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ASTAzero - An infrastructure for testing active safety and cooperating transport systems

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Motivation

- Cooperative automotive systems for **active safety**, **collision mitigation** and **autonomous driving** are currently under development
- These systems must be provided with **fault tolerance** and **graceful degradation** techniques to prevent hardware and software faults from causing accidents.
- To ensure **functional safety**, they must be designed according to the **ISO 26262** standard for functional safety in electrical and electronic automotive system

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ISO 26262

- ISO 26262 defines functional safety as "***Absence of unreasonable risk due to hazards caused by malfunctioning behaviour of E/E systems***"
- Four levels of safety integrity: ASIL A (lowest) – ASIL D (higest)
- **"zero" risk cannot be achieved**, there is always a residual risk that something bad happens!

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Import questions

Designers of cooperative system face a number of challenging research questions:

- **How dangerous is a system failure?**
- **How safe is a degraded service?**
- **How does the human operator (driver) deal with system failures and degraded service?**

To answer these questions we need to develop a variety of test beds for cooperative systems.

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Infrastructures for testing cooperative systems

- Proving grounds
- Driving simulators
- Miniature vehicles
- Desktop simulators
- Modelling tools
- …

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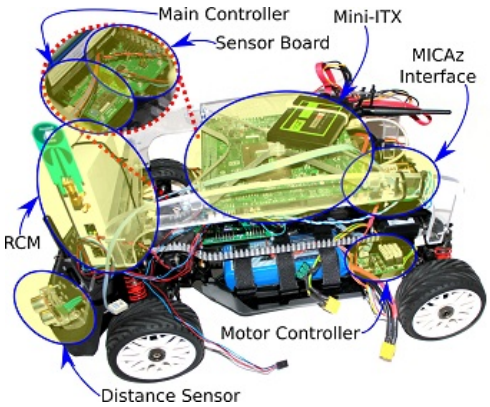
Miniature car developed in the Gulliver project



http://www.chalmers.se/hosted/gulliver-en/

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ASTAZERO

ACTIVE SAFETY TEST AREA

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ASTAzero

OWNERS	FINANCIERS	INDUSTRIAL PARTNERS
SP Technical Research Institute of Sweden	Investing in your future	VOLVO
CHALMERS	REGION VÄSTRA GÖTALAND	VOLVO
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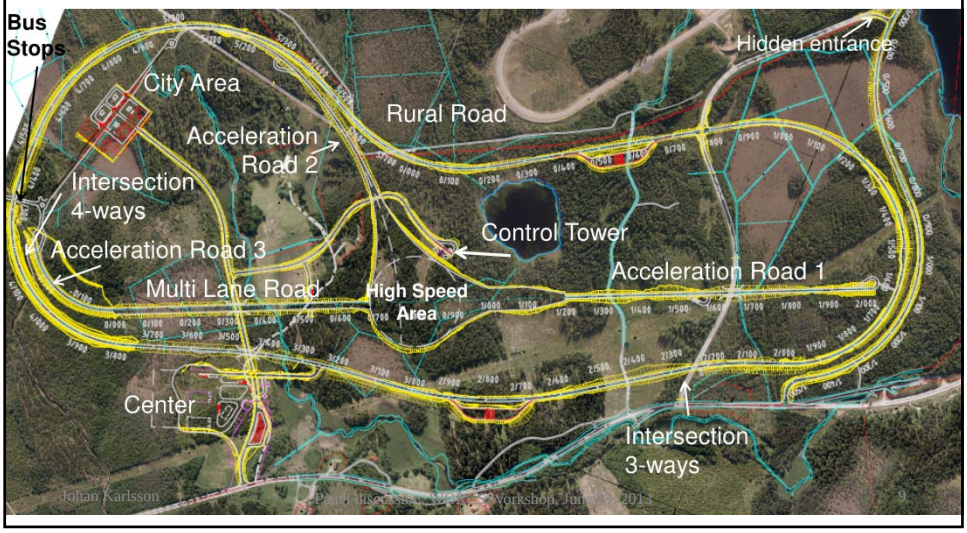

