

SPACE WAR
YOUR WORLD AT WAR

TERRADAILY
REAL ESTATE MARKET DATA

ENERGY DAILY
THE BEAT OF YOUR BUSINESS

MARS DAILY
THE BUREAU OF SPACE WEATHER

SOLAR DAILY
HOW HOT IS IT OUT THERE

SPACE MART
GETTING FROM SPACE TODAY

GPS DAILY
CONNECTING PEOPLE TO MAPS

SPACE TRAVEL
EXPLORATION AND YOU-TOO

THE 2012 Mazda3
IF IT'S NOT WORTH DRIVING,
IT'S NOT WORTH BUILDING.

STARTING AT \$15,200*

[EXPLORE NOW](#)

MazdaUSA.com Legal

SPACE DAILY

your portal to space

Advertisement

GPS Fleet Tracking
See the SageQuest Difference With a Live Demonstration.
www.Sage-Quest.com

Wireless Temperature Sensor
Our Business Is Temperature! Visit Our Extensive Product Catalog Today
www.TinTemp.com

GPS Fleet Tracking
Reduce Fleet Costs, Increase Profit See It Work Now - Free Live Demo!
www.FleetMatics.com/Fleet

Last Call At the Oasis
We can solve the water crisis. Watch the film in theaters May 4!
lastcallattheoasis.com

Water Conservation Award
Siemens is proud to be sponsoring the 79th US Conference of Mayors.
www.siemens.com/water

[Ads by Google](#) [GPS Tracking](#) [GPS Track](#) [GPS Systems](#) [Salt Water](#)

Be the first of your 1

Get Our Free Newsletters Via Email
your email address ...

[Buy Advertising](#) [Editorial Enquiries](#)

GPS DAILY

Floating robots use GPS-enabled smartphones to track water flow

by Sarah Yang
Berkeley CA (SPX) May 16, 2012

A fleet of 100 floating robots took a trip down the Sacramento River in a field test organized by engineers at the University of California, Berkeley. The smartphone-equipped floating robots demonstrated the next generation of [water monitoring](#) technology, promising to transform the way government agencies monitor one of the state's most precious resources.

The Floating Sensor Network project, led by associate professor Alexandre Bayen, a researcher at the Center for Information Technology Research in the Interest of Society (CITRIS), offers a network of mobile sensors



Andrew Tinka tosses a floating robot into the Sacramento River. (Jerome Thai photo).

▶ that can be deployed rapidly to provide real-time, high-resolution data in hard-to-map waterways.

One area that stands to benefit from this technology is the Sacramento-San Joaquin River Delta, with its complex network of channels that direct drinking water to two-thirds of California's population and irrigation water for 3 million acres of agriculture.

Having a high volume of sensors moving through the water can shed light on processes that are influenced by how water moves, such as the spread of pollutants, the migration of salmon or how salt and fresh water

Solar Water Heating
A system that captures the warmth of the sun to help your current water heater use less energy.

Find rebates and more.
Get started [NOW](#)

water heated by the sun.com

GO solar CALIFORNIA

EVERYBODY NEEDS ONE

PT1 POCKET TESTER
Conductivity/TDS/Salinity Pen
TEMPERATURE REPORTED WITH EVERY READING

NEW!

MYRON L. COMPANY
MYRONL.COM

spread of pollutants, the migration of salmon or how salt and fresh water mix in the Delta's ecosystem, the researchers said. Today's field test gave researchers a picture of how water moves through a junction in the river with a resolution never before achieved.

"We are putting water online," said Bayen, who holds joint appointments in UC Berkeley's departments of electrical engineering and computer sciences and of civil and environmental engineering.

"Monitoring the state's water supply is critical for the general public, water researchers and government agencies, which now rely upon costly fixed water sensor stations that don't always generate sufficient data for modeling and prediction.

The mobile probes we are using could potentially expand coverage in the Delta - on demand - to hundreds of miles of natural and manmade channels that are currently under-monitored, and help agencies responsible for managing the state's limited water supply."

