



Smart Mobility Lab - SML

New Generation of Scaled Truck Models in the Smart Mobility Lab

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Outline

- Introduction
- Previous LabVIEW Projects at SML
- NI real-time device myRIO
- Trucks features
- Ultrasonic sensors
- Tests
- Conclusions



Introduction

- Assembly of three new trucks
 - SCANIA truck models
- Install embedded hardware device for control
 - NI myRIO (Real-Time platform)
- Add physical and virtual sensors
 - Obstacle detection
 - Localization (MoCap)
- Test scenario implementation



Previous projects at SML

- Desktop computer dependency
- Wireless communication with Tmote Sky
- Qualisys Motion Capture (MoCap) system
- Trucks enabled features
 - Move forward
 - Steering



QUALISYS
Motion Capture Systems



tmote
sky





NI myRIO



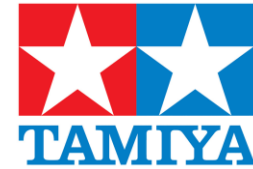
- Reconfigurable I/O (RIO) technology
- 10 analog inputs, 6 analog outputs, 40 digital I/O lines
- Wireless, LEDs, push button, accelerometer onboard
- Xilinx FPGA and dual-core ARM Cortex-A9 processor
- Linux real-time OS
- LabVIEW or C/C++





SCANIA

Trucks



- 1:14 Scale R/C Tractor Trucks
- Models:

