

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

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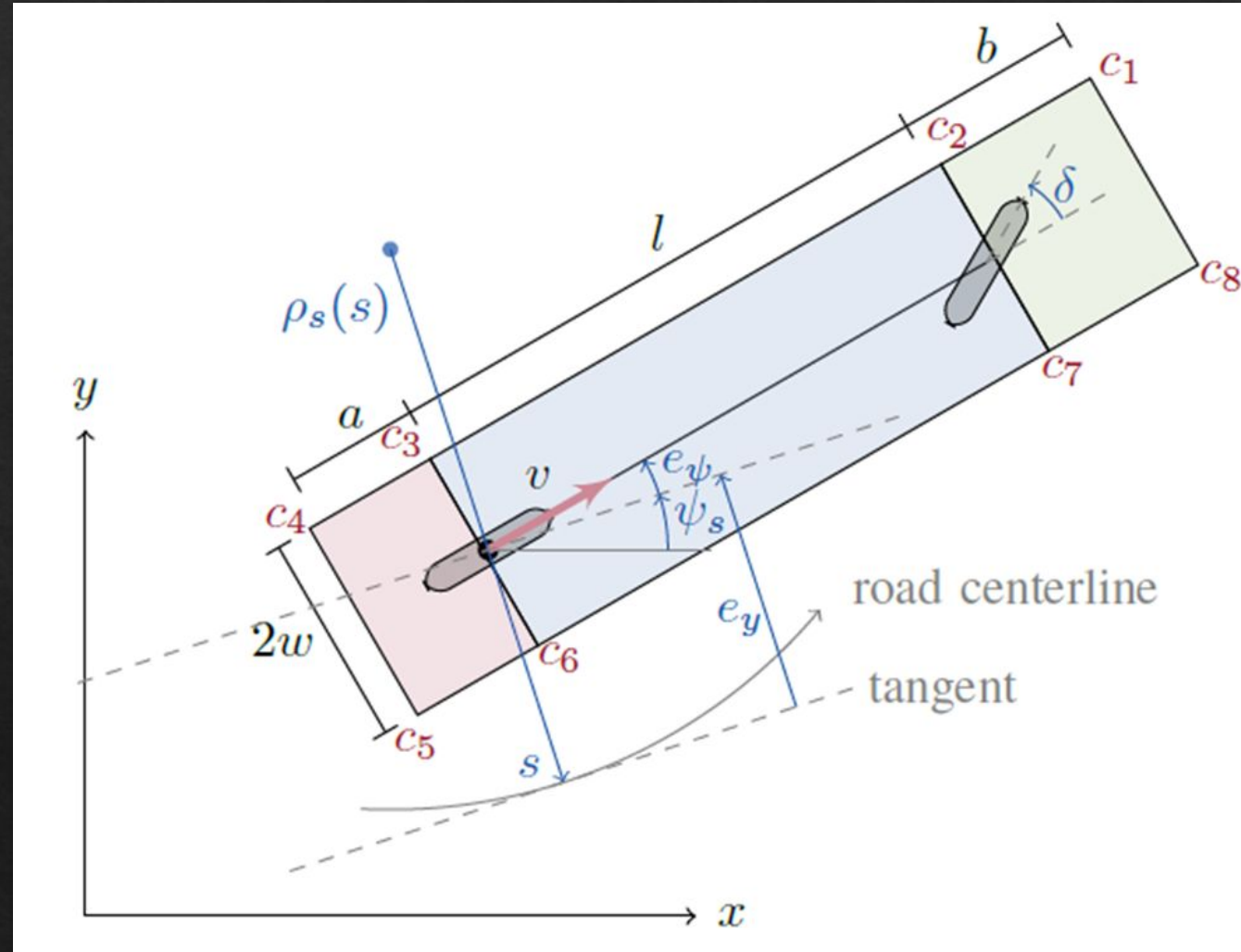
# Introduction

