

Driving dynamics analysis and control of an all-wheel electric vehicle with omnidirectional steering

Patrick Weißensteiner, Virtual Vehicle Research Center

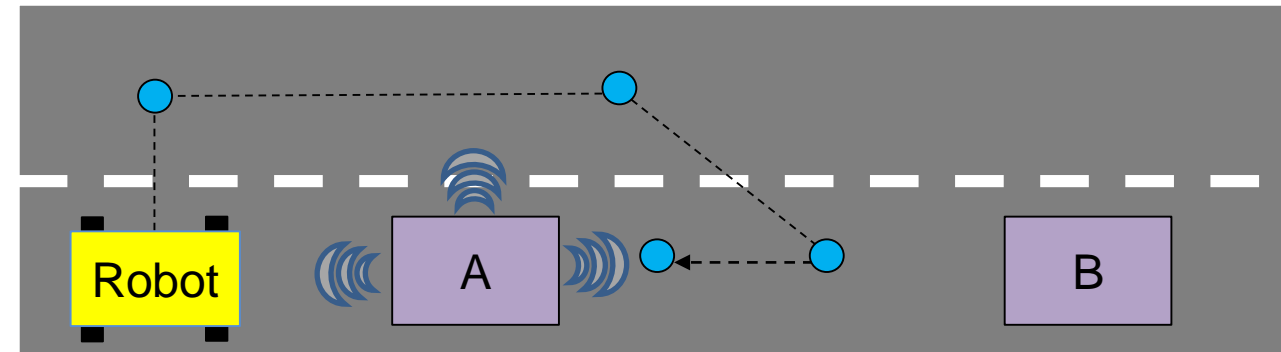
Fundamental task:

An omnidirectional steering robot should follow a trajectory which is derived from a set of given points.

Possible Application:

Testing of sensors for ADAS functions

- Multiple manoeuvre possible without moving the sensor itself
- Object A is equipped with various sensors



