Truck Safety Applications for Cost-Efficient Laser Scanner Sensors

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Introduction

Volvo are participating in MiniFaros from the perspective of a heavy vehicle OEM:

- How can cost-efficient laser scanners be used on heavy vehicles?
- What Advanced Driver Assistance System (ADAS) functions can be developed?
- Setting requirements on the sensors to fulfil these functions
- Building a vehicle to demonstrate a set of useful ADAS functions (Volvo FH12 rigid)

Introduction

Many ADAS functions already exist for heavy vehicles. eg ACC, lane change support

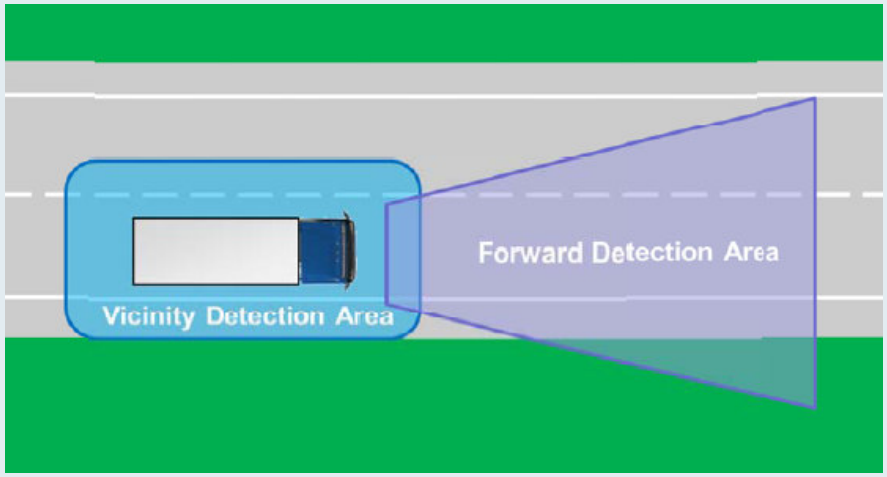
- But these rely on a set of sensors which are specific to each function
  - high cost
  - difficult to reliably fuse information from different sensors
- Laser scanners offer many advantages over existing sensors, but are currently too costly
  - Very accurate object position estimates (range, angle)
  - Large FOV
  - Possible to derive object classification
- Great potential for cost-efficient laser scanners

Relevant Detection Regions

Detection regions for heavy vehicle applications are:

1. Forward Detection Area
   - Long range, relatively narrow FOV
   - Safety and comfort functions: eg
     - Adaptive Cruise Control
     - Lane Departure Warning
     - Automatic Emergency Braking

2. Vicinity Detection Area
   - Short range, wide FOV
   - Safety functions: visibility for the driver is very poor



Truck Application

Three ADAS functions are being developed by Volvo to demonstrate the MiniFaros laser scanners:

1. Start inhibit
2. Right-turn assistance
3. ACC stop & go

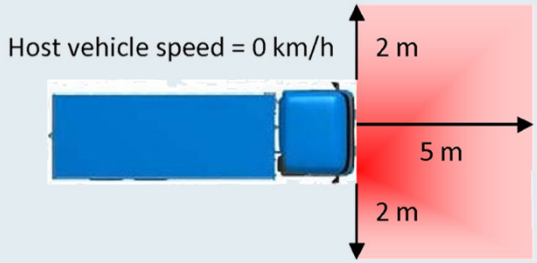
Truck Application – Start Inhibit

Start Inhibit function details:

- Safety function
- Driver has very poor visibility in front of truck
- 10% of all VRU accidents with heavy vehicles occur as frontal collision from 0 km/h
- Prevent the vehicle from accelerating when a vulnerable road user (VRU) is in the immediate path of the vehicle

Requirements of the sensor for start inhibit:

