Finding ET may require giant robotic leap

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(Phys.org) -- Autonomous, self-replicating robots -- exobots -- are the way to explore the universe, find and identify extraterrestrial life and perhaps clean up space debris in the process, according to a Penn State engineer, who notes that the search for extraterrestrial intelligence -- SETI -- is in its 50th year.

"The basic premise is that human space exploration must be highly efficient, cost effective, and autonomous as placing humans beyond low Earth orbit is fraught with political economic, and technical difficulties," John D. Mathews, professor of electrical engineering, reported in the current issue of the *Journal of the British Interplanetary Society*.

If aliens are out there, they have the same problems we do, they need to conserve resources, are limited by the laws of physics and they may not even be eager to meet us, according to Mathews.

He suggests that "only by developing and deploying self-replicating robotic spacecraft -- and the incumbent communications systems -- can the human race efficiently explore even the asteroid belt, let alone the vast reaches of the Kuiper Belt, Oort Cloud, and beyond."

Mathews assumes that any extraterrestrial would need to follow a similar path to the stars, sending robots rather than living beings, which would explain why SETI has not succeeded to date.

"If they are like us, they too have a dysfunctional government and all the other problems plaguing us," said Mathews. "They won't want to spend a

lot to communicate with us."

It is extremely difficult to broadcast into the galaxy and requires vast resources. Radio signals need to emanate in every direction to fill the sky, and the energy requirement to broadcast throughout space is quite high.

"Current infrared lasers can communicate across our solar system," said Mathews. "The problem in terms of SETI is they are highly directed beams."

Point-to-point communications using infrared signaling requires less power, but the signals are extremely directional. If ET is using laser-generated infrared signaling, we would never notice their signals because they are so tightly targeted to their destinations.

Mathews suggests that if human exploration is not possible, robots could go where many people do not want to go and do what many do not want to do, not only on Earth, but also in space.

To minimize the cost, he suggests that the initial robots be manufactured on the moon to take advantage of the resources and the one-sixth gravity. He notes that we have the technology to create these exobots now, except for a compact power source. To create a network of autonomous robots capable of passing information to each other and back to earth, the vehicles must be able to identify their exact location and determine the time. With these two bits of knowledge, they should be able to determine where all the other robots near them are and target them with an infrared laser beam carrying data.

"The expensive part of launching anything is escaping the surface of Earth and its gravity well," said Mathews. "It would also be easier to target the space debris in near Earth orbit and in geosynchronous orbit

and even recycle it."

Initially, the exobots would serve two purposes: clear existing debris and monitor the more than 1,200 near Earth asteroids that are particularly hazardous in that they closely approach Earth during their orbits.

"As a first step, we really should launch robot vehicles to learn something about these asteroids and to place beacons on them for identification and tracking," said Mathews.

Ultimately, the network of exobots -- self-replicating, autonomous and capable of learning -- will spread through the solar system and into the galaxy, using the resources they find there to continue their mission. Communicating with infrared lasers is communicating at the speed of light, which is the fastest we can hope to achieve.

"Our assumption in the search for extraterrestrial intelligence is that ET wants to be found," said Mathews. "But who has energy resources to spend trying to wave their metaphorical hand across the galaxy?"

He said it is more likely that one of our exobots will intercept a signal from one of theirs if we are to make first contact.

Provided by Pennsylvania State University

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