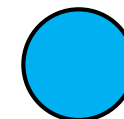
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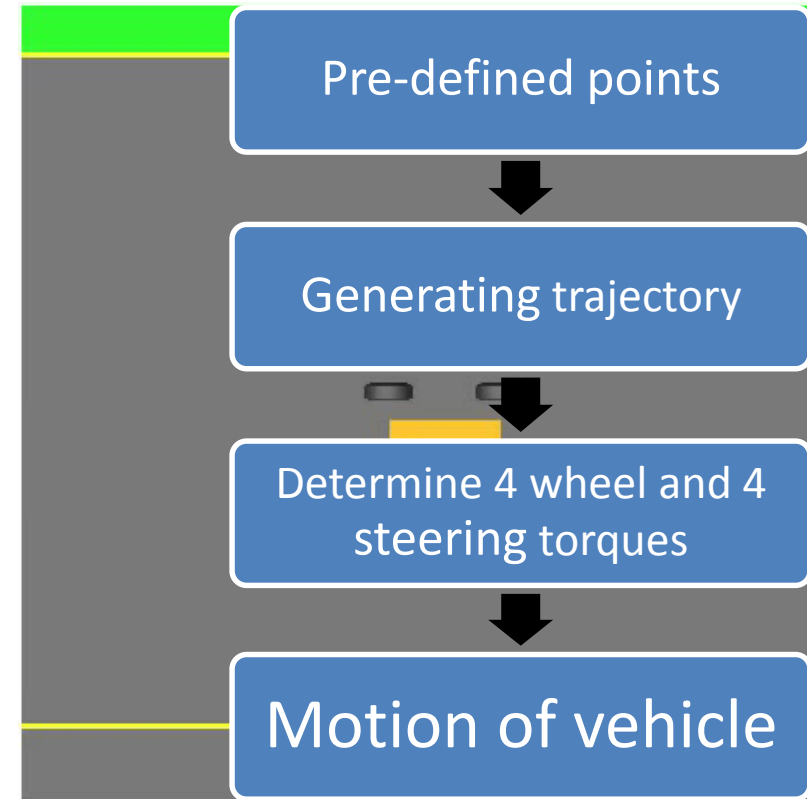
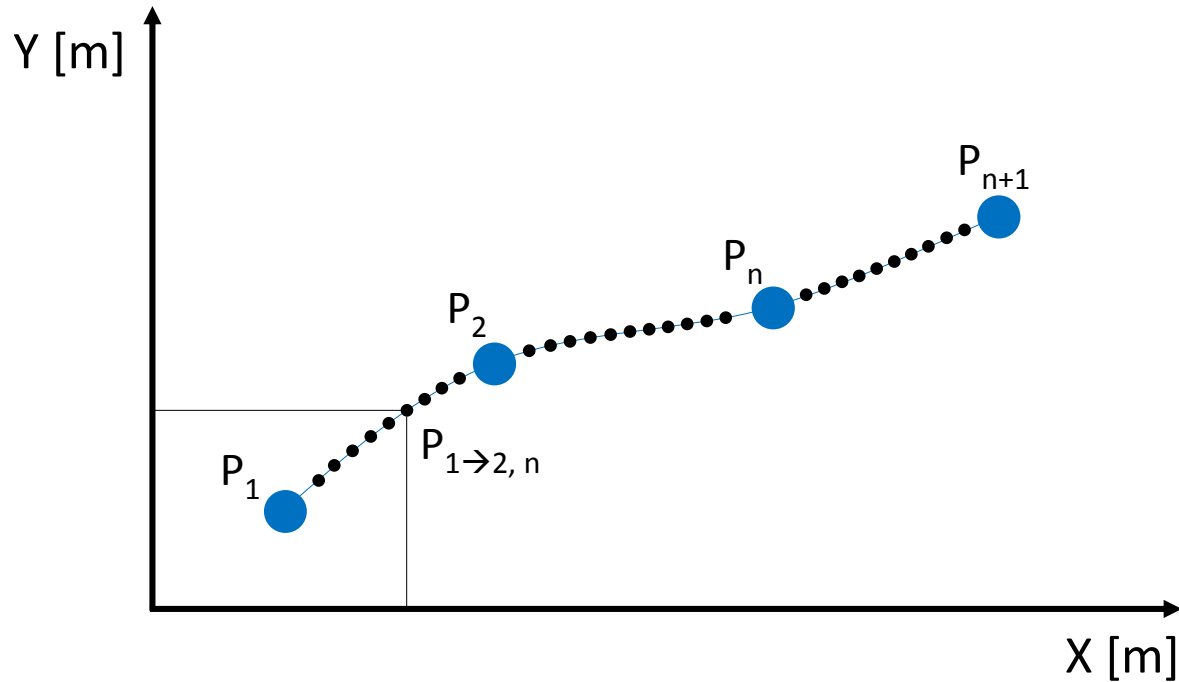


