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OCTOBER 08, 2022

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Why robots could play a bigger role in distant space stations of the future

Why in the news?

- Robots manning a space station might read like science fiction, but this could be a reality sooner than later. NASA has already been testing robots called 'Astrobee', which work on the International Space Station (ISS). These three cube-shaped free-flying robots began working independently alongside astronauts on the space station.

- "The **Astrobee robots** can use **cameras to navigate around the space station** based on a map of the station programmed into it. The **robot needs to know where it is based on inputs from its camera to decide where to go to reach its destination**. As it turns out, that is a very challenging problem," Jose Benavides, project manager for the Astrobee project at NASA, told indianexpress.com over a video interaction.
- One reason why **robots will be critical to future space station missions** is that these stations will be located at quite a distance from Earth. For context, ISS orbits the Earth at an altitude of approximately 400 kilometres above the surface of Earth where distance in communication is not an issue.
- But in contrast, NASA's proposed Gateway space station will orbit the Moon, which is an average of 384,400 kilometres away from our planet. In such scenarios, robots could solve many of the problems.
- But getting the robots to work in space is not so easy– even though they might work perfectly fine in the labs as NASA's experience with Astrobee showed.

- The environment on ISS is pretty dynamic. Things change day to day with bags moving, and lighting conditions changing. This made it difficult for the robot to navigate the environment. We had to redesign a lot of the software and algorithms that go into this vision-based navigation and ultimately, we got it right.
- The Astrobee robot's **current level of autonomy is an impressive technological** feat that makes them great for use on ISS. But for distant space stations, that just won't cut it. "It takes a few milliseconds to communicate with robots on ISS from Earth.
- That gets multiplied manyfold when you are speaking about somewhere as far as the Moon. At that point, we have to go for a little higher level of autonomy where we tell it where to go and what to do but it has to figure out the details of how to do that by itself," Benavides explained.
- Apart from the **software and algorithms that could go into robots on future space stations**, they might also need **different physical attributes** based on the tasks they have to complete. For example, a robotic arm placed on the outside of a space station will need a completely different form factor from one that works inside.
- Future robot platforms could have different form factors. One of the initial Gateway robot design concepts I saw, for example, involved a mobile manipulator, or a robotic arm that is attached at one end and free on the other. It could also be a humanoid robot, like **NASA's Robonaut**, which has already been to ISS," explained Benavides, who doesn't directly work on the Gateway project.
- And while the exact role that robots will play on these space stations is yet to be carved out, no one can deny that they have some advantages over humans. For one, they can handle many mechanical tasks more precisely.
- But for now, **humans are far better than robots at making in-situ decisions**. Current robotics and artificial intelligence technology have a long way to go before they can replicate human versatility. So, while robots cannot replace humans in space exploration missions, they could still stand in for humans during certain situations when the need arises.

Source: Indian Express