Smartphone network could track incoming cosmic rays

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Your smartphone could become part of the world's largest telescope. A team led by UC Irvine physicist Daniel Whiteson and UC Davis physicist Michael Mulhearn has designed an app to turn the global network of smartphones into a planet-sized cosmic ray detector, according to a paper posted today to the physics website arXiv.

A long-standing puzzle in astrophysics is the source of ultra-high-energy particles from space that hit Earth. Called cosmic rays, they're up to a billion times more energetic than particles at CERN's Large Hadron Collider. They strike the atmosphere and cause an enormous shower of other particles, mostly muons, electrons and photons, over a wide area. Though they were discovered decades ago, cosmic rays at these high energies are very rare, making it difficult to pinpoint where in the universe they originated.

"Whole square kilometers can be drenched in these particles for a few milliseconds," said Whiteson, associate professor of physics & astronomy at UCI. "The mystery is nobody knows where these crazy, high-energy particles are coming from or what's making them so energetic. But they can be captured by technology in smartphones' cameras."

The app, dubbed CRAYFIS (Cosmic Rays Found in Smartphones), collects data when the phone is connected to a power source and has not been used for several minutes, in order to not interfere with normal phone usage or drain battery levels. Anyone with an Android or iOS

smartphone or tablet will be able to participate in the detector network. If an individual's phone gathers data used in a scientific paper, he or she will be offered authorship. The app can also run in anonymous mode.

The silicon-based sensors in smartphone cameras use the same principles as detectors at CERN and elsewhere to identify the particles. But because the particles arrive so infrequently, a very large detector – such as a global network of smartphones – is needed.

As a side benefit, the same data can be used to calculate local levels of radiation from radon or other sources and function as an alarm system. The network of phones could provide a real-time radiation weather map, following the movement of plumes, for instance.

While it has recently been shown elsewhere that individual smartphones can spot particles, this is the first attempt to demonstrate that if enough devices are connected, a networked, worldwide detector can rival or exceed the scientific capabilities of huge, dedicated cosmic ray experiment sites such as the Auger Experiment in South America.

The team has been working on the project for nearly a year. The app is ready, and the researchers are now locating servers able to handle myriad users. Anyone interested can sign up to become part of the network as it expands.

Provided by University of California, Irvine