Such a flexible system could be critical in the event of an emergency, including a levee breach or oil spill, the researchers noted. The sensors could be thrown into action from a dock, shore, boats or even helicopters.

"If something spills in the water, if there's a contaminant, you need to know where it is now, you need to know where it's going, you need to know where it will be later on," said Andrew Tinka, a Ph.D. candidate in electrical engineering and computer sciences and the lead graduate student on the project. "The Floating Sensor Network project can help by tracking water flow at a level of detail not currently possible."

The May 9 launch in Walnut Grove, Calif., marked a milestone in the project, which is supported by CITRIS and the Lawrence Berkeley National Laboratory (Berkeley Lab). It was the first time researchers deployed their full arsenal of floats, each equipped with GPS-enabled mobile phones encased in 12-inch-long watertight capsules marked with fluorescent tape. The researchers wrote specific programs to run on the open source platforms used in the robots and on the smartphones.

The project is an evolution of earlier research led by Bayen called Mobile Century and Mobile Millennium, which uses GPS-enabled smartphones to monitor traffic flow. Instead of a map of traffic, the Floating Century mobile probes created a map of water flow.

Every few seconds, the phones in the floats transmitted location data back to servers at Berkeley Lab's National [Energy Research](#) Scientific Computing Center (NERSC), where the data was assimilated using a computer model called REALM (River, Estuary and Land Model). Information was processed to create a map that allowed researchers to track the devices on their computer monitors.

"Not only is this project interesting from a data collection perspective, but it also presents a new challenge for us on the data processing side," said Shane Canon, head of the Technology Integration Group at NERSC. "While the total amount of data is not unusual, the streaming rate is higher than we usually see, and the researchers are looking to access the data in near real-time."

The REALM model was developed by researchers at the Berkeley Lab and the California Department of Water Resources. It was later expanded to integrate data from mobile robots by Qingfang Wu, a UC Berkeley graduate student in civil and environmental engineering.

"Part of the novelty of this project is the use of the NERSC computer cluster to run large-scale data assimilation problems," said Wu. "The floating sensor project demands the ability to process hundreds of parallel versions of REALM and integrate the results into an estimate of the hydrodynamics of the Delta."

Although the sensors in the test were set up to monitor the speed of water currents, the researchers said the floats could be equipped with sensors for a variety of measurements, including temperature, salinity, or a contaminant of interest.

Of the 100 floats in the fleet, 40 were autonomous devices fitted with propellers to help them move around obstacles or targeted areas.

"The major constraint on floating sensors in inland environments is their tendency to get stuck on the shores," said Tinka. "Currently, using floating sensors requires close human supervision. We are developing autonomous, actuated sensors that can use propulsion to avoid obstacles."

The Floating Sensor Network's fleet of robots includes prototypes with advanced capabilities, including models that can dive below the surface of the water, versions equipped with salinity sensors to measure the water quality in rivers, and versions with depth sensors that can map out the shape of the channels in which they float.

"Our development efforts show the versatility of this technology and how it can adapt to the challenges faced in different applications," said Bayen. "For example, the capability to measure depth is particularly important in situations where it is impractical or dangerous to send personnel to do the job, such as in military operations in combat zones. Floating sensor fleets also provide capabilities which can be used to improve our understanding of the shape of domestic rivers and deltas."

The floating sensor network has been tested in collaboration with the U.S. Department of Homeland Security and the U.S. Army Corps of Engineers to assess water discharge downstream from broken levees. The researchers are also planning a deployment to monitor the ecosystem of Lake Tahoe in the coming months.

Floats are retrieved at the end of experiments, but the researchers acknowledged the possibility that devices can get lost. The researchers said they expect the expense of individual sensors to go down with continuing advances in mobile communications so that the system can better tolerate a certain level of device dropout.

"In the future, [cost](#) and size will go down, while performance and autonomy will go up, enabling monitoring at unprecedented scales," said Bayen. "We expect this to become an invaluable tool for the future management of a critical resource in this state and around the world."