... Object (e.g. car), not moving



... Measuring points

Basic Concept



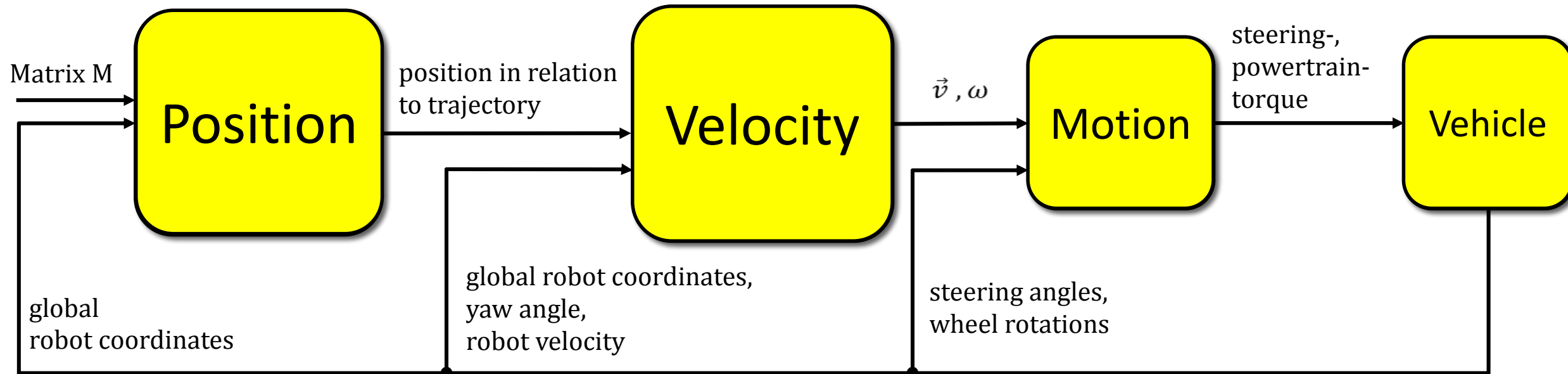
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Concept - Main components

