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IVR Workshop 2018

Autonomous Sailing *Setting the Scene*

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What connects those products, research projects, standards?

Products

- **MasterLine PilotMaster 60**
- **SIGMA-500 Kombi-Autopilot**
- **argoPilot**
- **argoTrackPilot**
- ...

Research projects

- **NOVIMAR**
- **LAESSI**
- **RAVEN**
- **Smart Shipping Challenge (SMASH!)**

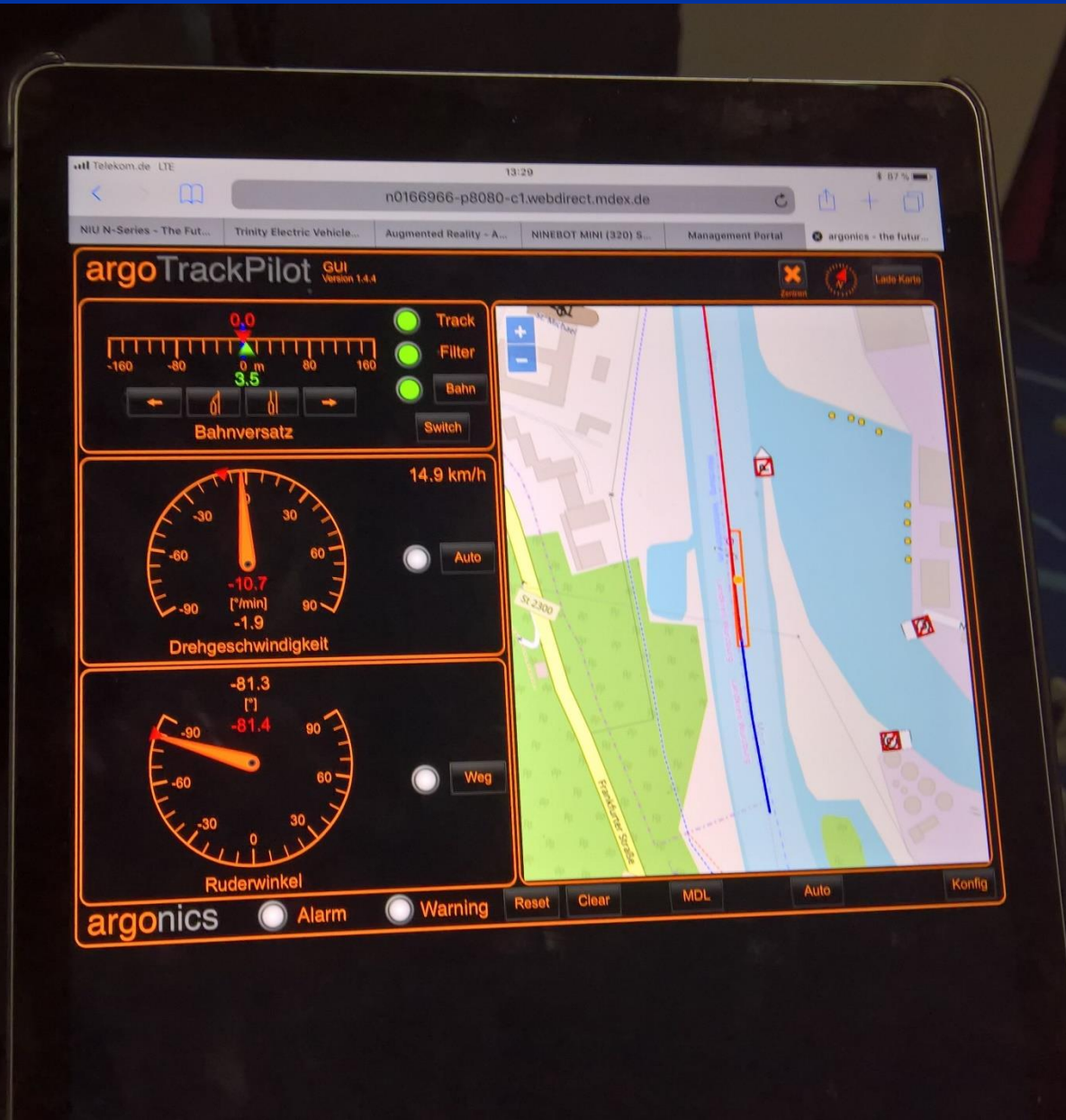
Automation of Navigation

Standardisation activities (legal, technical)

- **UK Maritime Autonomous Systems Regulatory Working Group**
- **Norwegian Forum for Autonomous Ships**
- **Comité Maritime International**
- **Mannheimer Transportrechtstag**
- ...



Real world example: argoTrackPilot



Vessel follows automatically a given (electronic) track

Commercial product

Remote control of vessel via track pilot possible



Autonomous or automation? What is in the words?

Autonomous

**Not controlled by others or by outside forces;
independent**

Automatic



















**Acting or operating in a manner essentially independent
of external influence or control**

Automation of Navigation

**(Proposal of the CCNR, covering all levels of automation
from *steering assistance* to *full automation (autonomous)*
including remote control)**



Proposed definition of levels of automation in inland navigation

Level	Designation	Vessel command	Monitoring of and responding to navig environment	Fall-back performance of dynamic navig tasks
0	NO AUTOMATION			
1	STEERING ASSISTANCE			
2	PARTIAL AUTOMATION			
3	CONDITIONAL AUTOMATION			
4	HIGH AUTOMATION			
5	FULL AUTOMATION			



What are possible benefits of (full) automation of navigation?

Increase of safety

by supporting skippers and reducing human error

Reduction of energy consumption and emissions
through optimal and constant navigation

Reduction of costs

with smaller crews (but expensive equipment)

Opening of new markets

through competitive cost structures

...



Important questions to be answered

***How do we ensure safety and ease of navigation?
in particular during the introduction of full automation***

***Is there a need for specific regulation? (How do we
address safety related radio communication?)***

What are the ethical questions to be addressed?

***In case of accidents, who is liable? On what legal basis?
Vessel owner, manufacturer / operator of navigation
equipment, infrastructure operator (administration)***

Do we need obligatory liability insurance?

What are the social implications?



*James FANSHAWE CBE, UK Marine Industry Alliance and
Chairman Marine Autonomous Systems Regulatory Working
Group (MASRWG)*

Safety at Sea in an Autonomous Era

*Dr. Robert VAN DEN HOVEN VAN GENDEREN, Director,
Center for Law and Internet, Vrije Universiteit Amsterdams*
**Artificial intelligence in traffic and transport with some
legal and ethical notions**

*Dr. Johannes TROST, Member Legal Committee IVR, Lawyer
Lebun & Buchta,*
Legal impacts of autonomous sailing