



MEMS-Based LIDAR System for Autonomous Vehicles

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This year's iGP (Interdisciplinary Graduation Project) is the "Design and Implementation of an Autonomous Hybrid Vehicle". One of the major sensing technologies in enabling autonomous vehicles is LiDAR. LiDAR is a remote sensing technology that measures distance by illuminating a target with a laser and analyzing the reflected light. LiDAR sensors are becoming increasingly interesting for the realization and improvement of driver assistance systems like pre-crash safety systems, intersection assistant, lane change assistant or traffic jam assistant. A wide angular range and high angular resolution are key-features that scanning LiDAR systems should offer.

The existing scanning LiDAR systems use bulky optics and motors for light scanning, which is not compatible with the required dimensions and cost for automotive applications. Cost reduction and a higher level of miniaturization are possible based on the optical MEMS technology. The objective of this project is to realize **a breakthrough optical MEMS-based LiDAR prototype** that is ready for the next step of commercialization and industrialization using innovative and patented optical MEMS technology. The project involves work on the level of system engineering, optical design, signal processing and experimental characterization. The LiDAR system to be implemented in this project includes:

- a highly compact MEMS scanner that is the device sensor core engine
- macro-scale based imaging optics that might end up integrated with the MEMS sensor on a single chip.
- interface electronics and DSP hardware to receive and interpret the sensor output.

For Students from the following Departments/Programs: ECE, MCT, COMM, CSE

Tasks

- Market analysis
- Feasibility study
- Design optimization and implementation
- Prototyping
- Characterization
- Reporting

Skills required

- Team work
- Ability to provide innovative solutions
- Hardworking
- MATLAB & Good programming skills

Tools

Optical MEMS Team

- ZEMAX optical design software
- ANSYS finite element for MEMS analysis
- MATLAB for system modeling and technical computing

Electronic Interface & Embedded Systems Team

- Circuit simulation tools, eg. PSPICE
- PCB Layout Editors , e.g. EAGLE
- MATLAB for system modeling
- Microcontroller development suites

Characterization Lab facilities

- Power supply, Function generator and CRO
- Visible and IR light source
- Optical power meter
- Lenses and mirrors kit
- Opto-mechanical components

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