

# Using virtual worlds to 'soft control' people's movements in the real one

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Eighty-eight percent of Americans now own a cell phone, forming a massive network that offers scientists a wealth of information and an infinite number of new applications. With the help of these phone users — and their devices' cameras, audio recorders, and other features — researchers envision endless possibilities for gathering huge amounts of data, from services that collect user data to monitor noise pollution and air quality to applications that build maps from people's cell phone snapshots.

Today, user data provides some opportunities; for example, researchers can use Flickr photos to compile 3-D virtual representations of various landmarks. But even opportunities like these have limits, as researchers are limited to using only photos that people choose to take and share. This creates a significant imbalance: Some geographic areas and landmarks have thousands of Flickr photos, while others have none.

"Take the Lincoln Memorial, for example," said Fabian Bustamante, associate professor of electrical engineering and computer science at the McCormick School of Engineering. "Flickr has thousands of photos of the front of the Lincoln Memorial. But who takes a picture of the back? Very few people."

This has led researchers to ask the questions: How can we get mobile users to break out of their patterns, visit less frequented areas, and collect the data we need?

Researchers can't force mobile users to behave in a certain way, but researchers at Northwestern University have found that they may be able to nudge users in the right direction by using incentives that are already part of their regular mobile routine.

"We can rely on good luck to get the data that we need, or we can 'soft control' users with gaming or social network incentives to drive them where we want them," Bustamante said.

In the paper, "Crowd Soft Control: Moving beyond the Opportunistic," Bustamante and his group designed a way to "soft control" people's movements by tapping into games or social networking applications. For example, a game might offer extra points if a player visits a certain location in the real world, or it might send a player to a certain location in a virtual scavenger hunt.

To test crowd soft control, the researchers created Android games, including one called Ghost Hunter in which a player chases ghosts around his neighborhood and "zaps" them through an augmented reality display on his phone. In actuality, the player's zapping motion snaps a photo of the spot where the ghost is supposedly located.

Unlike a regular "augmented reality game," where the ghosts might be placed randomly, in Ghost Hunter the researchers are able to manipulate where the ghosts are placed; while some are placed in frequently traveled areas, others are located in out-of-the-way, rarely photographed locations.

The game was tested on Northwestern students, who were told only that they were testing a new game. They were not informed which ghosts were placed randomly and which were placed for research purposes.

"We wanted to know if we could get the players to go out of their way to

get points in the Ghost Hunter game," Bustamante said. "Every time they zapped a ghost, they were taking a photograph of Northwestern's campus. We wanted to see if we could get more varied photographs by 'soft controlling' the players' movements."

The participants were willing to travel well out of their regular paths to capture the ghosts, the researchers found. For example, researchers were able to collect photos of Northwestern's Charles Deering Library from numerous angles and directions — a far broader range of data than the random sampling found on Flickr, where photographs overwhelmingly capture the front of the library.

"Playing the game seemed to be a good enough vehicle to get people to go to these places," said John P. Rula, a McCormick graduate student and the lead author of the paper.

If this technology were implemented on a larger scale, users would need to be notified that their data was being collected for research purposes, Bustamante said.

"Obviously users need to know where their data is going," he said, "and we take every measure to protect user privacy."

**More information:** The paper was presented in February at the Thirteenth Workshop on Mobile Computing Systems and Applications (HotMobile).

Provided by Northwestern University

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