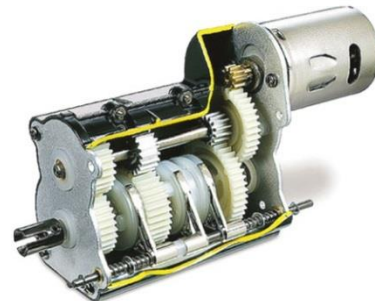
R470 HIGHLINE



R620 HIGHLINE



- 3-Speed transmission



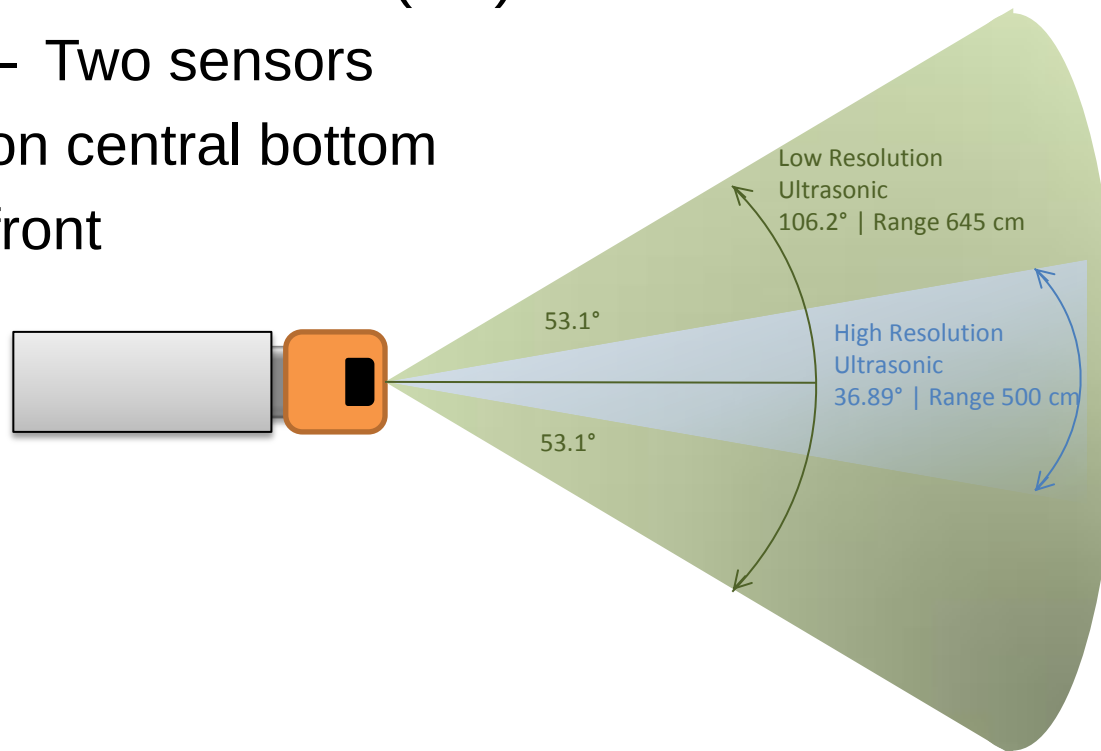
Trucks

- NI myRIO onboard
 - Computational autonomy
 - Network shared-variables
 - Wi-Fi programmable



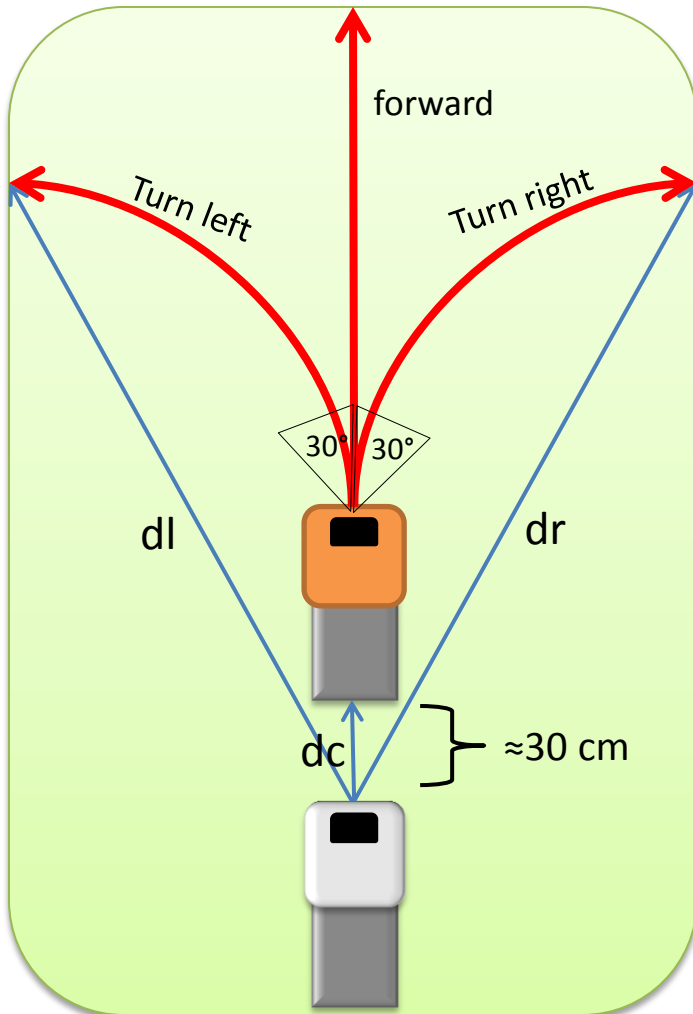
Ultrasonic Sensors

- High resolution (HR) / narrow beam / long range
 - One sensor on central top front
- Low resolution (LR) / wider beam / short range
 - Two sensors on central bottom front

