

ENVIRONMENTAL monitor

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Drone River Project

Monitoring the health of a river requires many types of tasks: visiting sites, gathering samples, fielding calls, evaluating data, determining corrective actions when problems arise and deciding whether changes in monitoring are needed, among others. In many cases, there simply aren't enough people to do all these tasks effectively. And some tasks, especially repetitive ones, might be done more reliably if they were not being performed by humans, but by intelligent machines.

Alberto Camacho, a PhD candidate in artificial intelligence at the University of Toronto and Patricio Córdova, a master's student studying applied computing at the same university, took up the challenge of automating many river monitoring tasks to improve efficiency in a prototype system they refer to as the Drone River project. The Drone River project system consists of an automated call center, sensors placed systematically along a river and a series of drones powered by solar energy that can perform a variety of monitoring tasks. The Ottawa River was used as a theoretical test case.

The Drone River monitoring system response starts with a variety of sensors placed along the river of interest. The sensors would monitor the river in real time, looking for readings outside normal parameters to detect problems. An automated call center, which Camacho and Córdova have already developed, would attend to phone calls and text messages and perform lan-

guage processing to understand problems reported by civilians. A unique feature of the Drone River project is that, in addition to phone calls or sensors reporting problems, a social media search can also be automatically performed to see if anyone is talking about problems in the river, which would trigger a system alert.

As Camacho mentions, "Once the system detects an anomaly using either method or both, the system automatically responds. A drone will be sent to inspect the affected area, taking pictures, recording videos or even deploying extra sensors. This makes it possible to have a complete report that will be sent to the authorities in the required format, thus speeding up the process to solve the problem and preventing its extension."

Some of the river characteristics the Drone River sensors could continuously monitor for are pH, dissolved oxygen, oxidation-reduction potential, conductivity (salinity), turbidity, temperature and dissolved ions.

Córdova adds that, "Since the sensors that take these measurements are connected to the cloud, we can perform the analysis of the water on the cloud and trigger further actions." As a part of routine monitoring or in response to sensor information, the drones could also be trained to do routine tasks such as taking samples from the river. **EB**