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LOCAL WARMING

MIT researchers develop a system to create personalized climates around individuals, as alternative to heating entire buildings.

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Cambridge, MA - MIT researchers have developed a system that creates personalized climates around individuals. The project, called "Local Warming," uses WiFi-based motion tracking and ceiling-mounted dynamic heating elements to project heat directly onto occupants of a building. As a result, each person is kept comfortable while the space around them is maintained at a lower temperature, thereby slashing total energy consumption. Local Warming will be presented for the first time as an installation at the International Exhibition of the 14th Venice Architecture Biennale, a bi-annual festival that opens on June 4, 2014. "Today a huge amount of energy is wasted on heating empty offices, homes, and partially occupied buildings," said professor Carlo Ratti, Director of the MIT Senseable City Lab, which lead the project's research and design. "Buildings are heated 24 hours a day, even when nobody is in them, and empty corners of the building are indiscriminately kept just as warm as rooms that are in active use. The technologies underlying Local Warming could address this asymmetry by synchronizing climate control with human presence, vastly improving the energy efficiency of buildings." Local Warming utilizes an array of dynamic heating elements to target a single person and create a precise personal climate around her. As a visitor enters a room, her location and trajectory are monitored in real time using a new WiFi-based location tracking technology developed at the MIT Center for Wireless Networks and Mobile Computing, directed by Professor Dina Katabi, and housed in MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL). This information is then transmitted in real time to an array of dynamic heating elements positioned in a grid near the ceiling. Each element is composed of a small servo-motor to change direction, a bulb to generate infrared radiation, a cold mirror and other optics to create focused beams. "Collimated infrared heat is emitted to generate what are essentially spotlights of warmth centered on people a few meters away" explains Leigh Christie, project engineer. "This ensures ubiquitous comfort - people feel as if they are inside a personal 'thermal cloud' - while improving the overall energy efficiency," Christie said. "With a dynamic system like Local Warming in place, buildings may not need to waste as many resources on climate control," added Miriam Roure, project lead. She noted that the first commercial application of this technology might be responsive outdoor heaters, which warm people as they move through exterior or semi-covered spaces. Local Warming systems could then be installed in large lobbies or industrial lofts - spaces that are often sparsely occupied. It is in these conditions that Local Warming could have the greatest impact, giving occupants the same thermal comfort as traditional systems while reducing energy consumption by an order of magnitude. As the technology is developed further, it could allow each person to define her own bubble's specific temperature and other heating characteristics via smartphone. "Local Warming allows participants to engage with their climate directly and to enact a new type of efficient, localized climate control," Roure concluded. "Local Warming is a new approach in the broader history of climate systems," said Matthew Claudel, project curator. "The earliest heating technology was the fire pit, a fixed domestic element that people gathered around. Throughout the history of architecture, climate has become unmoored, with the development of pipes and thermostats. Today, man no longer seeks heat - heat seeks man."

This year's Venice Architecture Biennale, curated by Dutch architect Rem Koolhaas, is an investigation of core elements of architecture - or, "fundamentals" - and their progression through history. Local Warming is a main component of the Central Pavilion of the Giardini, installed in the room that focuses [specifically] on the "Fireplace". The project was developed by MIT Senseable City Lab together with the MIT Center for Wireless Networks and Mobile Computing (motion tracking) and architecture firm Carlo Ratti Associati

(installation design). The project is sponsored by the MIT Energy Initiative and energy utility company ENEL.

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High-resolution images are available for download from the Senseable City Lab website at <http://senseable.mit.edu/local-warming/press/LWPressImages.zip>.

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KEY INFORMATION 14th Venice Architecture Biennale 7 June - 23 November 2014 Vernissage on 4 June, global press preview on 5 and 6 June Website: <http://senseable.mit.edu/>

ABOUT THE MIT SENSEABLE CITY LAB The Senseable City Lab at MIT (Massachusetts Institute of Technology) is a multidisciplinary research group that studies the interface between cities, people, and technology. The Lab explores the imminently possible through carefully designed questions and speculative answers. Not bound by traditional academic methodologies, the Lab is characterized by an omni-disciplinary approach, bringing together designers, planners, engineers, physicists, biologists, mathematicians, as well as social, computer, systems, and data scientists. Senseable City Lab collaborates with industry partners and metropolitan governments on a broad spectrum of projects, aiming to open new possibilities for citizens and new opportunities for urban communities around the world.

FULL PROJECT TEAM Concept and Project Lead: MIT Senseable City Lab (Director: Carlo Ratti; Associate Director: Assaf Biderman; Research Lead: Yaniv Turgeman; Engineering Lead: Leigh Christie; Project Lead: Miriam Roure; Curator: Matthew Claudel; Electrical Engineer: Carlos Greaves; Research Advisor: Rex Britter; Motion Control and Visualization: Matthias Danzmayr, Jacob Fenwick, Shan He, Pierrick Thebault; Fabrication and Design: Ricardo Alvarez, Thomas Altmann, Dorothy Bassett, Gene Chunyayev, Clara Cibrario Assereto, David Dowling, Feifei Feng, Sebastian Grauwin, Chris Green, Elyud Ismail, Sam Judd, Jessica Marcus, Aaron Nevin, Jessica Ngo, Oleguer Sagarra Pascual, Kristopher Swick, Michael Szell, Remi Tachet des Combes) Motion tracking: MIT Center for Wireless Networks and Mobile Computing (Director: Dina Katabi; Motion Tracking Design: Deepak Vasisht, Jue Wang) Exhibition Design and Production: Carlo Ratti Associati (Project Architect: Saverio Panata; Design Team: Pietro Leoni, Walter Nicolino, Giovanni de Niederhausern) Exhibition Construction: DesignLab

Graphic Design: Jessica Svendsen Special Thanks to: MIT ACT (Seth Avecilla and Madeleine Gallagher) Sponsors: MIT Energy Initiative, ENEL

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