- ◇ *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



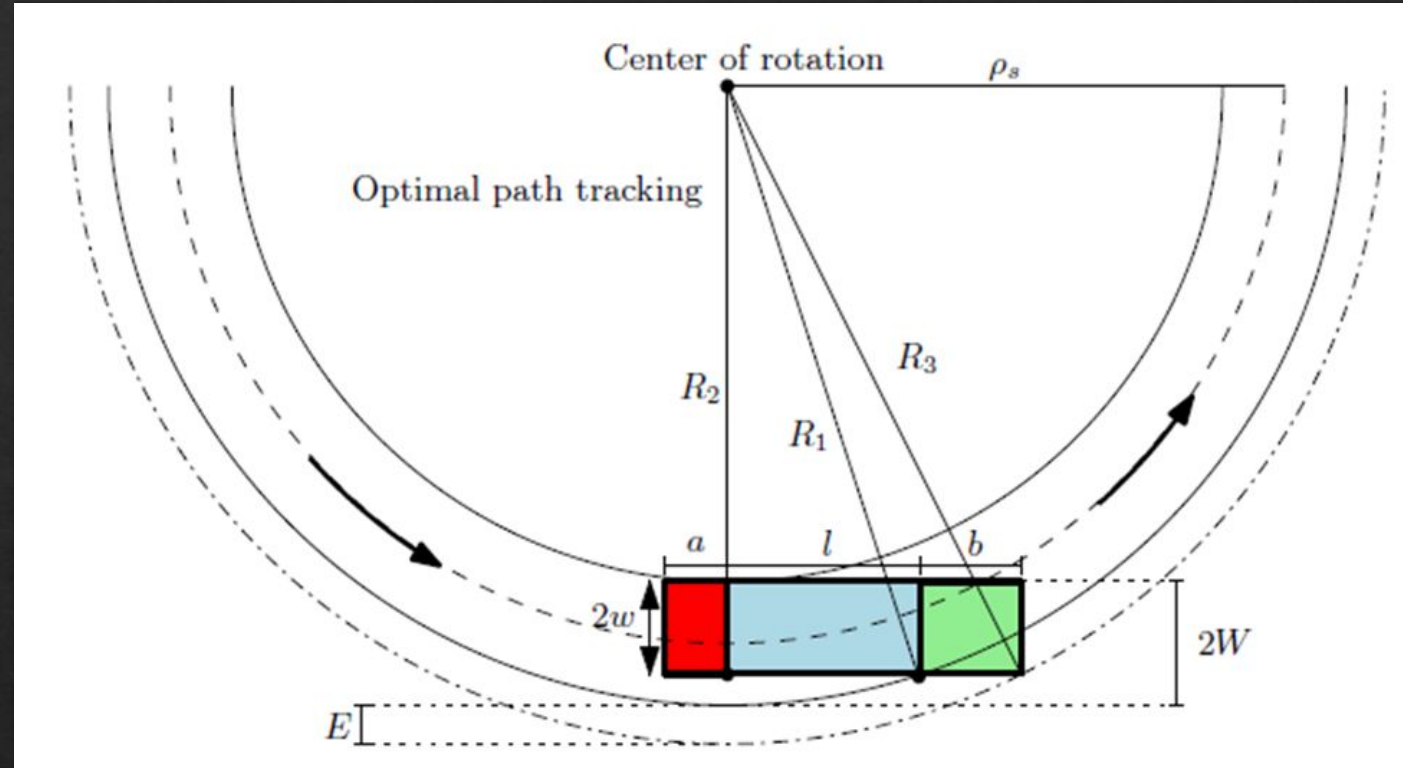
# Simulation result

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:

