

Honey bee search strategy: Robot swarms to search Mars caves

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Mars surface.

(PhysOrg.com) -- In a recent paper published in *Acta Astronautica*, Aron Kisdi, a University of Southampton engineer, proposes an idea of utilizing a swarm of robots to search large areas of Mars and the caves which current robots have been unable to explore.

The theory behind Kisdi's robots incorporates the idea of quorum sensing, similar to that used by honey bees. Quorum sensing is a type of decision-making process used by groups to coordinate behavior and can be seen with honey bees when worker bees scout for new nest areas. Bees will leave the nest, gather information, and determine the best new location.

Kisdi's theory works on this same principle. A computer program has been created that functions in a similar way to the honey bees. The robots, called [Jollbot](#), are a [rolling and jumping robot](#).

A Lander would be able to release the swarm of 40 to 60 robots, allowing them to then individually go out and search for pre-programmed information, such as a difference of temperature found in a cave. Once a robot locates this information, it

would return to the lander via the shortest route, and upload the information (temperature readings and coordinates).

Once the information is uploaded, the [robot](#) can then evaluate information shared by previous robots and decide to either start a new search or revisit a previous finding for more information. As information is collected, those sites which the robots decide to be a potential site for more exploration can then be sent to mission control for further exploration by other rovers.

This concept would be cheaper to build than the large rovers and allow for much more initial exploration, leaving the in-depth exploration for the rovers. The other benefit with this idea is that should one of the Jollbots in the swarm be lost or not function, the search process is still able to continue.

In the simulation shown by Kisdi, a swarm of 50 robots would be able to cover a 300 square meter area in around 5 days. With the addition of more robots with a greater search capability, the search area would be able to be increased.

Kisdi's next step is to begin developing the hardware required for the robots, but the idea of a swarm of [honey bee](#) robots opens up the potential for much more in-depth searches becoming possible on [Mars](#).

More information: Future robotic exploration using honeybee search strategy: Example search for caves on Mars, by Áron Kisdi and Adrian R.L. Tatnall, *Acta Astronautica*, Article in Press. [doi:10.1016/j.actaastro.2011.01.013](https://doi.org/10.1016/j.actaastro.2011.01.013)

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