

## Innovation: 19th-century tech makes a smarter iPhone

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Yaw, meet pitch and roll (Image: Yell)

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Rarely has 19th-century technology stirred an audience of 21st-century technophiles as it did last week when Apple co-founder Steve Jobs revealed that the next-generation iPhone [will pack a gyroscope](#). But will this new sensor be, in Jobs's words, "just perfect for gaming"?

The GPS, compass and accelerometer crammed into today's smartphones pinpoint the phone's location almost anywhere on Earth, establish its orientation relative to magnetic north, and sense its motion up and down, side to side and forwards and backwards. But that's still not enough position and orientation information to sate the appetite of ambitious phone app developers.

"The accelerometer knows in which direction the phone has moved in three dimensions – but it does not know how the phone has rotated around its own axis," says Nick Black, co-founder of San Francisco-based location-aware mapping apps maker [Cloudmade](#).

"And the compass knows which way the device is pointing – but only along one plane. It can't tell if the device is pointing upwards or downwards," he adds.

If smartphones were airplanes, you'd say that although compass-equipped phones have been able to establish the phone's yaw, only a gyroscope can establish pitch and roll too.

### Virtual graffiti

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Gamers who grab the new iPhone should notice the difference: fans of flight simulators, for instance, will be using essentially the same gyroscope technology to keep the virtual aircraft stable as real pilots use.

But it's perhaps augmented reality (AR) apps that will see the greatest benefit, says Black. In AR, iPhone-generated imagery is [pasted over the real world](#) 📱 – rather like virtual graffiti. The phone's GPS and compass help to establish the phone's position and two-dimensional orientation, so that when phone's camera is pointed towards a restaurant, for instance, the phone's screen might display reviews superimposed over the video feed.

But without the additional 3D orientation information that the gyroscope will provide, any virtual text or images will drift relative to the video as the phone is tilted, says Black. "More accurate sensors could make the experience more enjoyable."

Marcus Thielking from mapping app maker [Skobbler](#) agrees. "I see this as tremendous benefit for pedestrian navigation, bike navigation and any map-based app which you use holding a device like the iPhone 4 in your hands," he says.

## Downsizing

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The [first known gyroscope](#) was made in the 19th century by Johann Bohnenberger in what is now Germany, and the devices are now an integral part of aircraft control systems. But those gyroscopes, with their complicated array of spinning flywheels, are too big, power-hungry and fragile to work in mobile-scale devices.

It's only because companies like [InvenSense](#) of Sunnyvale, California, have developed micro-electromechanical versions that smartphone users can at last benefit. These lightweight gyroscopes are built on a microchip and contain a [mutually perpendicular array of three "tuning forks"](#), each with a resonant frequency that changes as it rotates to help establish the precise 3D orientation of the device.

Those gyroscope manufacturers look set for a busy year. The electronics business magazine *EE Times* [reported last week](#) that all smartphone vendors are expected to have micro-electromechanical gyroscopes in their phones by Christmas.

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