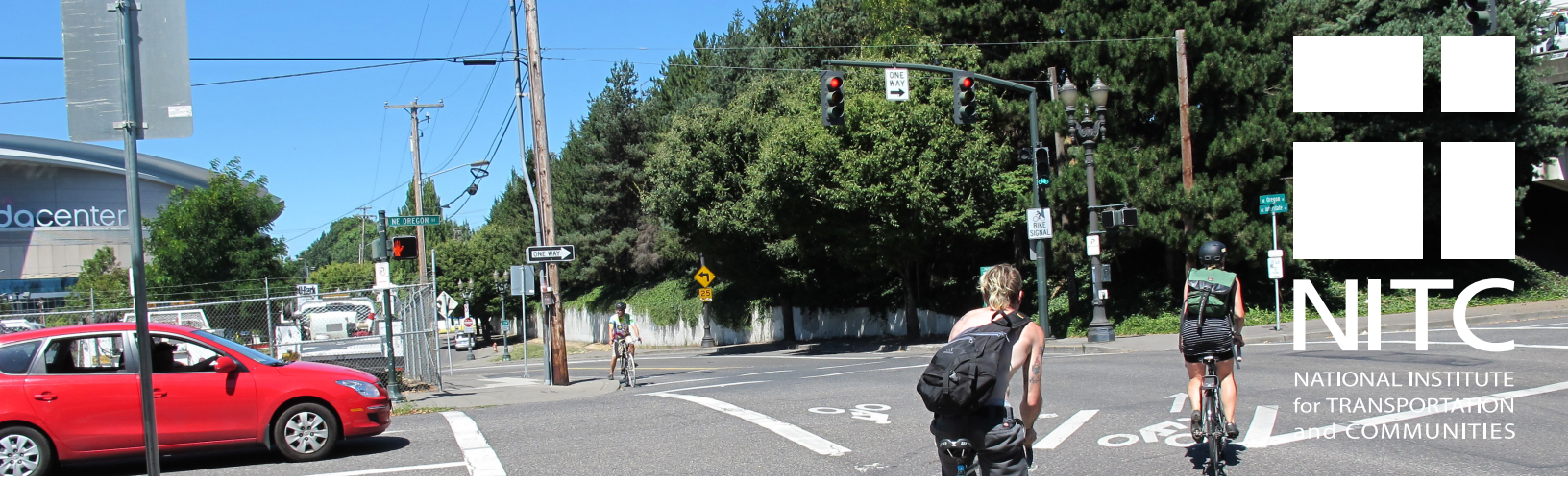


If Bikes Could Talk: Would Connected Vehicle Tech Get More People Riding?

John MacArthur

What if your bicycle could warn you that a car is coming from a side street you can't see? Or let you know that your front tire is getting a little low? As CV technology moves forward in the rest of the transportation system—with buses and streetcars requesting early green lights from the traffic signals, and cars chatting with each other about their locations and trajectories—there may be potential in the technology that may enable people to ride bikes who currently aren't, for a wide variety of reasons.

THE POTENTIAL FOR CONNECTED BICYCLES

Since the early 2010s, the U.S. Department of Transportation has been prototyping and assessing CV technologies. Researchers identified those that could benefit current and future bicyclists and grouped them into two categories: **situational sensing** and **two-way communication**.

SITUATIONAL SENSING

Situational sensing (see diagram on reverse) encompasses a myriad of technologies such as accelerometers, gyroscopes, GPS chips, light and motion sensors. Situational sensing technology can collect data on **trip information** (e.g. speed, distance), **bicyclist information** (e.g. heart rate, blood pressure), **bicycle status information** (e.g. tire pressure, battery life) and **environmental information** (e.g. potholes, weather, traffic).

SAFETY APPLICATIONS

Several of these CV technologies can detect and alert bicyclists of approaching vehicles, or direct them away from potentially dangerous intersections and routes. Some can detect a crash using data collected from an onboard accelerometer.

PHYSICAL APPLICATIONS

Many individuals face physical limitations that may deter them from bicycling. Integrated sensor technologies can be especially important for individuals facing health barriers, by providing pedal assistance and/or additional incident awareness.

NAVIGATION & MOBILITY APPLICATIONS

Bicyclists are sensitive to route obstructions such as congestion, roadwork/construction, and ground conditions like potholes, icy roads or debris. The detection of these hazards allows bicyclists to reroute their trip and avoid delay. Not knowing how long a trip will take can be a significant deterrent for choosing to travel by bicycle.

OTHER APPLICATIONS

Connected bicycle technologies can also help with security, real-time maintenance, and measuring and tracking personal performance metrics. These devices can make it easier for individuals with varying health conditions to monitor important metrics, which could permit the prevention of a health-related incident while bicycling.

TWO-WAY COMMUNICATION

Two-way communications (see diagram on reverse) between road users, or between a road user and the infrastructure, are another type of CV technology.

SAFETY APPLICATIONS

Two-way communication between bicyclists and other road users would provide bicyclists with many of the same safety benefits projected for CV operators. Bicyclists would be able to alert other road users of their presence and receive warnings regarding potential collisions, dangerous intersections and encroaching vehicles.

NAVIGATION & MOBILITY APPLICATIONS

Bicycle-to-infrastructure communication could provide bicyclists with real-time information regarding collisions, weather, recommended speeds, and road conditions. This information could be used to generate optimal routes

and to avoid potential delays. Improved travel time and reduced physical effort would help overcome two significant deterrents to bicycling, especially for commute purposes.

