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NEWS ROBOTICS

iRobot Brings Visual Mapping and Navigation to the Roomba 980

>The new robot vacuum uses VSLAM to navigate and clean larger spaces in satisfyingly straight lines

BY [EVAN ACKERMAN](#) [ERICO GUIZZO](#) | 16 SEP 2015 | 6 MIN READ |

Evan Ackerman is IEEE Spectrum's robotics editor.
Erico Guizzo is IEEE Spectrum's digital innovation director.



The new Roomba 980 is equipped with a camera that allows the robot to navigate using VSLAM (Vision Simultaneous Localization and Mapping). By moving around more efficiently, the robot can now cover an entire level of a home with multiple rooms. PHOTO: IROBOT

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We've known for a while now that [iRobot](#) has been developing robots with [wireless integration](#) along with [intelligent navigation capability](#) based on VSLAM (Vision Simultaneous Localization and Mapping). We've know this for enough of a while that it's been a little bit frustrating to see iRobot's most recent Roomba upgrades come out

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with wireless integration along with intelligent navigation capability based on VSLAM (Vision Simultaneous Localization and Mapping). We've known this for enough of a while that it's been a little bit frustrating to see iRobot's most recent Roomba upgrades come out without those neat features. Today, iRobot is announcing the Roomba 980, which manages to cram everything new and amazing that we've been hoping for into one round little robot: Wi-Fi communication, remote control with a smartphone app, and (most importantly) VSLAM that allows the robot to navigate and vacuum larger spaces than before in satisfyingly straight lines.



The Roomba 980 is a pretty big deal for iRobot, and it's a pleasant surprise to see so much new technology packed into one robot vacuum. "This is probably the most important robot that iRobot has launched since the original Roomba," said Colin Angle, CEO and co-founder of iRobot, at an event in New York City. "Still round, still cleans, but it's a completely new robot."

In terms of sensors, iRobot has seemed a bit behind, with so many other robot vacuums coming out over the last several years with mapping and navigation capabilities. We're not saying iRobot *was* behind—the company has nearly 70 percent of the global robot vacuum market—just that it *seemed* that way; that when people saw Roombas zigzagging all over a room and compared it to other vacuums that would do nice and neat straight lines, some would think that the Roombas weren't as capable. To be sure, that was never the case, but iRobot is now fighting back anyway. We know they've been working on this for years, and we're quite excited to see the result.

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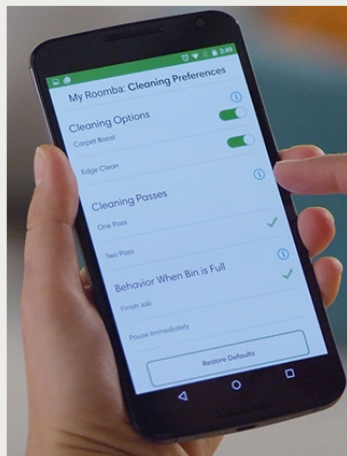


Photo: iRobot An app for iPhone or [Android](#)

lets you set a cleaning schedule and other preferences without touching your robot.

First, let's go over the wireless capability, since it's the most straightforward new thing. You can connect the Roomba 980 to your home Wi-Fi network, and then download the iRobot Home app for iPhone or Android, which will allow you to set a cleaning schedule much more easily than through the buttons on top of the robot (iRobot research showed that many consumers found the scheduling functions too difficult to use, much like with the old VCRs). The app will also provide some basic information about the robot and help with troubleshooting, and there are options to set a few different behaviors, like multiple cleaning passes and what to do when the dust bin is full.

It also looks like there may be some new enhanced virtual walls that can provide area denial capability to keep the robot from running into pet food and water dishes and other things that you keep on the floor but don't want tackled by a robot. (On a pet-related note, iRobot says cats will still be able to ride on top of the new Roomba.)

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Now, let's get to the navigation.



Photo: iRobot

One of the new sensors on the Roomba 980 is a camera pointed forward and up.

On top of the Roomba 980 there's a camera pointed forward and up at what looks to be about 45 degrees. VSLAM is a way of dynamically building a map while keeping track of your own position at the same time. To create a map, the camera takes a picture, and then some fancy software looks for distinctive patterns of pixels in that picture:



Photo: iRobot

To create a map and navigate around a home, the robot takes pictures and looks for distinctive patterns of pixels.

In this example, the VSLAM algorithm has picked out a bunch of features on a couch (corners of things are very distinctive), and the robot will remember what these features look like and keep track of



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In this example, the VSLAM algorithm has picked out a bunch of features on a couch (corners of things are very distinctive), and the robot will remember what those features look like and keep track of them as it moves. The robot will continue to take pictures, detecting and tracking new features and gradually building up a picture-based map of its environment. To localize itself, however, the robot needs to combine that map with odometry, and iRobot has added a new sensor to the bottom of the Roomba 980 to collect that data (and we assume there are other sensors, like a gyro and IMU, as well).

Angle noted that “it’s very difficult to create a real usable map of the environment that you can build upon,” but that’s a capability that robots—not only vacuums but other types of home robots as well—will need. iRobot’s solution was to use a simple camera (it costs 75 cents, he said) and custom digital signal processors (instead of more expensive computers) to do VSLAM. “Now we can create digital representations of what a home looks like so our robots can be smarter.”