$$a = 2,66 \text{ m,}$$

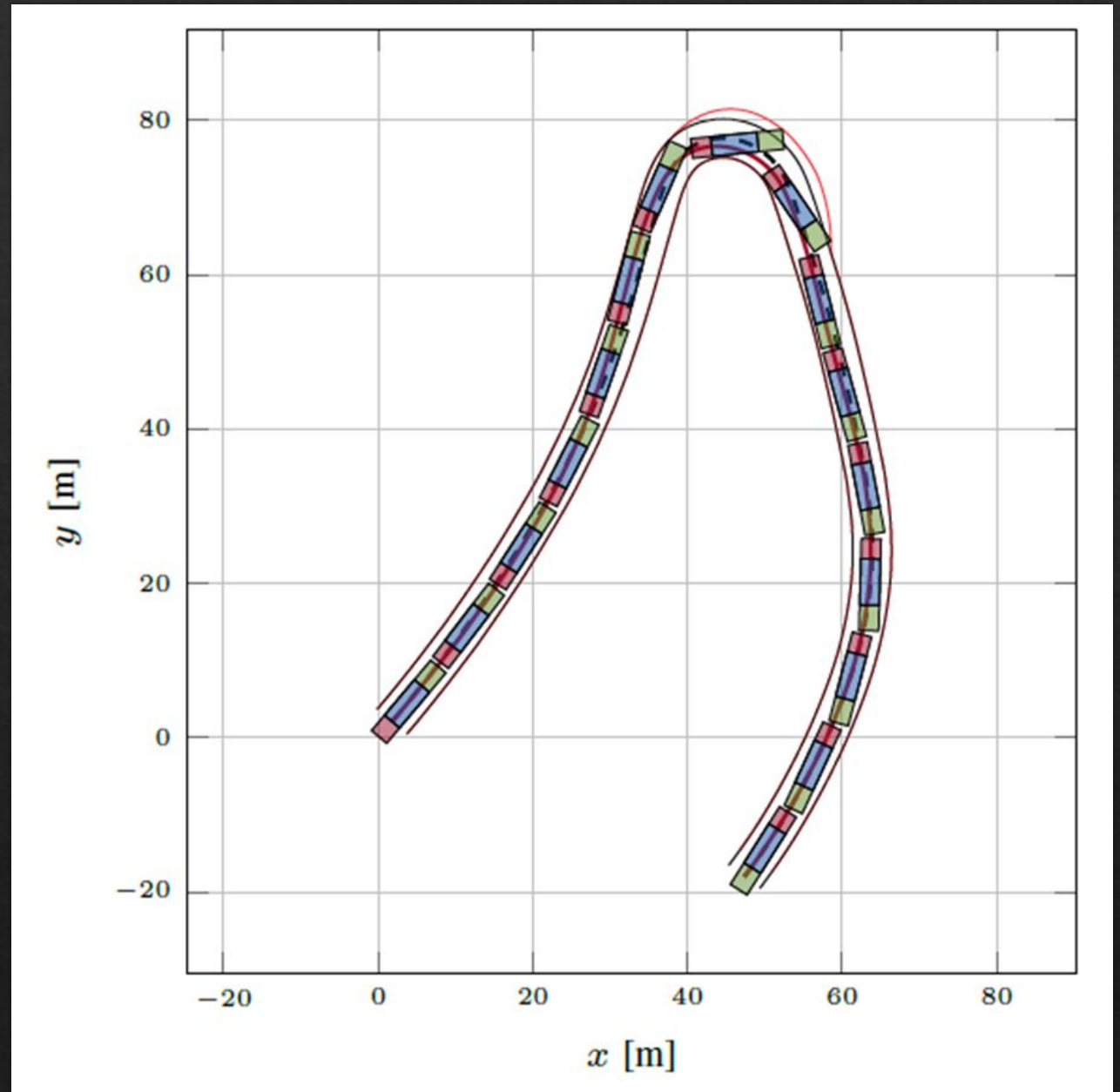
$$b = 3,34 \text{ m, } l = 6 \text{ m,}$$