→ System architecture for implementation in real vehicle with ROS (robot operating system)



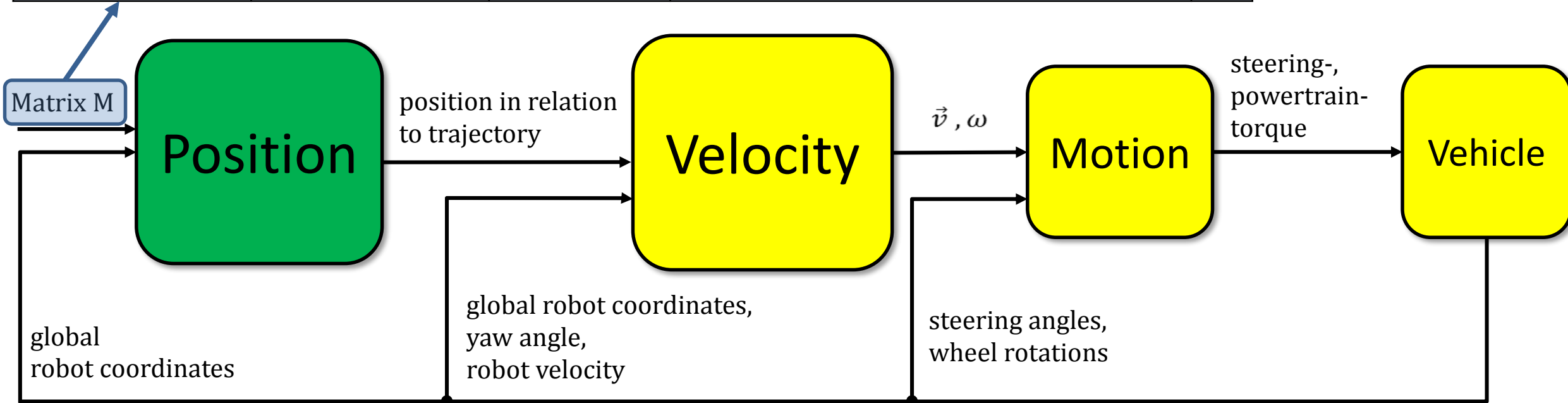
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Concept - Position

