

VisLab History and Main Milestones

1994 **The Mob-Lab vehicle:** after 4 years of research activities together with the main European car makers, the first vision system for intelligent road perception is demonstrated on board of MobLab (MOBILE LABORATORY) at the final meeting of the PROMETHEUS European Project.

1998 **ARGO completes the MilleMiglia in Automatico:** completely designed and implemented by VisLab, the ARGO prototype vehicle is the first autonomous passenger car exhaustively tested for more than 2000 km (94% of which in autonomous mode) on Italian highways, together with regular traffic. ARGO is considered one of the milestones of vehicular robotics worldwide.

2001 **VisLab eyes in the South Pole:** RAS (Surface Antarctic Robot) is equipped by VisLab with cameras that provide vision-based sensing of the South Pole icy environment. It demonstrates to be able to provide a leader-follower functionality in extreme off-road conditions.

2004 **IEEE Trans on ITS is edited by Alberto Broggi:** for the term 2004-2009, VisLab's director serves as the Editor-in-Chief to the major IEEE publication in the field of Intelligent Transportation Systems.

2004 **VisLab hosts the IEEE Intelligent Vehicles Symposium:** the IEEE IV 2004 Symposium is organized by VisLab in Parma, Italy; researchers, practitioners, and managers reach Parma to attend the conference and the related vehicles' demonstrations.

2005 **VisLab's vision systems drive TerraMax to the finishing line of the DARPA Grand Challenge:** in total autonomy, TerraMax completes the DARPA Grand Challenge: a 132 miles long unknown off-road course, traversing mountains and deserts. TerraMax is the only vehicle completing the race using vision as main perception technology.

2005 **VisLab at the Pentagon:** thanks to the outstanding results obtained at the DARPA Grand Challenge, in December 2005 VisLab presents the results of its activities at the Pentagon, in Washington, DC, USA.

2007 **TerraMax is qualified for the DARPA Urban Challenge:** TerraMax is one of 11 vehicles to pass the qualifications and attend the DARPA Urban Challenge; TerraMax perceives the 3D world thanks to 11 cameras, providing all-round vision in a urban environment.

2008 **VisLab spin-off company:** after 18 years of worldwide renowned activities, the research team decides to mark its presence in the industrial market: the VisLab spin-off company focuses on enhancing automotive safety.

Company Profile

After being for many years one of the key laboratories worldwide providing top-notch theoretical and applied research on Intelligent Vehicles, in 2008 the University of Parma started a spin-off company named VisLab.

VisLab is specialized in vehicular applications involving both environmental perception and intelligent control, and offers its expertise in the field of perception for vehicular robotics. Thanks to its tight cooperation with top level companies in Europe, America, and Asia, VisLab has developed its own vision on products for the automotive market and offers a wide variety of perception and safety systems.

Thanks to the presence of Faculty members and PhDs, VisLab researchers also provide training and education.

Expertise

One of the most distinctive features that explains VisLab's continuous and proactive presence in projects with car manufacturers, automotive suppliers, and vehicle-based companies is the very specific experience developed throughout the years.

The application of vision systems on board of vehicles not only requires to fully dominate the latest vision technologies, but also to have a deep knowledge of the key issues of this environment, such as calibration, illumination, noise, temperature, power consumption, as well as cost and installation requirements.

Besides its renowned expertise, the key to VisLab's quick application prototyping is the proprietary software that has been developed in the last 10+ years and that constitutes the basis of each application developed by VisLab.

VisLab was one of the first laboratories to invest on vision technologies on board of vehicles, and its efforts are still contributing to shape the history of vehicular robotics.

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Selected VisLab Prototypes



MobLab was realized within the PROMETHEUS project. It implemented vision-based lane and obstacle detection.



In 1998, ARGO completed a 2000+ km drive on Italian highways in automatic mode, using visual perception only.



Equipped with stereo cameras, RAS demonstrated leader-follower functionality in icy Antarctica environments.



The start-inhibit system mounted on the Volvo Truck prevents the vehicle from taking off in front of pedestrians.



The Touareg used FIR and NIR cameras, together with radars, to perceive pedestrians in front of the vehicle.



TerraMax was the only vehicle to conclude the DARPA Grand Challenge using vision as primary sensor.



FIR cameras are used on board of unmanned boats to detect obstacles in their way.



Laser and cameras perceive pedestrians in urban environments for automatic braking.

The Research Group

The VisLab research team is composed by faculty members of the University of Parma, postdocs and researchers, all deeply committed to bringing artificial vision technologies to the robotics world. Thanks to an excellent and highly motivated team work, VisLab is providing research to many projects involving partners from all over the world: North America, Asia, Africa, and indeed Europe.

The Mission

VisLab's mission is to provide supervisory and fully autonomous systems to help vehicles reach a higher degree of safety. VisLab's interest started with road, off-road, and all-terrain vehicles, but has recently extended to cover maritime and aerial applications as well. VisLab's ultimate goal is to provide vehicles with a sufficiently complete and sharp perception to allow them to move autonomously in any environment.

VisLab Entrepreneurism

VisLab is not only performing advanced research for major car makers and automotive suppliers, but -thanks to its long experience in the field is also proposing a series of its own products, designed to satisfy specific market needs.

Main Research Streams

The main research themes that VisLab has been working on in the last decade are connected to perception on board of

vehicles. Both sensing technologies (using artificial vision and other complementary sensors) and processing techniques have been the focus of VisLab's efforts since its constitution. The most important achievements, some of which are regarded as worldwide milestones, cover the following applications:

Advanced Driving Assistance Systems: perception systems able to understand the surrounding environment and assess the danger level; in unsafe situations, such systems either warn the driver or take control of the vehicle bringing it back to safety conditions.

Automatic Driving Systems: perception systems that, besides understanding the surrounding environment, are able to model the 3D world and provide enough information to a following processing module that can safely drive the vehicle with no human intervention.

Other Applications

VisLab is also active in other fields where the application of visual perception plays a basic role, such as video surveillance and industrial inspection.

Technical Skills

The many projects brought VisLab's researchers in close contact with applications for which innovative techniques had to be developed and different technologies had to be mastered. Monocular, stereoscopic, and even 4-camera systems were developed in Daylight, Near, and Far Infrared domains, while sensor fusion with laserscanners, radars, and other vehicle data are now part of VisLab's expertise.



The VisLab Research Team