Related Links

- [Floating Sensor Network](#)
- [UC Berkeley News Center](#)
- [GPS Applications, Technology and Suppliers](#)


Be the first of your
 1



Immediate Savings!

LEARN MORE!

Comment on this article via your Facebook, Yahoo, AOL, Hotmail login.



Post to Facebook Posting as Jonathan Beard ([Change](#))

Facebook social plugin

Share this article via these popular social media networks

-  [del.icio.us](#)
-  [Digg](#)
-  [Reddit](#)
-  [Google](#)

- [Ads by Google](#)
- [GPS Tracking](#)
- [GPS Track](#)
- [GPS Systems](#)
- [Salt Water](#)

GPS DAILY

North Korea stops jamming South's GPS: official

Seoul (AFP) May 15, 2012

North Korea has stopped transmitting signals which jammed the GPS systems of hundreds of civilian aircraft and ships in South Korea for two weeks, officials said Tuesday. The state Korea Communications Commission said the signals designed to jam global positioning systems halted as of 8:34pm on Sunday. The transport ministry confirmed civilian flights had not been affected since Sunday n ... [read more](#)



MOON DAILY

Perigee "Super Moon" On May 5-6

India's second moon mission Chandrayaan-2 to wait

European Google Lunar X Prize Teams Call For Science Payloads

Russia to Send Manned Mission to Moon by 2030

MARS DAILY

Opportunity Rolling Again After Fifth Mars Winter

Mojave Desert Tests Prepare for NASA Mars Roving

Mars Opportunity Rover Is A Go For More Travel

WSU air-quality researcher to lead field studies in support of NASA Mars mission

SPACE TRAVEL

JPL Invites all Earthlings to Annual Open House

ATK Announces Complete Liberty System to Provide Commercial Crew Access

NASA Conducts Tests on Orion Service Module

Boeing Completes Full Landing Test of Crew Space Transportation Spacecraft

DRAGON SPACE

Shenzhou 9 to be ready for mid-June launch?

China confirms plans to build own orbital station

Building a Heavenly Palace in outer space

Long March-2F rocket delivered to launch center

STATION NEWS

Russia launches astronauts after 5-month break

Three astronauts blast off for ISS on Russian rocket

New Space Station Crew in Orbit

Middle School Students Send Commands to the International Space Station

LAUNCH PAD

Ariane rocket launches two Asian satellites

Japan enters commercial space race

Refurbishment on Grand Scale for Iconic VAB

EchoStar XVII comes to French Guiana for a dual-payload Arianespace flight in June with Ariane

EXTRA SOLAR

In search of new 'Earths' beyond our Solar System

Cosmic dust rings no guarantee of planets

Free-floating planets in the Milky Way outnumber stars by factors of thousands

Unseen planet revealed by its gravity

TECH SPACE

US class-action ebook price-fixing suit can proceed

At least half of S. Korea cellphone users on smartphones

Greenpeace members arrested in Apple 'cloud' demo

VPT Adds 15 Amp Point of Load DC-DC Converter to Space Family of Power Conversion Products



[Tempur-Pedic
Mattress
Comparison](#)

[SPACE MEDIA NETWORK PROMOTIONS](#)

[Solar Energy Solutions](#)

[Memory Foam Mattress Review](#)

**Newsletters :: SpaceDaily Express :: SpaceWar Express ::
TerraDaily Express :: Energy Daily
XML Feeds :: Space News :: Earth News :: War News :: Solar
Energy News**

The content herein, unless otherwise known to be public domain, are Copyright 1995-2012 - Space Media Network. AFP, UPI and IANS news wire stories are copyright Agence France-Presse, United Press International and Indo-Asia News Service. ESA Portal Reports are copyright European Space Agency. All NASA sourced material is public domain. Additional copyrights may apply in whole or part to other bona fide parties. Advertising does not imply endorsement, agreement or approval of any opinions, statements or information provided by Space Media Network on any Web page published or hosted by Space Media Network. [Privacy Statement](#)