x-coordinate	y-coordinate	Distance s	Angle between robot and trajectory

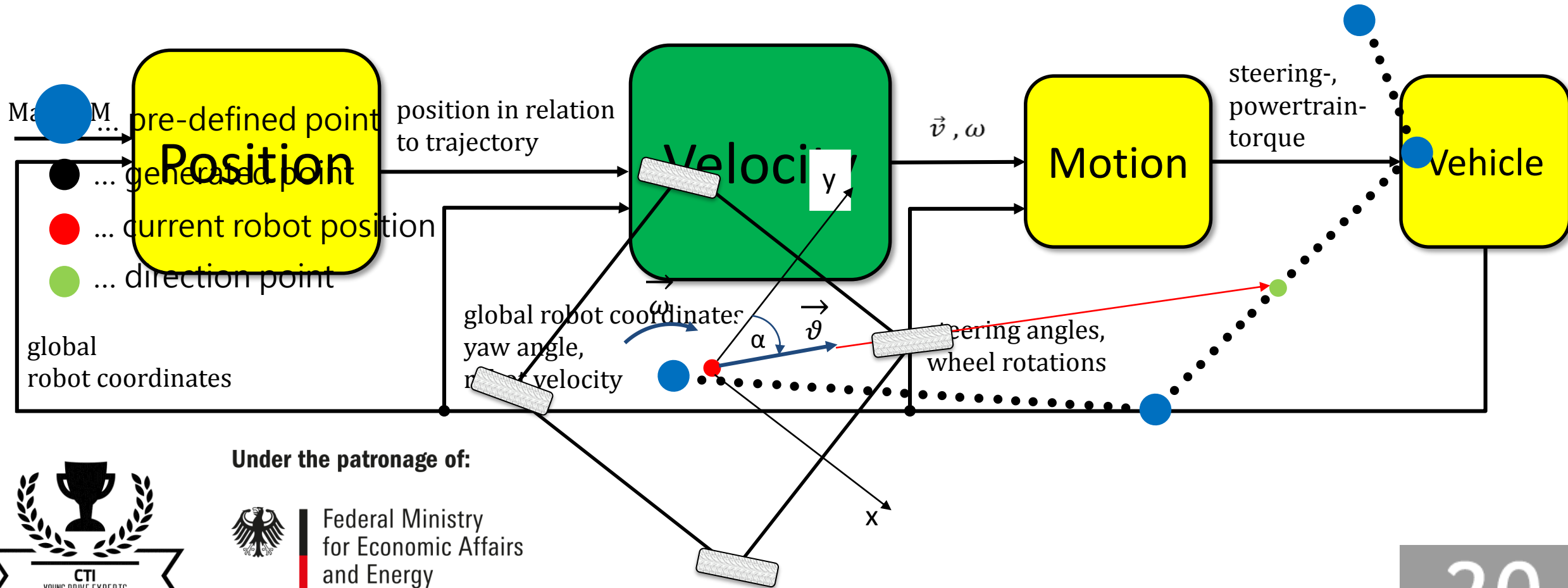


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Concept - Velocity



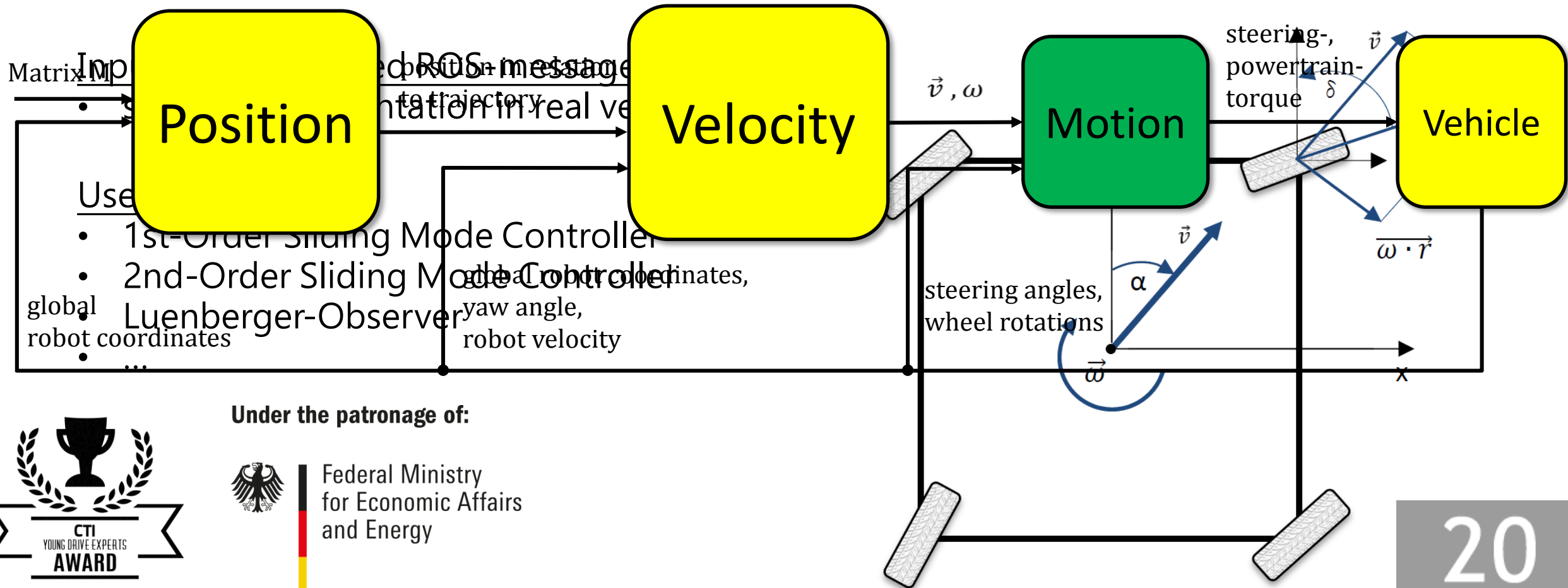
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Concept - Motion

