

## Smart Cars on Smart Roads: An IEEE Intelligent Transportation Systems Society Update

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**T**ransportation systems play a critical role in virtually all facets of modern life. However, significant challenges remain in further improving their efficiency and safety and in developing related value-added applications. Opportunities to meet these challenges emerge continuously, largely owing to fast-paced developments in a broad spectrum of related engineering, communications, and information technology fields, including pervasive computing.

The IEEE Intelligent Transportation Systems Society ([www.ieee.org/itss](http://www.ieee.org/itss)) is actively exploring such opportunities. Its goal is to bring together scientists and engineers interested in theoretical, experimental, and operational aspects of electrical and electronics engineering and information technologies as applied to intelligent transportation systems (see the “History of the ITSS” sidebar). ITS is a dynamic field, and, as we discuss here, many of its research streams involve pervasive computing research and applications.

### INTELLIGENT VEHICLES AND ROADS

The current generation of vehicles is already equipped with many different kinds of sensors, CPUs, software systems, and communication capacities. In the next few years, active in- and out-vehicle environment sensing will become standard, enabling intelligent driver and passenger assistance and increasing driving safety, efficiency, and comfort. Eventually, road infrastructures will also significantly change to provide better sensing solutions (among other benefits), but this will take more time.

Fortunately, several technologies already exist that can give vehicles additional information for safer operations and better performance. Examples include remotely controllable, locally activated, variable-message systems; RFID-type roadside sensors; and embedded barcode-like road marks. Some of these developments are straightforward applications of existing

pervasive computing frameworks, whereas others pose significant technical challenges and call for innovative solutions.

### TRAVELING IN INTELLIGENT SPACES

*Intelligent spaces* are environments that can continuously monitor what’s happening in them, communicate with their inhabitants and neighborhoods, make related decisions, and act on these decisions.

Embedding such intelligence in an automobile would be a natural next step for intelligent vehicles. Current in-vehicle applications of GPS, ad hoc networks, and sensor networks have already led the way. Future cars will behave more like intelligent agents traveling in intelligent spaces. For example, traffic control at intersections could employ cooperative-driving technologies implemented over ad hoc networks, instead of relying on traffic lights. Researchers working on such technologies aim for roads with zero fatalities.

### HISTORY OF THE ITSS

In 1994, the IEEE started forming various organizations to explore, in a synergistic manner, the use of electrical and electronics engineering, systems and control engineering, and information technologies in intelligent transportation systems applications. It first formed the Ad Hoc Committee on ITS and then the ITS Council. Then, in 2005, because the ITS community had matured and experienced steady growth, the IEEE Technical Activities Board approved the transition of the ITS Council to the IEEE ITS Society. The ITSS’s constitution defines ITS applications as “those systems utilizing synergistic technologies and systems engineering concepts to develop and improve transportation systems of all kinds” (see [www.ewh.ieee.org/tc/its/constitution.html](http://www.ewh.ieee.org/tc/its/constitution.html)).

### AGENT-BASED CONTROL

As connectivity becomes ubiquitous, agent-based control offers an ideal approach to transportation management, addressing its geographically distributed and alternately busy-idle operating characteristics. Intelligent, autonomous agents will traverse traffic control centers, road intersections, highways, streets, vehicles, houses, offices, and so on. They will use the Internet as well as wireless and ad hoc networks to collect the right

information at the right times and to make smart decisions. Agent-based control essentially transforms centralized operational algorithms into distributed operational agents, letting networked transportation systems operate on a management-on-demand or service-on-demand basis.

The articles in this special issue showcase some of the many other applications of pervasive computing methodologies and technologies in ITS. It's an exciting time to be an ITS researcher and practitioner, and the intersection of pervasive computing and ITS holds a lot of promise. **E**

## ITS RESOURCES

In addition to *IEEE Transactions on Intelligent Transportation Systems*, several ITSS sponsored conferences cover pervasive computing:

- IEEE Intelligent Transportation Systems Conference ([www.ewh.ieee.org/tc/its/itsc2007](http://www.ewh.ieee.org/tc/its/itsc2007)),
- IEEE Intelligent Vehicle Symposium ([www.iv2007.itu.edu.tr](http://www.iv2007.itu.edu.tr)),
- IEEE Vehicular Electronics and Safety Conference ([www.ieeeves.org](http://www.ieeeves.org)),
- IEEE Service Operations and Logistics, and Informatics Conference ([www.ssglobal.org/2007](http://www.ssglobal.org/2007)), and
- IEEE/ASME Mechatronic and Embedded Systems and Applications Conference ([www.asmemesa.org/mesa06](http://www.asmemesa.org/mesa06)).

Also, the ITSS has three technical subcommittees—intelligent vehicular technologies and applications, communication networks, and mobile communications—that sponsor activities directly related to pervasive computing (see [www.ewh.ieee.org/tc/its/officers.html](http://www.ewh.ieee.org/tc/its/officers.html)). We encourage pervasive computing researchers with an interest in ITS applications to participate in such activities.



### Stay on Track

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