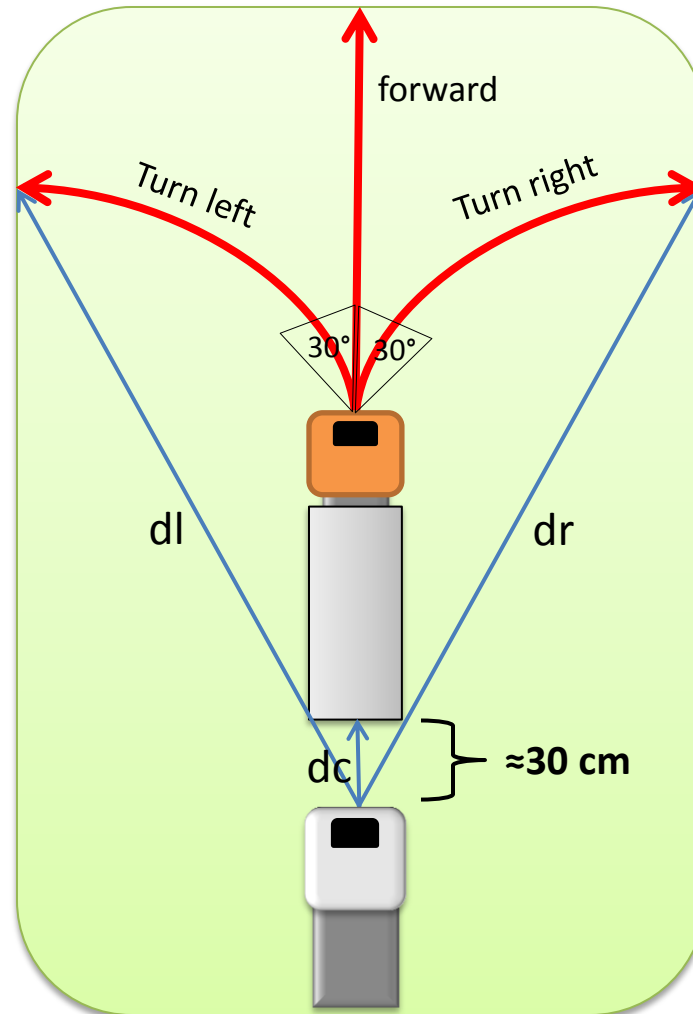


Ultrasonic Sensors – Experiment Setup

1 - Without Trailer



2 - With Trailer

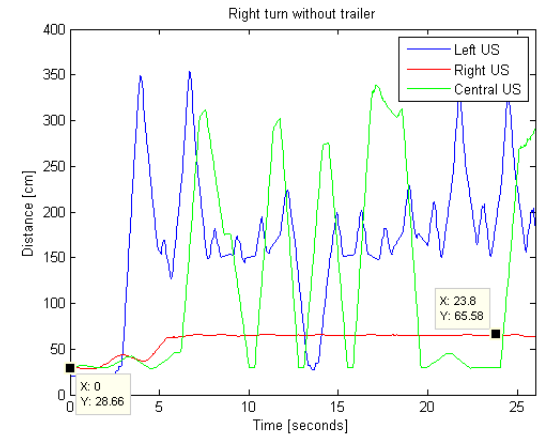
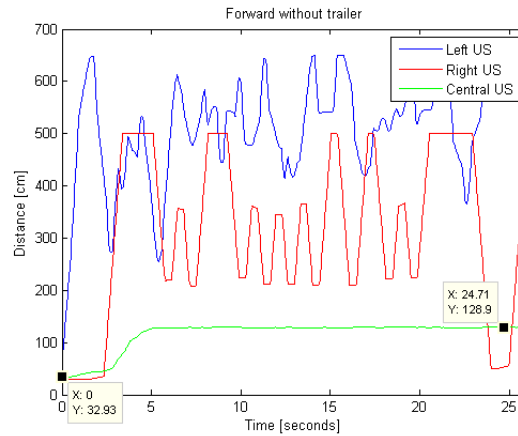
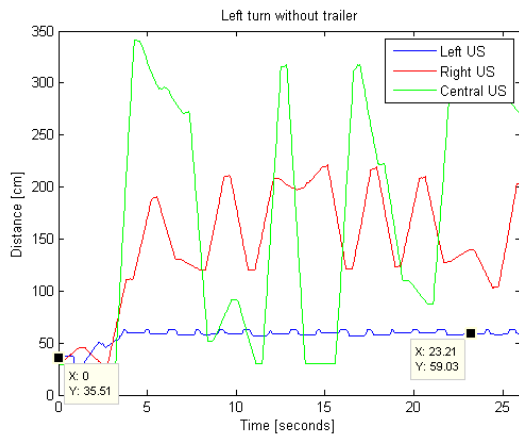