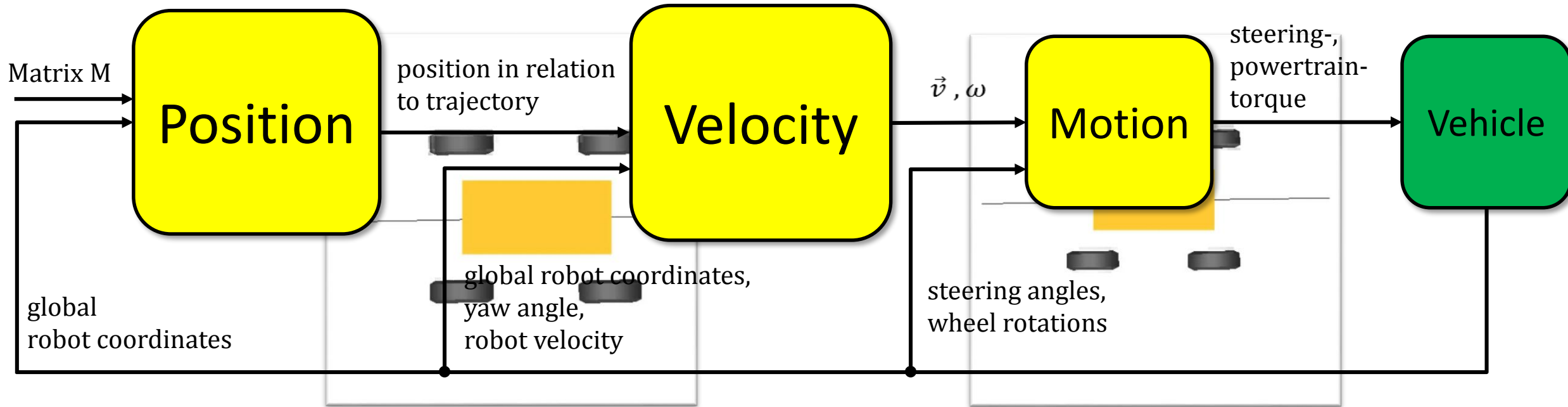


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Concept - Vehicle



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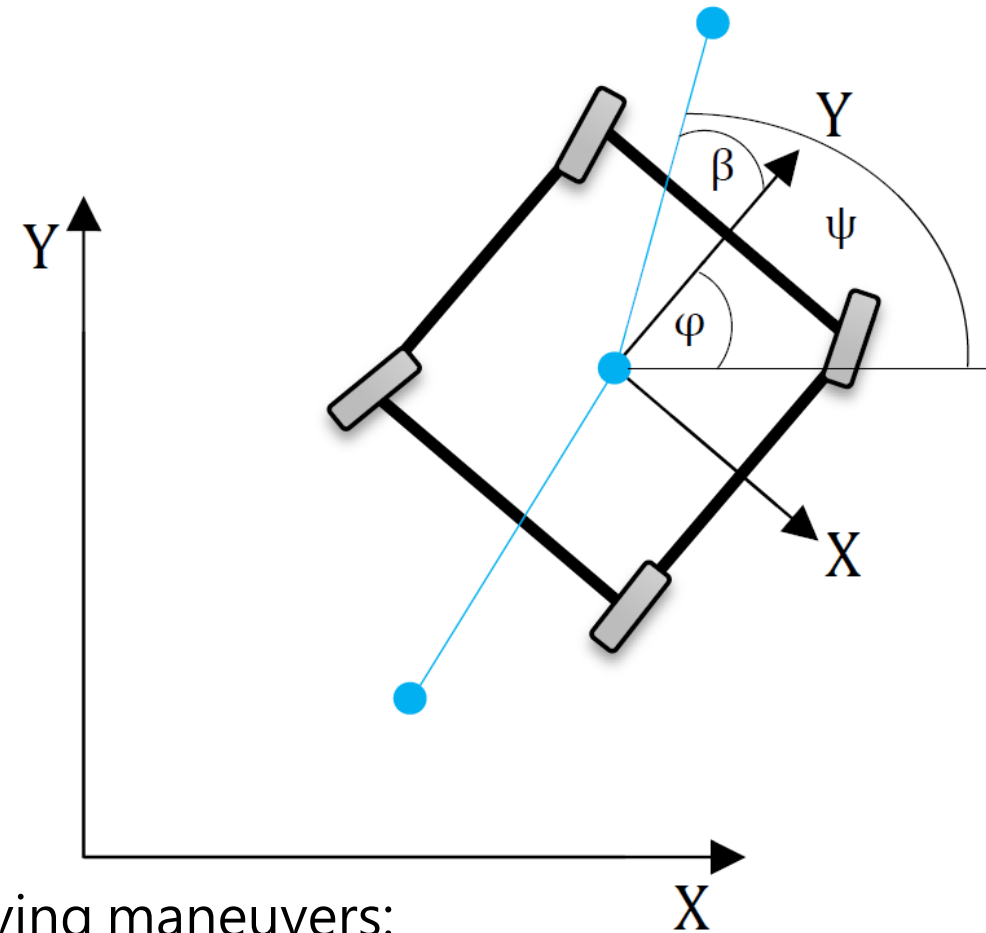


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Robot angle in relation to trajectory

Angle between robot and trajectory is free of choice:

- During maneuver tests practical distinction between:
 - Car-Mode: $\beta \rightarrow 0$
 - Robot-Mode: $\varphi \rightarrow 0$



