

Gonzalez says these are questions that will have to be answered as drones become used more frequently.

The U.S. military has been using drones for surveillance in foreign conflicts, and the U.S. Department of Homeland Security and U.S. Customs and Border Protection have been using drones to monitor activity on the nation's borders. US CBP has the largest U.S. drone fleet of its kind outside of the military. But there has been considerable criticism of both programs from many groups, including the American Civil Liberties Union (ACLU), which argues that drones limit privacy and personal liberties.

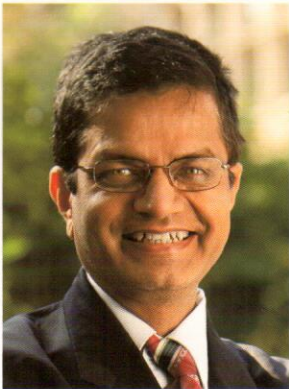
Police departments, such as the St. Louis Metropolitan Police Department, have advocated for the use of drones to assist them

in watching over large crowds or to help chase a suspect. While some police departments are using drones, the implementation nationwide has been slow due to privacy and safety concerns.

“Do we want to have particular rules for police drones, particularly weaponized drones with teargas or missiles or plastic flechette guns to control crowds, and do we want to have particular procedures in place before police will deploy a drone against civilians in the U.S.?” Richards asks. “These are things that we want to work out soon rather than after the fact. We’re going to need to strike some balances between police effectiveness and civil liberties and between the ability to use drones to look at the world and people’s rights of privacy against being spied on.”



Other applications



Raj Jain, PhD

Raj Jain, PhD, professor of computer science & engineering, is working on other applications for drones in his lab. Jain's group is working on a project called Cellular System for Emergency and Disaster Relief, based on the concept that natural disasters can compromise ground-based communication infrastructure, making it difficult for victims to contact safety personnel and for those personnel to communicate warnings. Under their proposal, unmanned aerial vehicles could be used to provide cellular access to users with standard mobile phones, improving communication during times of crisis.

“Ninety-six percent of the world has cell phones,” Jain says. “When there is any emergency, such as a hurricane or other natural disaster, cell towers are useless, and that is the time everyone wants to call someone.”

In addition, Jain says drones with sensors, which cost about \$700, can be sent up for many other applications, including in forests to detect wildfires, temperature and carbon dioxide; in oil and gas exploration; wildlife and environmental monitoring; and in agriculture, in which sensors can be placed in crops to detect moisture levels or temperature.



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Drones: Wave of the future or nuisance?