"Automated driving" that opens up the future

The advent of the age of personal mobility that performs automated driving while assessing the surrounding traffic conditions means that the “accident-free” mobility society of which Honda dreams is getting closer to reality. While the age of automated driving brings utility that enables everyone to reach his/her destination safely, there is also a concern that the values Honda has put into mobility, such as the fun of driving and the sense of excitement when starting on a drive, may be lost. How is Honda assessing automated driving in the forthcoming age, and what kinds of values will it create as a result? Toshio Yokoyama, Senior Chief Engineer at Automobile R&D Center of Honda R&D Co., Ltd. explains.

Toward a sustainable mobility society

Regarding the context in which so-called “automated driving” is drawing worldwide attention recently, I think that global issues can be divided into 2 major aspects, social and economic.

In the social aspect, there is an issue of increase in the number of traffic accidents worldwide in the last few years as a result of the progress of motorization in emerging countries. Meanwhile, in the developed countries, although the number of accidents is decreasing in absolute terms, the decreasing rate is leveling off, creating a situation in which no further advancement seems possible. In addition, approximately 1.2 million people are losing their lives from traffic accidents every year in the world, and approximately 90% of them are said to be attributable to drivers’ mistakes in operation.

Another factor to consider is that, in the developed countries, particularly in rural areas, there is high expectation for the realization of automated driving as a means to solve the issue of so-called “mobility poor” who are unable to have the freedom of mobility due to aging.

In the economic aspect, economic loss from traffic accidents in Japan amounts to 6.3 trillion yen*. Factoring
in the loss of time and energy consumption due to traffic congestion, the economic loss is much more enormous. Consequently, from the viewpoint of economy, and furthermore, from the viewpoint of ecology as well, we believe that automated driving will play a significant role.

On the basis of such assessment of issues, Honda held up an ideal of “no accidents with collision-free cars” and has been realizing numerous advanced driver-assistive safety technologies that contribute to “active safety,” “collision avoidance” and “passive safety.” In 2014, we coined the term “Honda SENSING”/“AcuraWatch” to collectively refer to key advanced driver-assistive safety technologies that would be installed in automobiles to be launched in the future, and we released the roadmap for safety technologies up to 2020 (p. 51). We included “Automated driving system” at the upper right of this roadmap, in order to clearly show our commitment to creating a new mobility value that will surpass “driver-assistive safety.”

Aiming at the realization of automated driving, a race is on for the development of technologies that involves not only automakers but also other industrial sectors, such as IT and electronics. Each company has its own focus, but there is no doubt that the race will be fought in the 4 technological areas of automated driving called “core technologies.”

First, there is a “localization” technology that recognizes the current location of a vehicle with the use of digital maps, GPS and so forth. Then there is a “driving road condition recognition” technology that recognizes other vehicles, pedestrians and others through the integration of information from multiple cameras, millimeter-wave radar, laser radar and other sources. The other two are a “path planning” technology that draws out the optimum path to a destination based on the result of recognition from the technologies mentioned above, and a “vehicle control” technology for the realization of safe and pleasant mobility. Depending on the degree of progress of these 4 technologies, driving road conditions and weather/traffic conditions to which the automated driving can be applied will be determined.

For the development of these technologies, Honda’s biggest advantage is the accumulation of technologies developed for the bipedal robot “ASIMO.” For ASIMO that walks while recognizing its current location and the surrounding environment and autonomously avoiding desks, chairs and other obstacles, cutting-edge technologies in robotics that integrate highly sophisticated technologies, sensor technologies, mechatronics and other technologies are utilized. Staff members for the development of ASIMO are involved in the development of automated driving technologies, and these members are bringing their abilities into full play for further refining the technologies required for automated driving. For example, during automated highway driving, it is necessary not just to drive straight but also to perform freeway entry/exit, lane keeping/changing and other sophisticated maneuvers.

At the ITS World Congress held in Detroit, Michigan in the United States in September 2014, Honda carried out its own demonstrations of intelligent driver-assistive safety...
technologies and automated driving technologies that we had developed so far. We showcased intelligent driver-assistive safety technologies, which combine “Honda SENSING”/“AcuraWatch” with “DSRC” (Dedicated Short Range Communications), and automated cruising, which includes freeway merging/exiting and lane changing. This is a declaration of Honda’s intention to put automated highway driving into practical use in the near future.

**Active participation in the creation of maps and other projects that are based on public-private partnership**

To realize automated driving on highways and open roads, it will become important from now on to engage in initiatives in what can be characterized as the area of partnership, with other companies in the industry, other industrial sectors, government agencies and other related parties.

Open roads are also used by pedestrians and cyclists. In addition, the complexity of the road environment cannot even be compared to the highways, due to the existence of intersections, traffic signals, and the inconsistent use of white lines to indicate lanes. To realize automated driving in such an environment, it is necessary to obtain information on real-time maps and conditions of roads ahead from the outside through communications. At the same time, it is also necessary to put legal frameworks in place, in order to clarify where the responsibility lies in case of the occurrence of an accident after the realization of fully automated driving. In other words, for the realization of automated driving, we need to proceed with activities in both of the following areas: the “area of competition” in which we will refine core technologies on our own and compete with others in safety, recognition accuracy for driving road conditions, etc., and the “area of partnership” in which the social infrastructure, such as roads and digital maps, and the legal frameworks will be put in place. Research on the “dynamic map,” which is pursued in the “Innovation of Automated Driving for Universal Services (SIP-adas)” project under the Japanese Government’s SIP (cross-ministerial Strategic Innovation promotion Program), can be characterized as a typical example in the area of partnership. Honda will strive to realize automated driving in compliance with international standards through active participation in worldwide projects based on the public-private partnership, in addition to the pursuit of research and development on our own.

**Example of the configuration of automated driving system**
**Bringing the joy of mobility that is uniquely Honda to automated driving as well**

Currently, as future images of cars, various corporations/organizations including Honda are proposing their visions of mobile study/living/meeting/entertainment space, but what we would like to emphasize is that, even with the advent of the age of automated driving, Honda will continue to offer the values that drivers have expected from personal mobility – the fun of driving, a sense of excitement, or how to enjoy the driving itself without setting any destination.

Mobility with no traffic accidents, congestion or environmental pollution while providing “the joy and freedom of mobility” to enable anybody at any location to go anywhere he/she desires anytime, which raises positive impacts in social/economic/environmental aspects to the ultimate level – that is the automated driving system for which Honda strives.

**TOPICS**

Realization of “omni-directional driving safety system” that coordinates with motorcycles, bicycles and pedestrians

At the “2014 ITS World Congress” in Detroit, in addition to automated highway driving, Honda also demonstrated an “omni-directional driving safety system,” which utilizes a technology called “V2X,” in an urban area. This system utilizes sensors installed on the vehicles, “DSRC” (Dedicated Short Range Communications) and other technologies. It exchanges information on locations, etc., with communication devices installed on motorcycles (V2M: Vehicle to Motorcycle) and bicycles (V2B: Vehicle to Bicycle), smartphones and other devices that pedestrians are carrying (V2P: Vehicle to Pedestrian). This system alerts the driver of the vehicle to the presence of others at an intersection with blind spots, for example, and applies the vehicle’s automatic brake when deceleration is required.