Researchers improve on an old model for studying predator search patterns

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(Phys.org) -- The inspiration for the next Google or search-and-rescue drone may spring from a seemingly unlikely source: Watching how animals sniff out food, according to new University of Florida research.

Innovators in everything from robotics to Internet search engines study patterns that animal predators walk while searching for prey. But mathematical models that have been used in the past to study these patterns are in need of a little revamping, the UF study finds — because in the animal kingdom, scent plays a major roll in tracking prey.

The study appears in the July 10 edition of the *Proceedings of the National Academy of Sciences.*

“Imagine trying to find a bakery in a foreign city without a map,” said Andrew Hein, a researcher in UF’s biology department. “You’re in sort of a general search mode until you catch of whiff of fresh bread. Then you start to look more carefully for visual cues like a store front or someone else carrying a baguette.”

The strategy saves predators time and energy by helping them cut to the chase, but the models currently used to represent animals on the hunt aren’t equipped with olfactory senses. Hein worked with colleague Scott McKinley, a researcher in the mathematics department at UF, to endow two widely used computer models with a simulated sense of smell.

“In a natural environment, smell can be a very vague, directionless signal

for where a target, like prey or a mate, can be found," Hein said. "But even when an animal smells nothing, that signal is telling him something: Keep moving."

In the study, Hein and McKinley pit the olfactory-equipped computer models against two of the original models in a series of virtual hunts. The models with smelling power won hands down. They were far more efficient and reliable predators than their non-sniffing counterparts, the study found.

The improvement also made the model behave more like what biologists have observed in nature, Hein said.

"We know that albatrosses alter their flight pattern when they encounter prey scent," he said. "And frigatebirds find the eddies where they hunt at least in part, by smell."

McKinley said their work addresses a gap in the existing body of literature on modeling animal search patterns. But Massimo Vergassola, a physicist at the Pasteur Institute in Paris, said the study is important because it provides an abstraction of general principles that can be useful for scientists modeling bio-inspired search strategies in a variety of applications.

People are using this sort of research to inform a range of exploration, Vergassola said, from insect mating and reproduction control to "sniffer robots" that could be deployed to detect chemical leaks.

Provided by University of Florida