— Direction
— Beam

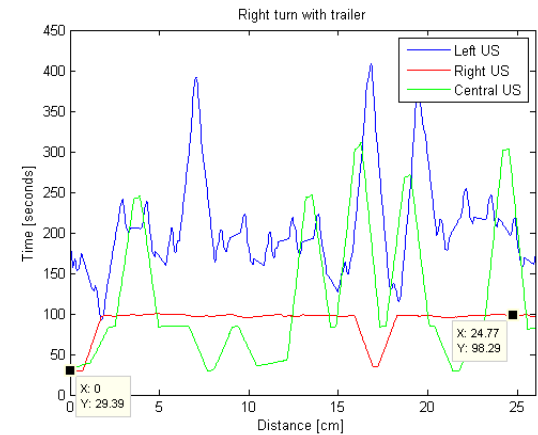
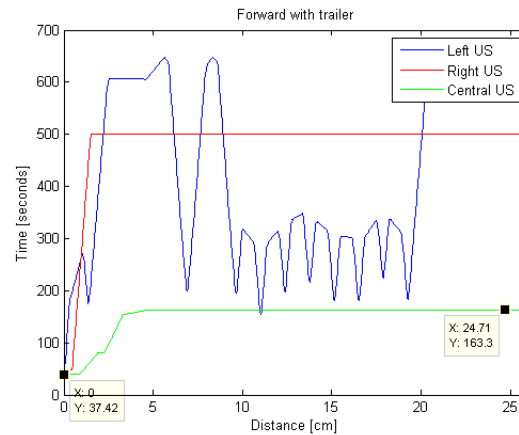
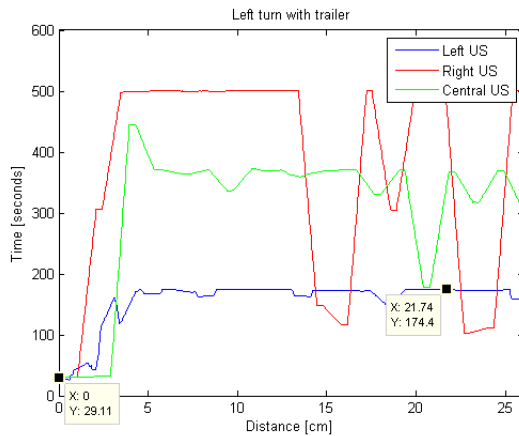
dl- left distance
dr- right distance
dc- central distance