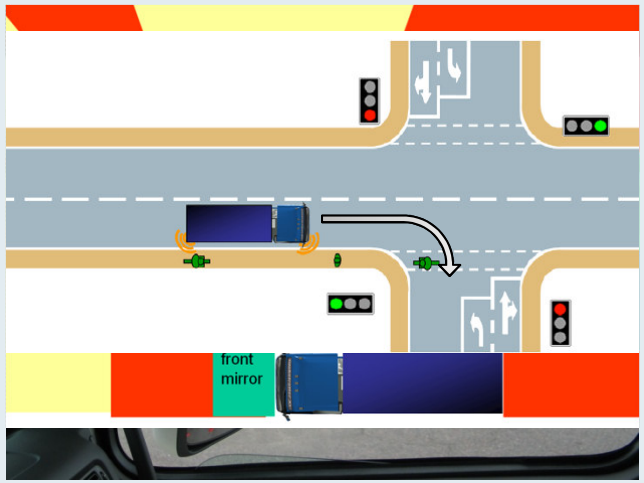
- Detection range 0-5m
- 180º FOV in front
- Reliable detection of VRU (pedestrians, cyclists etc)
- Host vehicle 0km/h



Truck Application – Right Turn

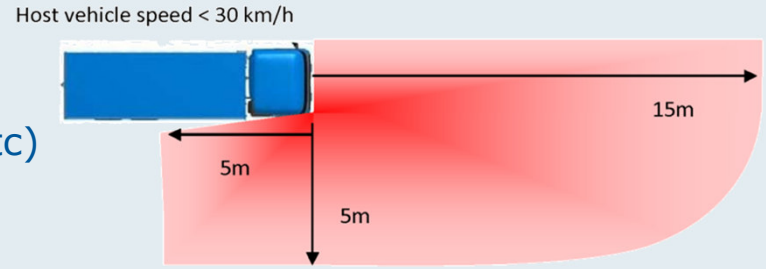
Right-Turn Assistance function details:

- Safety function
- Driver has very poor visibility at the front and right of truck
- 30% of all pedestrian accidents with heavy vehicles occur when truck is making right hand manoeuvres
- System should warn the driver when a collision is likely, potentially even automatically brake the truck



Requirements of the sensor for right-turn assistance:

- Detection range -5 to 15m forward, 0-5m on side
- ~250º FOV
- Reliably detection of VRU (pedestrians, cyclists etc) in cluttered, urban environments
- Host vehicle speed, slow to medium



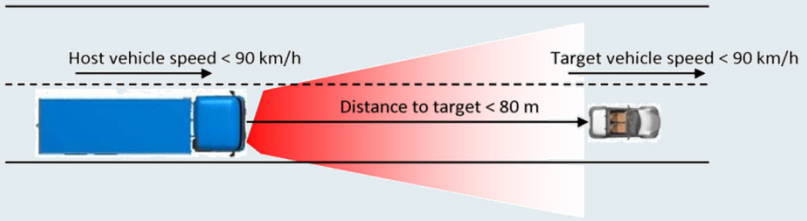
Truck Application – ACC Stop & Go

ACC with Stop & Go function details:

- Comfort function
- ACC already exists in production

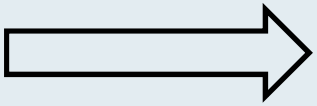
Requirements of the sensor for ACC Stop & Go :

- Detection range 0-80m
- Relatively wide FOV
- Reliably detect vehicles
- Host vehicle speed to 90km/h, target to 90km/h



Vehicle Integration

- Sensor will be integrated on the development vehicle in the coming weeks
- Planned integration as follows:



Conclusions

- The MiniFaros laser scanners can offer many advantages for commercial vehicle ADAS functions:
  - Reduce the need for many sensors to fulfil functions
  - Good accuracy and potential object classification
- With the planned vehicle mounting and sensor specs, 3 valuable ADAS functions will be implemented on a Volvo truck:
  - Start inhibit
  - Right-turn assistance
  - ACC stop & go
- Results expected after August 2012

Thank you for your attention

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