Algorithms inspired by nature sustain wireless sensor networks

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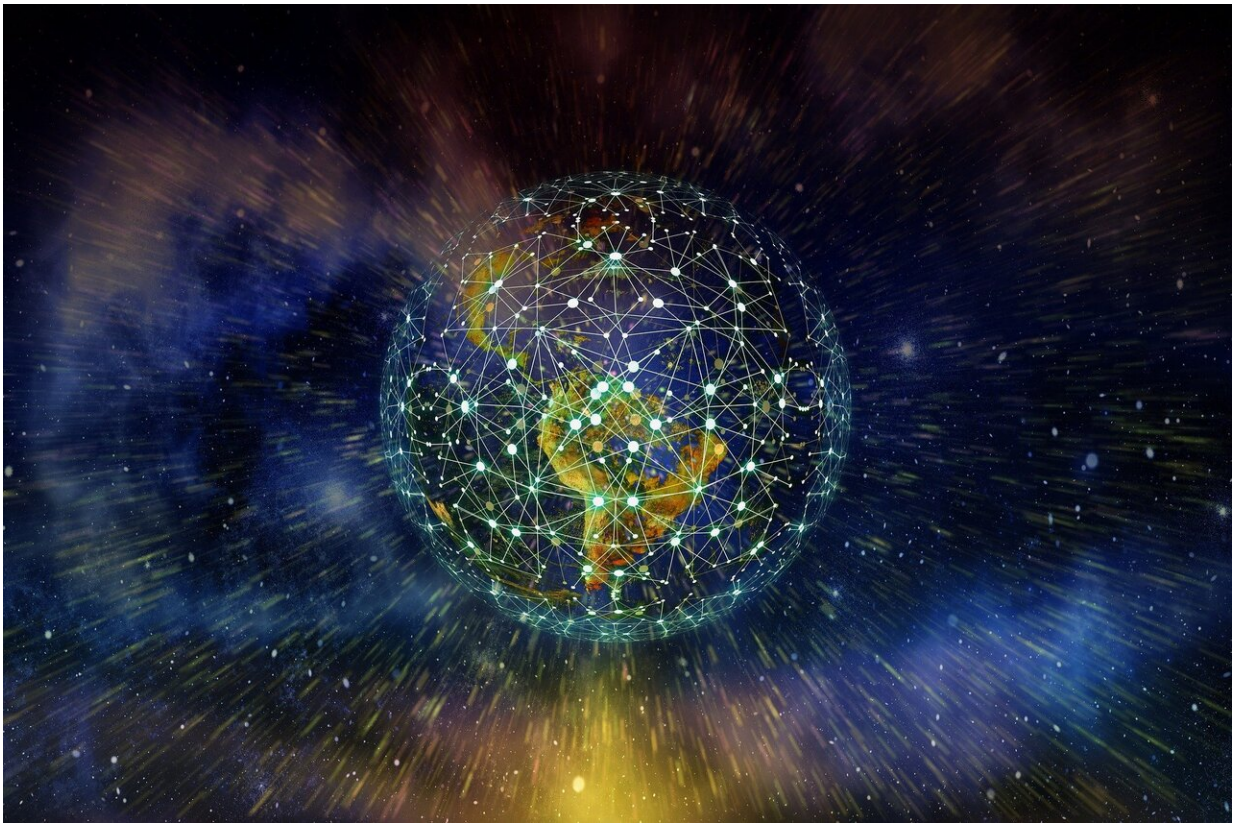

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Wireless sensor networks have many applications in environmental monitoring, safety and control monitoring of industrial processes, in healthcare, and in disaster management. To be effective the devices, the

sensors, must be constantly and consistently accessible to the network. There are many problems that can arise in a large wireless network because of energy supply, connectivity, and other factors.

Writing in the *International Journal of Ultra Wideband Communications and Systems*, a team from India has turned to bio-inspired algorithms to demonstrated how such algorithms can be used in fault detection across a network. Bio-inspired algorithms map the properties and behavior of a natural system to the solving of a problem at the computational level. Researchers have used ant colony behavior, foraging bat sonar, beehive swarming, and many other biological systems to create useful tools for solving complex problems that do not succumb to conventional linear computation.

In the present work, the team of Beledha Santhosh Kumar and Polipalli Trinatha Rao of the Department of Electronics and Communication Engineering at the Institute of Aeronautical Engineering in Hyderabad, Telangana, have turned to algorithms inspired by the behavior of glow-worms (bioluminescent insect larvae) that move and congregate based on the light levels of neighboring larvae. The second algorithm is based on the courtship behavior of the male satin bowerbird which constructs and optimizes a display of materials it finds in its neighborhood to attract a mate.

The glow-worm algorithm is programmed to home in on faulty nodes in the network looking for change that indicates a fault, no change is recognized as no fault but uses no energy to determine, a fix can be sent when a fault is detected. The bowerbird algorithm is encoded in such a way into the sensor network that it then routes the required information packets with a minimal of energy demands. The hybrid approach to wireless sensor networks based on these two algorithms working together—with glow-worm detecting and fixing faults and bowerbird sustaining the network and keeping energy costs down—work well, the

team reports. Ironically, the hybrid system outperforms two other bio-inspired systems: the emperor penguin optimization and flower pollination optimization algorithms.

More information: Beledha Santhosh Kumar et al, Cell zooming-based fault identification and optimal routing using glow worm-satin bowerbird optimisation, *International Journal of Ultra Wideband Communications and Systems* (2022). DOI: 10.1504/IJUWBCS.2022.10045971

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