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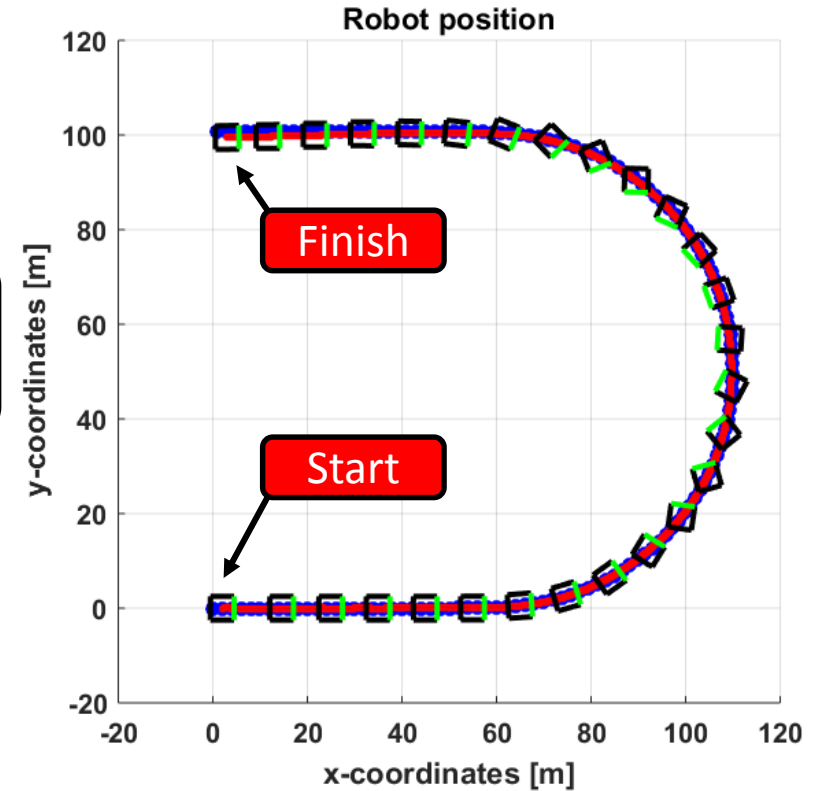
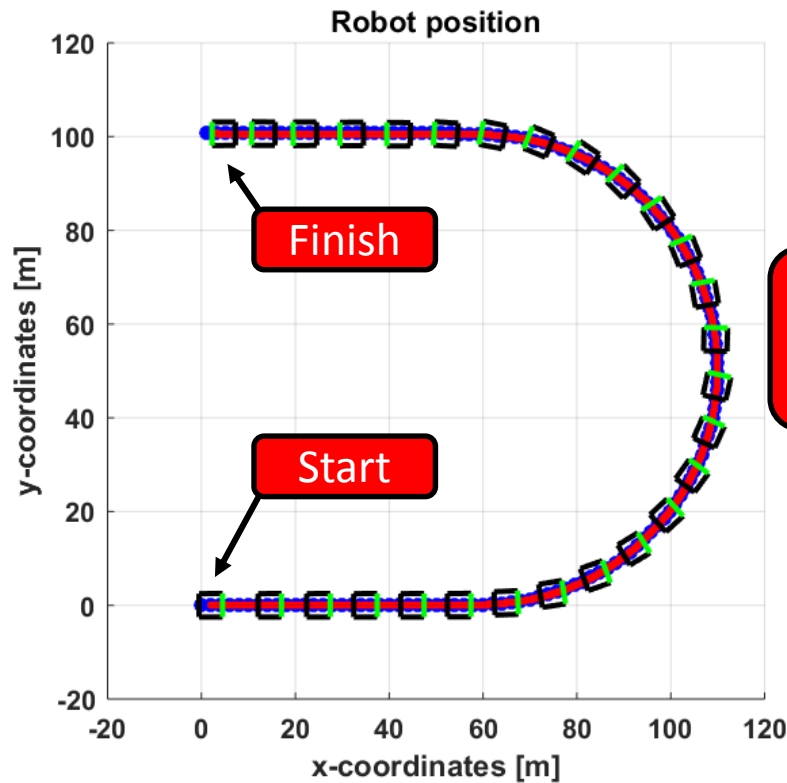
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Investigated driving maneuvers:




- double lane change
- s-curve
- clothoide curve
- μ -split braking
- cornering
- ...



