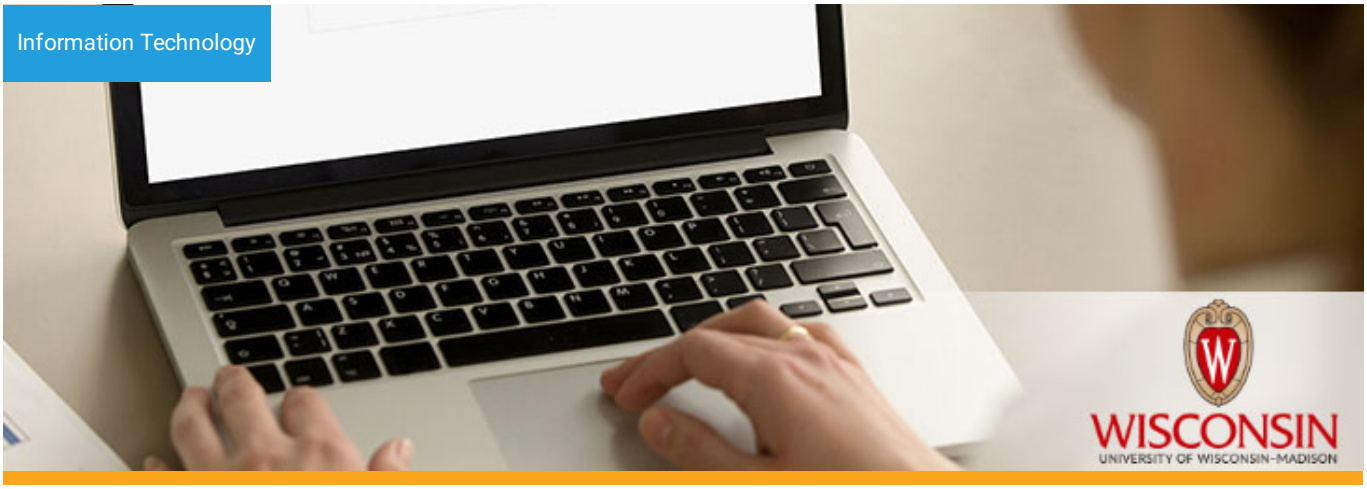
Information Technology



Power-Saving, Data-Transmitting System for Wireless Remote Sensing

View U.S. Patent No. 11,039,391 in PDF format.

WARF: P190273US01

Inventors: Bhuvana Krishnaswamy, Yaman Sangar

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a low-power wireless network system well suited to smart agriculture. By dramatically improving energy efficiency, this technology will allow for longer deployment of sensors without battery replacement.

Overview

Real-time data monitoring via wireless sensors is used in a wide range of applications, such as "smart agriculture," where sensors measure soil moisture and monitor livestock, and in health care, where wearable sensors monitor the vital signs of patients. Ideally, wireless sensors in remote locations must be capable of long communication range and low power consumption for a long battery life. However, there is usually a trade-off between range and power. Often this is managed by placing the transmitter into a low-power mode between transmissions. While this approach reduces average transmission power, it also limits the amount of communicated data.

The Invention

UW–Madison researchers have developed a low-power, wireless network system that conveys information in the time elapsed between two symbols (start and stop symbols). A transmitter transmits two (short) anchor symbols per message and encodes data in the time between the symbols, unlike other methods, which encode data in the symbols itself. This creates a shorter duration of radio on-time for any message length and reduces the power needed per message. In addition, the transmitter is always in sleep mode, including the time between anchor symbol transmission, i.e., it can be in sleep mode while transmitting data.

This modulation technique can be combined with other existing techniques to yield longer communication range and low-power consumption networks that scale extremely well. The improved system can provide as much as three times the energy savings over state-of-the-art LPWAN (Low Power Wide Area Networks) techniques such as LoRa, SigFox.

Applications

- Network software and hardware for real-time data monitoring with long range, low power consumption and large scale.

Key Benefits

- Profoundly decreases energy consumption, allowing the network to easily scale
- Provides substantial range and collision avoidance in a multisensor environment
- Exploits the benefits of no-power data transmission using versatile carrier modulation and multibit anchor symbols
- Provides for ultra-low power and is easy to integrate with existing/off-the-shelf components

Stage of Development

This innovation could provide up to 82-fold improvement in energy efficiency compared to state-of-the-art LPWANs that provide comparable communication range and achieve an average collisions-per-node of less than 5 percent in a deployment with more than 1,000 nodes.

Additional Information

For More Information About the Inventors

- Bhuvana Krishnaswamy

Publications

- WiChronos: energy-efficient modulation for long-range, large-scale wireless networks
- This technology was a 2019 WARF Innovation Award finalist.

Tech Fields

- Information Technology : Networking & telecommunications

For current licensing status, please contact Emily Bauer at emily@warf.org or 608-960-9842