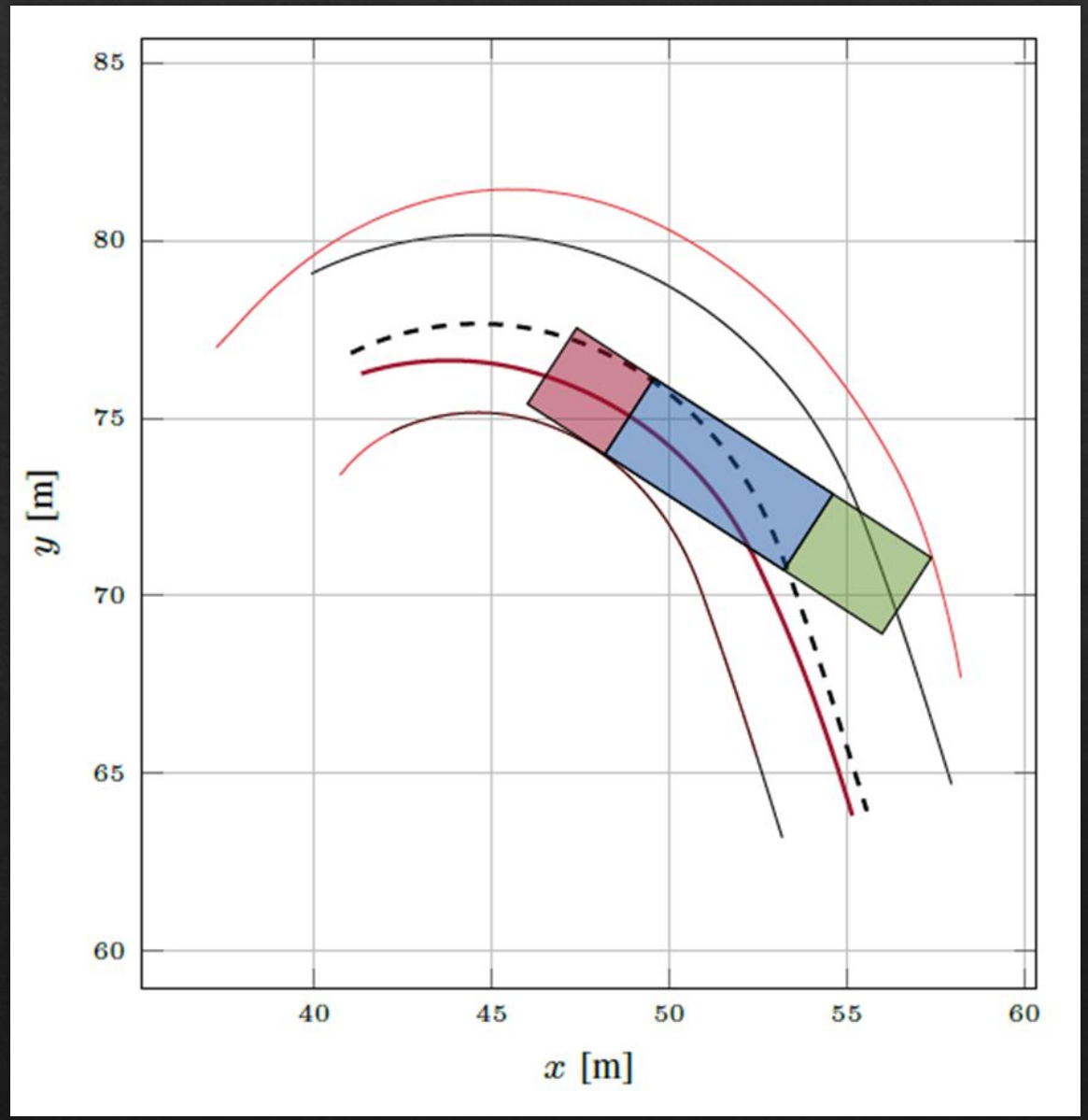
w = 1,27 m.

The input constraints are:

$k^{max} = 0{,}18m^{-1}$

$k \cdot^{max} = 0{,}03^{m^{-1}}/_{s}$




85
80
75
70
65
60
40
45
50
55
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y [m]
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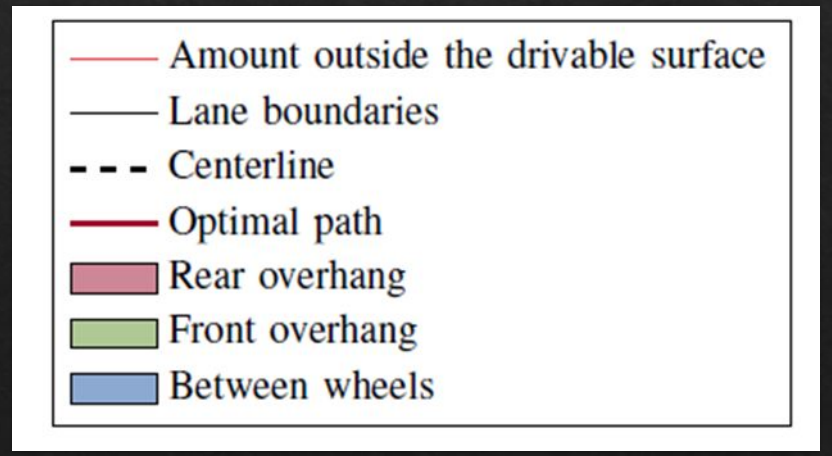
Amount outside the drivable surface
Lane boundaries
Centerline
Optimal path
Rear overhang
Front overhang
Between wheels

Dictionary

Overhang Exceeding-Превышение выступа

Convex Path Optimization-Выпуклая оптимизация пути

Overhang-свес

Dimension-измерение

Exceed-превысить

Assigned driving corridor-назначенный ведущий коридор

Boundaries-границы

Current automated motion planning algorithm-автоматизированный алгоритм планирования движения

collision-столкновение

Surface-поверхность

Derive- произойти

Curvature-искривление