



IPN and Massachusetts Institute of Technology Create Mobile Intelligent Urban Sensor for Environmental Monitoring

- Operates with cutting-edge technology and Artificial Intelligence to enhance environmental platforms; provides data on carbon monoxide (CO) and PM 2.5 and PM 10 particles.
- Developed with ESCOM researchers; can be installed on public transportation to contribute data to fixed environmental monitoring stations.

Scientists from the Instituto Politécnico Nacional (IPN) and the Massachusetts Institute of Technology (MIT) have developed an Urban Sensor that operates with cutting-edge technology and Artificial Intelligence (AI) to strengthen the platforms of environmental organizations and improve air quality monitoring.

This technological innovation generates real-time GPS positioning coordinates to produce data to aid decision-making and protect public health. It provides information on carbon monoxide (CO) and suspended solid particles such as PM 2.5 and PM 10 at pedestrian mobility levels.

Roberto Zagal Flores, a researcher at the Escuela Superior de Cómputo (ESCOM) and head of the Urban Data Laboratory, along with Ángel Alejandro Ruiz Enríquez, a student in the Master's Program in Mobile Computing and graduate of the Data Science undergraduate program, collaborated with MIT's Senseable City Lab scientists Simone Mora and Fabio Duarte. Together, they combined expertise to develop this low-cost Urban Sensor, which can be installed on public transportation to supply additional data to fixed environmental monitoring stations in various Mexican cities.

MIT's team provided the technological platform (an open-source system called Flatburn), which was then modified by IPN scientists using state-of-the-art sensors and solar panels.

Dr. Roberto Zagal Flores, who holds a Ph.D. in Advanced Technology from the Unidad Profesional Interdisciplinaria en Ingeniería y Tecnologías Avanzadas (UPIITA), explained





that the compact IPN device was installed on buses servicing the route from Metro La Raza to ESCOM (Zacatenco) in Mexico City. The goal was to measure environmental pollution levels in areas with high pedestrian mobility.

The project, named Intelligent Urban Sensor or Urban Well-Being by IPN, originates from an MIT initiative under the Misti Fund (MIT-Center for Global Experiences). Through this program, MIT—ranked among the world’s top institutions—aims to engage its students and faculty with international peers to address the planet’s most pressing challenges, including health, climate, artificial intelligence, and sustainability.

"With this fund," said Zagal Flores, "we secured resources for MIT and IPN scientific teams to convene in Boston starting in 2022, conducting seminars, workshops, collaborations, and knowledge-sharing sessions to address urban challenges. We agreed that implementing this technology in Mexico City was essential for providing pedestrian-level data."

He noted that the Urban Sensor was designed in a modular fashion to ensure scalability and allow for the integration of additional sensors with new capabilities, such as a thermal camera for heat data collection in specific areas and sensors for sulfur dioxide and nitrogen measurement.

He also clarified that the technology developed by IPN within the framework of the Urban Sensor project is eligible for patent protection. With the newly integrated software and hardware components, along with Artificial Intelligence, the IPN Urban Sensor can generate recommendations for environmental authorities, making it an essential tool for Mexico’s transition toward Healthy and Smart Cities.

For more information, visit www.ipn.mx

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