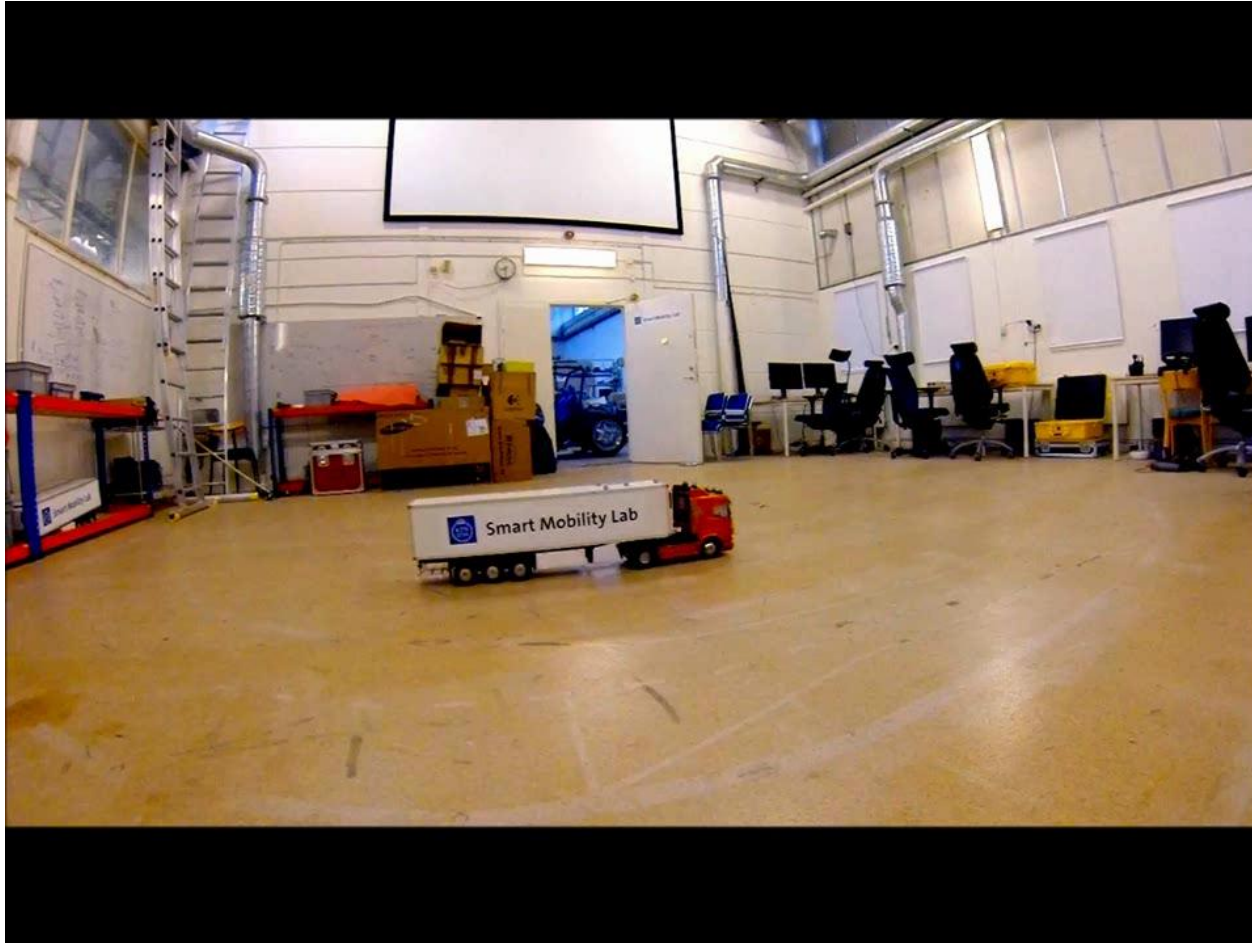
Ultrasonic Sensors - Results



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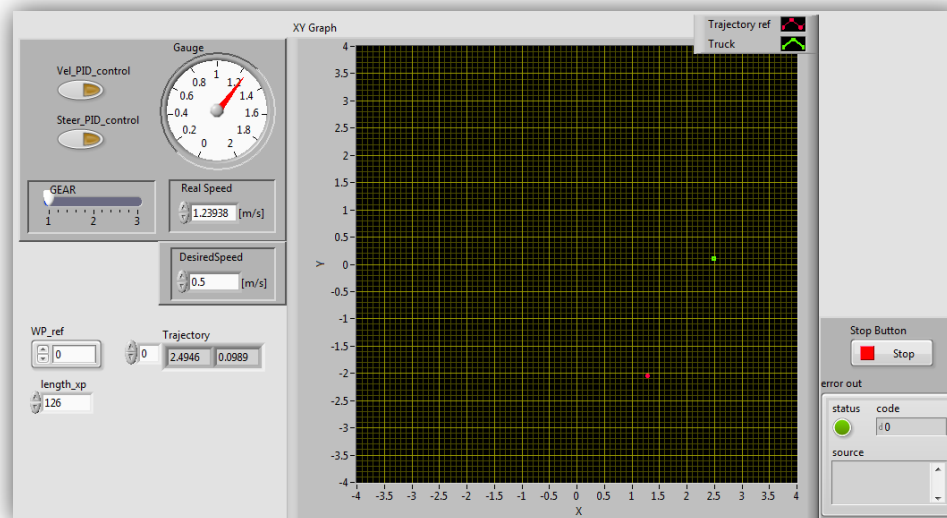


Test – Manual Control



Automatic Control

- PID controllers implemented
 - Speed
 - Steering



LabVIEW Front Panel

Test – Automatic Control



Conclusions

- NI myRIO versatile device for engineering educational purposes
- Stand-alone systems
- Reusable from project to project
- Future work
 - Target tracking without MoCap system
 - Direct communication between myRIOs
 - Automatic parking
 - Add sensors on the trailer



Thanks for your attention



Questions?