Result - driving along a trajectory



Lateral acceleration of 0.5g

-  Robot (5 times scaled)
-  Pre-defined point
-  Current robot position

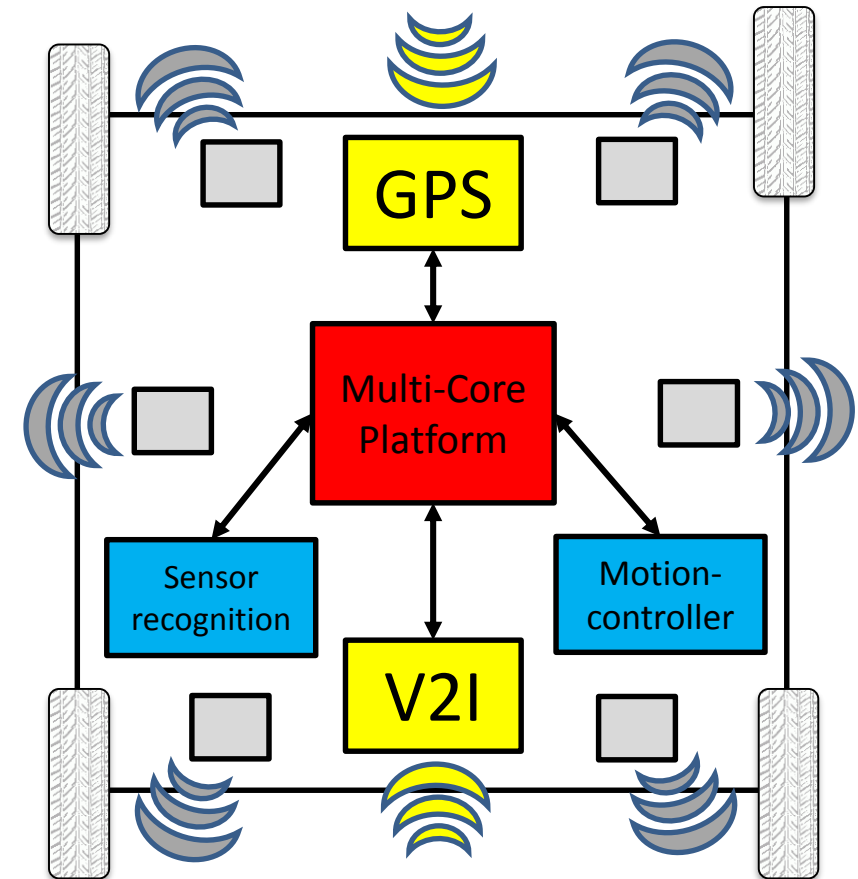
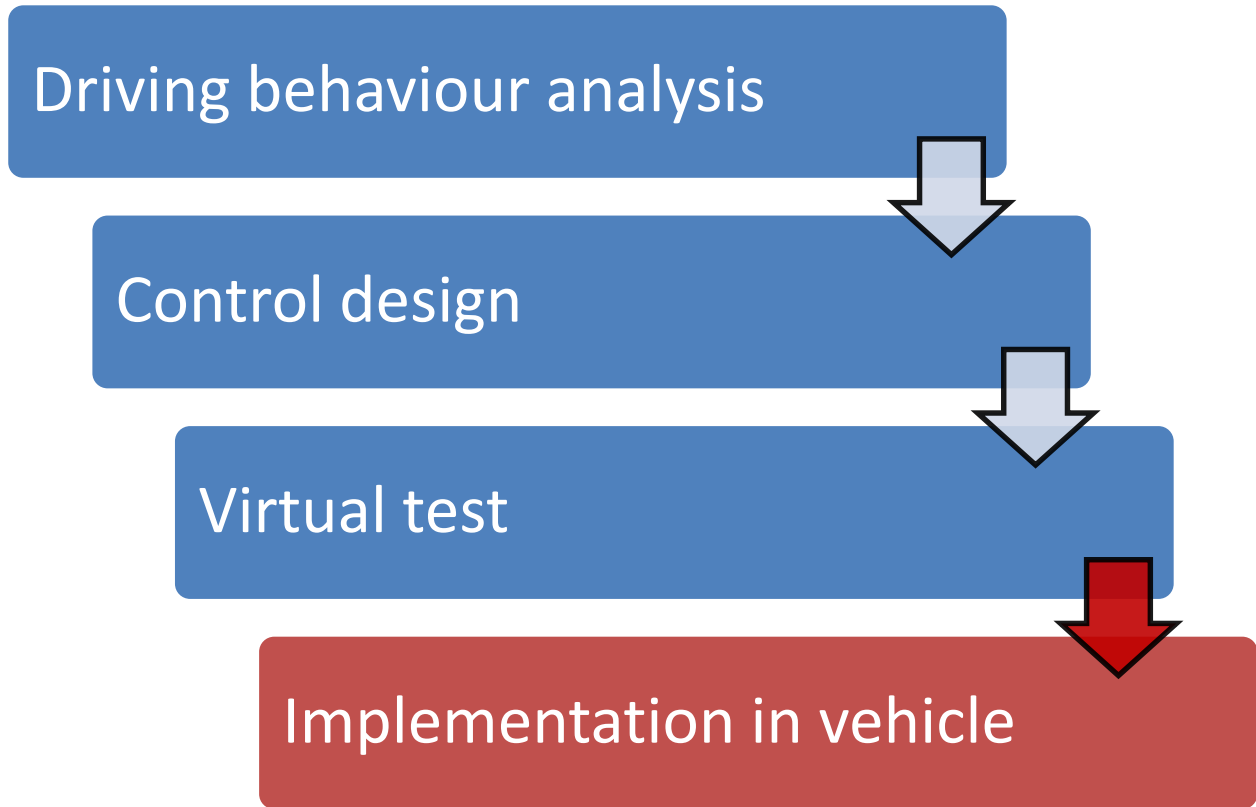
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Summary / Outlook



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