NAIST® Research Highlights

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Networking

Efficient data sorting for wired cars

A more efficient system for data delivery should improve the performance of mobile apps for 'wired' vehicles

We are rapidly moving towards a world in which cars are continuously wired into mobile services that help drivers avoid traffic, accidents and construction to arrive — and park — at their destination. To facilitate these developments, researchers at NAIST have devised a system that could make it easier for such vehicular communication systems to obtain their data without overly burdening wireless networks[1].

In order to function, apps based on vehicular communication systems draw on traffic information and data transmitted from connected cars, pedestrians and other sources. Given that only a tiny fraction of this data will be of value to any user at a given time, an efficient system needs to act as a matchmaker — selectively delivering geographically relevant information from across the entire network. Atsuo Inomata, Kazutoshi Fujikawa and colleagues at NAIST have proposed a solution that could streamline this process and make it practical to bring vehicular communication systems and resources together on a nationwide scale.

Their approach is based on what is known as a publish–subscribe model. In this system, data-generating 'publishers' indiscriminately release resources into the network with classifying information that allows 'subscribers' (in this case, apps running on vehicular communication systems) to recognize whether those resources are relevant. For example, one vehicular communication system might report a traffic jam bringing cars to a standstill, but this will only be of interest to other drivers using a navigation app that might direct them onto the same highway.

Regulating the amount of information circulating in the network is a critical factor, however. "Larger scope is preferable for resource discovery, [but] may cause scalability issues," the authors write, while "smaller scope may fail to discover potential publishers."

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An efficient vehicular communication system that links mobile applications with useful navigational information can connect vehicles across a country as dense as Japan.

The team avoid swamping the system by limiting data publication to instances when a given vehicle changes its speed or direction, rather than continuously broadcasting. Communications between publishers and subscribers will depend on the interaction between mobile routers and devices with regional servers through what is known as the GeoNetworking protocol, a framework that makes it possible to assign a target address for data transmission based on geographic and topographic information.

In addition to demonstrating the theoretical feasibility of their system, the researchers note that their models demonstrate that this approach could be affordably expanded to efficiently relay data between large numbers of vehicles — "even in the highly-populated scenario in which all vehicles in Japan support the proposed system." As a next step, the researchers will be moving on to real-world implementation and testing.

Reference

1. Noguchi, S., Matsuura, S., Inomata, A., Fujikawa, K. & Sunahara, H. Wide-area publish/subscribe mobile resource discovery based on IPv6 GeoNetworking. *IEICE Transactions on Communications* **7**, 1706–1715 (2013).

More information about the group's research can be found at the Internet Architecture and Systems Laboratory webpage:
http://isw3.naist.jp/Contents/Research/cs-08-en.html