
(HazCam View)

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00:00:04,000 --> 00:00:09,000
Hi, I'm Mark Maimone, rover planner and mobility engineer on the Mars Science Laboratory mission.

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00:00:09,000 --> 00:00:15,000
I'm here with the Curiosity engineering model at JPL's Mars yard, and this is your Curiosity rover report.

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00:00:15,000 --> 00:00:20,000
Out here in the Mars yard is where we developed the software that Curiosity will use to drive autonomously.

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00:00:20,000 --> 00:00:23,000
We can test all kinds of situations out here.

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00:00:23,000 --> 00:00:27,000
We can put rocks in its way and big holes and watch what happens

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00:00:27,000 --> 00:00:30,000
and see how it responds to different terrain situations.

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00:00:30,000 --> 00:00:35,000
For the past year, Curiosity has been driving on Mars following instructions from human rover planners.

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00:00:35,000 --> 00:00:41,000
But now we have a new capability that's coming on line something that will let Curiosity drive herself on Mars

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00:00:41,000 --> 00:00:43,000
This is called 'Autonomous navigation.

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00:00:43,000 --> 00:00:46,000
Humans are still in the loop. We're going to tell her where to go.

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00:00:46,000 --> 00:00:49,000
Curiosity is going to decide how to get there.

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00:00:49,000 --> 00:00:53,000
Curiosity takes pictures from the navigation cameras, with the hazard cameras,

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00:00:53,000 --> 00:00:58,000

and it's able to combine that information, put it all together to define a safe way

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00:00:58,000 --> 00:01:00,000
to get to where we ask her to go.

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00:01:00,000 --> 00:01:03,000
And that capability is going to let us drive much farther than before.

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00:01:03,000 --> 00:01:08,000
This is an animation showing Curiosity's first autonomous drive on Mars.

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00:01:08,000 --> 00:01:11,000
The drive lasted about 10 meters and you can see in the animation

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00:01:11,000 --> 00:01:15,000
that she turned her camera this way and that to look at what's ahead of her.

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00:01:15,000 --> 00:01:19,000
And you can also see, she didn't just go in a straight line. She actually curved a little bit

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00:01:19,000 --> 00:01:22,000
to the right to avoid some of the small rocks that were directly in front of her.

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00:01:22,000 --> 00:01:27,000
Another part of the autonomous navigation capability is using visual odometry.

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00:01:27,000 --> 00:01:33,000
Visual odometry uses images from the mast cameras to look at the terrain before and after a small drive step.

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00:01:33,000 --> 00:01:38,000
Curiosity will see a few hundred features and see how they move across the step.

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00:01:38,000 --> 00:01:43,000
And by tracking those features she can know exactly how far she moved,

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00:01:43,000 --> 00:01:46,000
whether she slipped or twisted a little bit during the drive.

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00:01:46,000 --> 00:01:50,000
And with that knowledge, the knowledge of where Curiosity is

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00:01:50,000 --> 00:01:54,000
and the knowledge of what the terrain looks like, we get really strong information to drive safely

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00:01:54,000 --> 00:01:59,000
into areas no human has seen before at enough resolution to know that its safe.

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00:01:59,000 --> 00:02:02,000
And now you can see the actual speed that Curiosity moves on Mars.

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00:02:02,000 --> 00:02:06,000
It's only about 2 inches per second. Kind of slow

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00:02:06,000 --> 00:02:10,000
but it gets where it's going and have enough power to climb over any obstacles in its way.

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00:02:10,000 --> 00:02:15,000
And this is a look at a real autonomous drive in JPL's Mars yard.

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00:02:15,000 --> 00:02:19,000
We don't need to do this kind of testing everyday, but we still come out here as we're writing new software.

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So for the next few months we're looking forward to putting the pedal to the metal

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and heading toward Mount Sharp;