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ASTAzero facts

- 2.5 x 2.7 kilometers
- 5,700m rural road designed for 70km/h – 90km/h
- High-speed area with a diameter of 240m
- 700m multilane road connected to the high-speed area
- City area with four blocks

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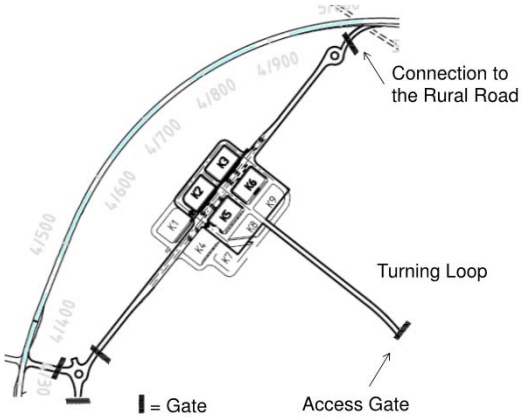
ASTAzero – City Area



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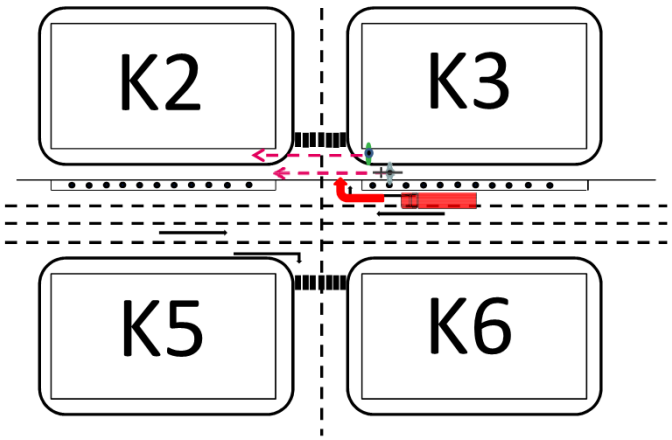
ASTAzero – City Area



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ASTAzero – City Area

- 9 blocks
  - 40m * 25m
  - Height: 4m
  - Acceleration roads: 150m
  - Normal street lighting
- Lab area
  - 100m * 30m
- Main street
  - Sidewalk
  - Cyclists road
  - Lane markings
  - Crossing: 7m plus sidewalks
  - Pedestrian crossing with signs

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ASTAzero – Technical Infrastructure

Communication

- WiFi coverage for the whole area
- High-speed internet connection in all control rooms and garages
- V2V and V2I installation prepared

DGPS

- Basis station to cover the whole area
- Video system synchronized to position

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ASTAzero – Technical Infrastructure

Dummies & carriers

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ASTAzero – Technical Infrastructure

Driving robots

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ASTAzero – Test Area Center

- Guard and reception
- Traffic Control
- Garages for 10 cars (5 with lifts)
- Garages for 2 long vehicles, 25.25 meters long
- Overhead crane for loading
- Separate working areas for visiting personnel
- Lunch restaurant in cooperation with Volvo Cars
- Fuel depot
- Car wash
- Calibration Surface for gyros

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ASTAzero – Winter 2013

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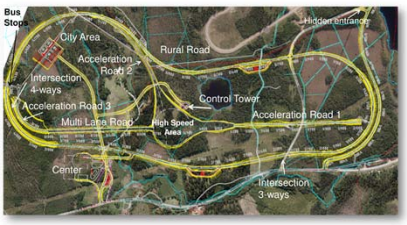
EDCC-2016

Join us for EDCC in Gothenburg, May 2016

The programme will feature a visit to ASTAzero!

Chalmers main entrance and conference center



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ACTIVE SAFETY TEST AREA