

Urban Mobility—

REINVENTING THE WHEEL

Suggesting a bicycle is environmentally friendly is stating the obvious. But the Copenhagen Wheel, unveiled at the 2009 COP15 United Nations Climate Conference, is taking green technology and cycling in a new direction. Scheduled for release in June 2011, the Wheel was conceived and developed by the SENSEable City Lab, a research initiative at the Massachusetts Institute of Technology (MIT).

The smart/responsive Wheel allows the rider to capture the energy dissipated while cycling and braking and store it for later use. The “hybrid E-Bike” also maps pollution levels, traffic congestion and road conditions in real-time. Riders hook up to the Wheel through their smart phones and can lock/unlock the bike, change gears or select how much assistance they need from the motor.

“Our goal with the Copenhagen Wheel is to promote cycling by expanding the range of distance people can cover and by making the riding experience smoother,” says Assaf Biderman, associate director at the SENSEable City Lab. “When long distance and steep hills are no longer barriers to comfortable cycling, many cities can become more bicycle-friendly.”

The Copenhagen Wheel differs from other electric bikes in that all components are elegantly packaged into one hub. There is no external wiring or bulky battery packs, making it retrofittable into any bike. Inside the hub, City Lab has arranged a motor, three-speed internal hub gear, batteries, a torque sensor, general packet radio service (GPRS) and a sensor kit. In the future, riders will be able to spec out their bikes according to their personal riding habits and needs.

The Wheel’s sensing unit collects information on road conditions, carbon monoxide, noise, ambient temperature and relative humidity. The rider can access this information through his or

her phone or the Web and use it to plan healthier bike routes. It will also track the rider’s exercise goals.

“Bicycles are very efficient machines,” Biderman says. “Rather than reinventing them, we’re introducing a simple technological enhancement that allows any bike to become a smart and responsive hybrid.”

Cyclists utilizing the Wheel can also make bigger contributions through their daily commute. Sharing the information collected with the city allows city planners to cross-analyze different types of environmental data on a scale that has never before been achieved. It can also build a more detailed understanding of the impact of transportation on a city infrastructure or study dynamic phenomena like urban heat islands. Ultimately, this type of crowd sourcing can influence how a city allocates its resources, how it responds to environmental conditions in real-time or how it structures and implements environmental and transportation policies.

“Over the past few years we have seen a kind of ‘biking renaissance,’ which started in Copenhagen and is now transforming the urban experience in many cities from Paris to Barcelona or Montreal,” says Professor Carlo Ratti, director at SENSEable City Lab. “We could also call it a ‘Biking 2.0’ revolution, whereby cheap electronics allow us to augment bikes and convert them into a more flexible, on-demand system.”

While the navigation, health reporting and smart phone functions are fairly snazzy, one of the Wheel’s greatest technological achievements may be its smart security system.

“If someone rides away with it, the Wheel goes into a mode where the brake regenerates the maximum amount of power and sends you a text message with its location,” Biderman



says. “So in the worst case, the thief will have fully charged your batteries before you get back your bike.”

For more information on the Copenhagen Wheel, contact senseable-cph@mit.edu or visit www.senseable.mit.edu/copenhagenwheel/.