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As far as VSLAM algorithms go, the Roomba has to be a little bit clever, because it frequently finds itself under tables and couches and beds, where tracking “features” in the environment gets harder. And if it reemerges someplace it hasn’t been before, it’s going to have to work up a new map, and then (hopefully) find some way of connecting the new map to the map that it had before to figure out where it is. We’re looking forward to getting more details on how this all works. *(If you live in a mansion, we’d like to borrow it so we can properly test the new Roomba in a really challenging environment. It should take only a day or two. Thank you.)*

Once the Roomba 980 knows exactly where it is, all sorts of new behaviors are made possible. It can vacuum in straight lines, increasing the efficiency of its coverage. It can beeline back for the charger if it runs low on battery power, even if it’s in a distant room

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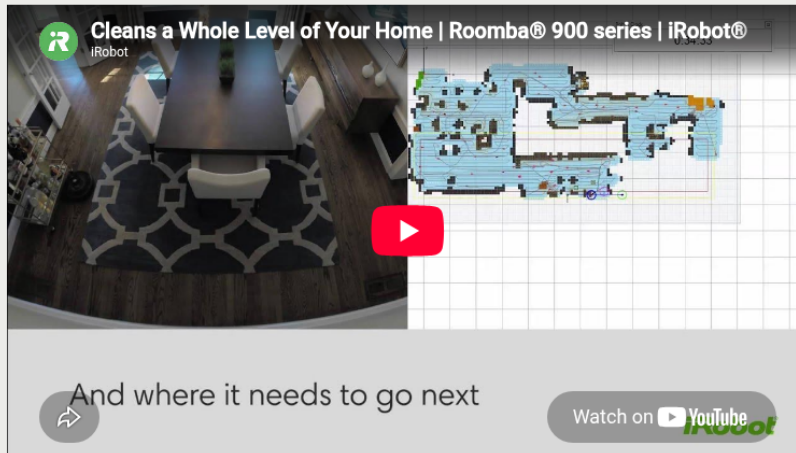
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Once the Roomba 980 knows exactly where it is, all sorts of new behaviors are made possible. It can vacuum in straight lines, increasing the efficiency of its coverage. It can beeline back for the charger if it runs low on battery power, even if it's in a distant room. And most importantly, it can clean half of your floor, remember where it left off, go recharge, and then finish the other half. This solves a significant limitation of the traditional Roomba, whose pseudorandom navigation meant it couldn't clean more than three rooms (the robot was able to go back to the charger, but because it didn't have a map, it didn't know how to resume where it had stopped). Now you can hit "Clean" and the robot will clean an entire level of a home with multiple rooms. The lithium-ion battery lasts two hours, which is a lot, but full autonomous operation including recharging means that the battery life doesn't really matter.



While straight lines and efficiency is great, it's worth mentioning that every time we've asked iRobot to compare the Roomba to robot vacuums that do this exact sort of "intelligent" single-pass cleaning, they've maintained that their pseudorandom approach results in multiple passes from multiple directions and that means a cleaner floor, especially on carpet. On average, the Roomba you have now covers each part of the floor three times in three different ways, while the new 980 will do one pass, or two if you specifically ask it for a second one. Perhaps to address this issue, the clever engineers at iRobot programmed the 980 to "automatically increase the performance of the motor on carpet and rugs." Indeed, you can audibly notice the robot boosting its suction when it detects a felted surface (using a combination of optical and acoustic sensors, we were told), but we'll have to see what the cleaning is really like in practice.

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Roomba 980 automatically increases suction on carpets and rugs. PHOTO: IROBOT

If some of these features sound familiar, it's because there are other vacuuming robots that have been doing similar things for a while. There's the Neato, which uses an incredibly awesome low-cost scanning laser to do SLAM. There's also LG's Hom-bot, which uses cameras to do VSLAM on your ceiling and floor, but it's never been available in the United States due to (we assume) some iRobot patent(s) that it's infringing on. Same goes for Toshiba's Smarbo, which has ceiling VSLAM and is only available in Japan. And finally, we've got Dyson's 360 Eye, which is supposed to be available soon (or something) but we really have no idea.

Does the Roomba 980 navigate better than these other robots? We're not sure yet. But the real question is, does the Roomba 980 **works better as a vacuum** than these other robots. In other words, does the fact that the Roomba can navigate improve its utility? Based on our testing, and the general consensus of many if not most other reviews, Roombas have historically cleaned at least just as well and in many cases better than other robot vacuums. It seems like the navigation (and the wireless access) certainly improves usability and convenience, but we're very curious to see how well the new Roomba compares to the old Roomba that users have been relying on for such a long time.

We're expecting a Roomba 980 for review soon, and we should have our hands-on impressions for you in the next few weeks. If you just can't wait, the Roomba 980 is available now in the United States and Canada for US \$899, with availability in Europe and Japan expected

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[iRobot 980]

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Ty Buchanan

21 APR 2022

Instructions are very poor. No information on the difference between "New job" or "Vaccum Everywhere". No guide on how to use them, not even on the internet, Youtube, etc. No information on how it learns your house plan. When does it save to house plan in the cloud? Does it save to plan when "push the bottom" start? Does it save "New job" start? Does it save ""Vaccum Everywhere start? Do you start from the dock for New task. Or, like I did move it to another room and click New task. You have to solve all these mysteries yourself. Of course, saving to the house plan is something only Roomba knows and for some reason is keeping to itself.

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