CONCLUSIONS

CV technology offers opportunities for growth in technology, innovation, and the overall bicycling mode share. The report authors believe that bicycle manufacturing companies, bicycle advocates, and active transportation planners should be included in the connected vehicle conversations taking place at all scales of government. As CV technologies advance, these groups have a unique opportunity to explore new concepts and encourage the integration of connected bicycles.

ABOUT THE AUTHORS

The research team consisted of John MacArthur, Michael Harpool, and Daniel Scheppke; Portland State University.

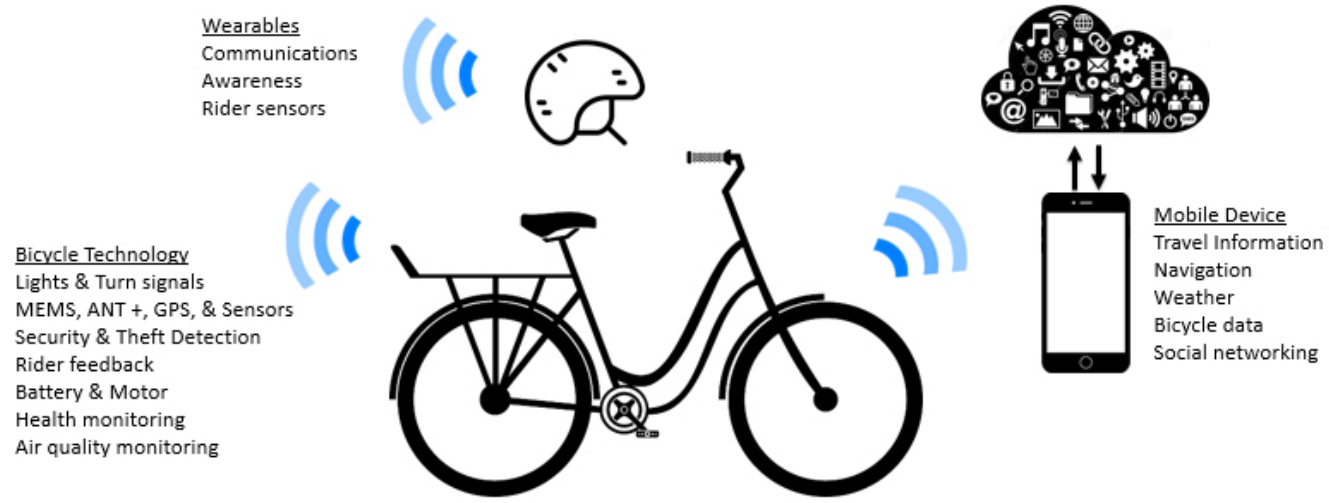
ABOUT THE FUNDERS

This research was funded by the National Institute for Transportation and Communities, with additional support from the Oregon Department of Transportation, Intel, and Portland State University.

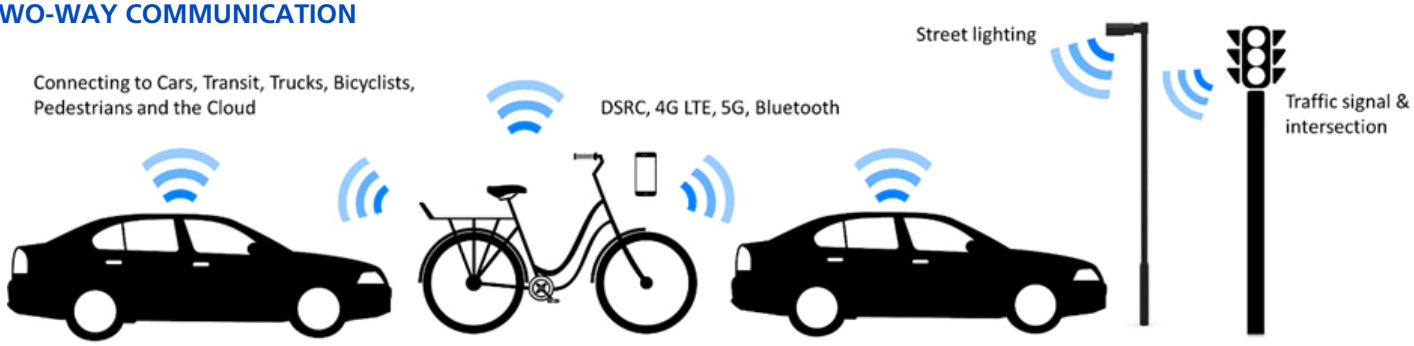
THE FULL REPORT and ONLINE RESOURCES

For more details about the study, download the full report **How Technology Can Affect the Demand for Bicycle Transportation: The State of Technology and Projected Applications of Connected Bicycles** at **https://nitc.trec.pdx.edu/research/project/759**

SITUATIONAL SENSING



TWO-WAY COMMUNICATION



The National Institute for Transportation and Communities (NITC) is one of seven U.S. Department of Transportation national university transportation centers. NITC is a program of the Transportation Research and Education Center (TREC) at Portland State University. This PSU-led research partnership also includes the Oregon Institute of Technology, University of Arizona, University of Oregon, University of Texas at Arlington and University of Utah.