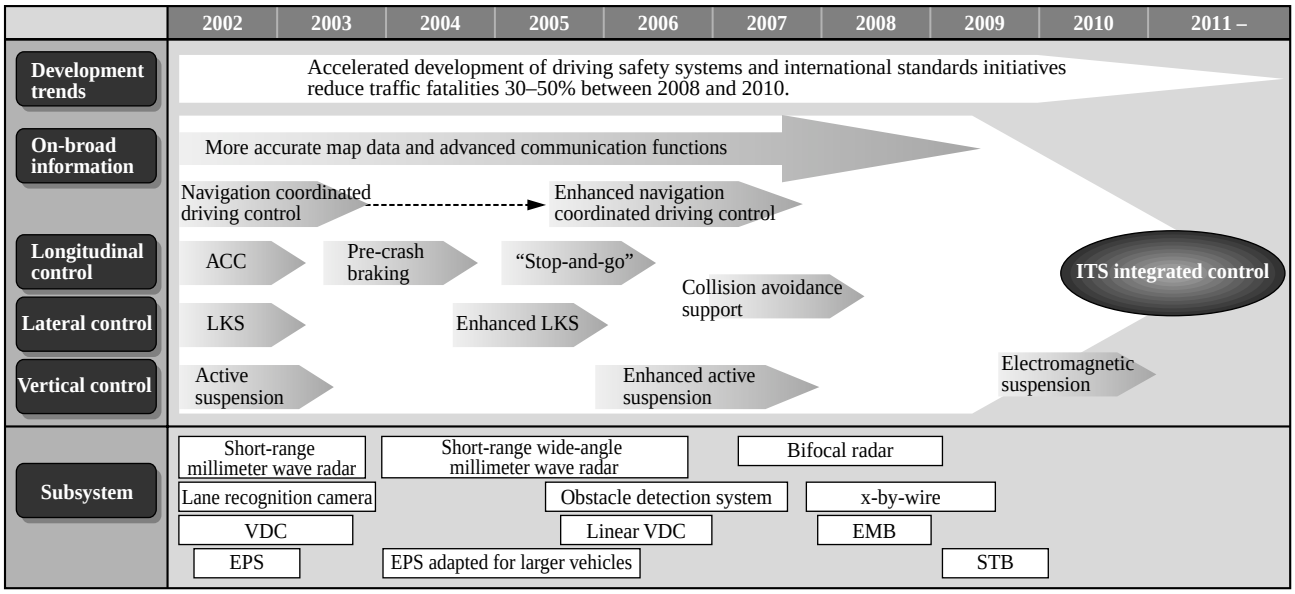
Trends in Drive Control Systems and Hitachi Group Initiatives



ACC: adaptive cruise control
LKS: lane keep support
VDC: vehicle dynamics control
EPS: electric power steering
EMB: electro-mechanical brake
STB: steer by wire
ITS: intelligent transport systems

TARGETING the timeframe from 2008 to 2010, Japan and the West are stepping up their efforts to develop more advanced vehicle safety technologies with the goal of slashing traffic accidents and fatalities by 30-50% and preventing accidents before they occur. Paralleling these efforts, a diverse range of global standardization initiatives are also moving ahead at a rapid pace.

Drive control systems are essentially systems supporting recognition, decision-making, and vehicle operation that correspond to these ongoing trends in society. For example, practical ACC systems are already available that automatically maintain the proper distance between a vehicle and the vehicle ahead, and currently work is well advanced on pre-crash brake system that detects the danger of collisions and automatically applies brakes if necessary. We can also expect to see stop-and-go systems* and much more sophisticated collision avoidance support systems in the not-too-distant future.

Practical versions of LKS systems that prevent drivers from drifting into neighboring lanes and active suspension systems that control vertical clearance have been developed and came into practical use. Here we can anticipate a range of different systems that markedly improve vehicle safety such an electromagnetic suspension systems providing much faster response. And as these various longitudinal, lateral, and vertical controls are harmonized, integrated, and eventually linked with car navigation and other in-vehicle information systems, this will lead to the emergence of advanced ITS integrated controls.

In order for these systems to become a reality, we must see further progress in the development of environment recognition sensors based on millimeter wave radar and image processing cameras as well as brake, steering, and other subsystems.

Supporting the evolution to ITS integrated control, Hitachi Group is committed not only to the types of systems already described but is also pursuing R&D on a wide range of drive control related subsystems and parts.

Millimeter wave radar, with its powerful detection capability and robustness under all sorts of environmental conditions, will be a critically important key technology for the further development of drive control systems. Hitachi Group has focused on

* Stop-and-go systems: ACC systems that extend the speed range to stop so that the systems can be used in congested stop-and-go driving conditions.

developing a variety of different radars for future stop-and-go systems and for collision avoidance support systems including short-range wide-beam millimeter wave radar and the highly economical bifocal radar.

One application of the image processing camera already implemented as a product is the lane recognition camera. The image processing camera has also been combined with millimeter wave radar in the development of an obstacle detection system for use as a collision avoidance support system.

In our work on brake systems, we extended the functionality of existing VDC systems, and plan to commercialize a linear VDC system enabling smooth braking control right down to a full stop. This could be implemented as a stop-and-go system that largely eliminates the sense of discomfort associated with stop-and-go traffic in the city.

Continuing the trend toward electrically-controlled steering systems, we plan to develop a series of products that would apply this technology not only to compact cars but to mid-size and larger vehicles as well.

Finally, as a basic enabling technology supporting the migration to ITS integrated control, we are building on technologies cultivated in the industrial sector to develop highly reliable x-by-wire systems that replace mechanical systems with electrical and electronic systems.