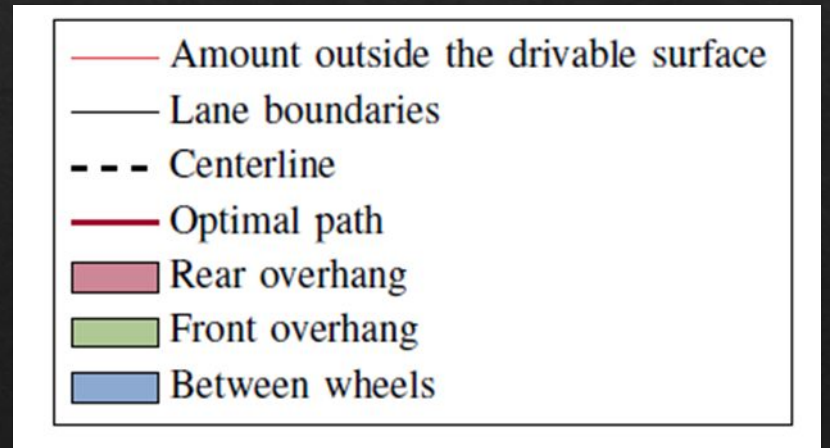
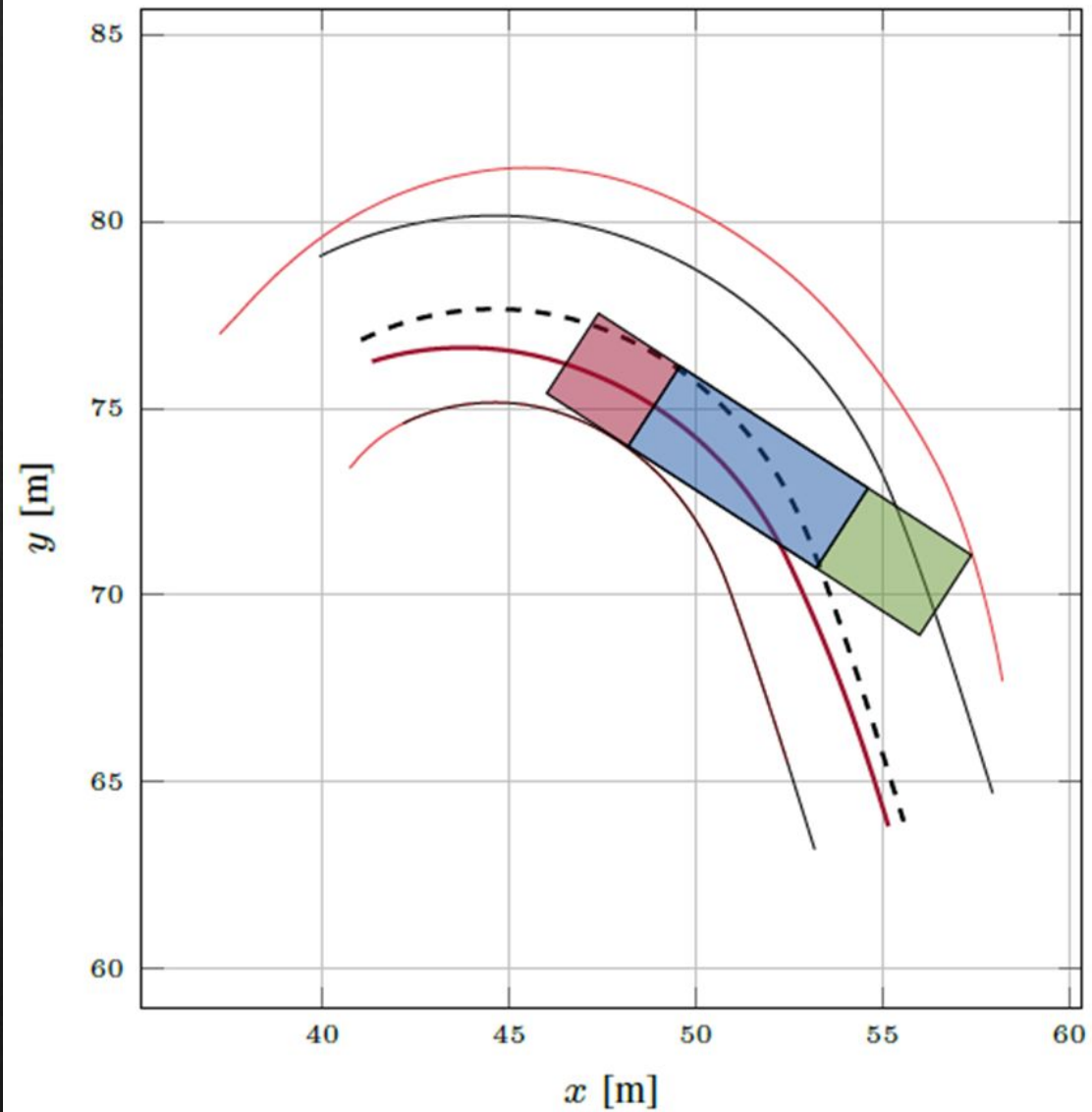
$$w = 1,27 \text{ m.}$$

The input constraints are:

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

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





# 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