Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

1475 N. Scottsdale Road, Suite 200
Scottsdale, AZ 85287-3538
Phone: 480 884 1996 Fax: 480 884 1984

Case ID:M14-191P
Published: 4/29/2015

Inventors

Xue Zhang
Cihan Tepedelenlioglu
Mahesh Banavar
Andreas Spanias

Contact

Shen Yan
shen.yan@skysonginnovations.com

Distributed Location Detection in Wireless Sensor Networks

Location detection systems employ wireless sensor networks (WSNs) to approximate the physical position of events within an area of interest. WSNs consist of sensor and anchor nodes that are spatially distributed over the area of interest, and are overseen by a fusion center (FC) that collects node information. In applications such as fire or motion detection for safety and security systems, anchors detect the location of sensor nodes that have been triggered by the event. However, for tracking hospital equipment or self-guided tours, anchors monitor target nodes that appear and disappear within their signal reception boundaries. Anchors also measure angle and time of arrival from target and sensor node signals. Current location detection methods are centralized, so that the FC collects all measurements from anchors before performing node location calculations. This requires a heavy transfer of data, and wastes an unnecessary amount of network power and bandwidth.

Researchers at ASU have developed a distributed location detection method that reduces power and bandwidth requirements. In this distributed method, each anchor only determines whether or not a node is present within the boundary of its reception and sends its decision to the FC, which then makes a collective decision. Anchor reception boundaries frequently overlap, and the node's location can be estimated by which anchors detect its presence. Since the anchors no longer transmit complex measurements, less data needs transferred in order to describe node locations. Additionally, this method can detect important node locations amidst interference from other irrelevant nodes.

Issued U.S. Patent No.: 10,028,085

Related publication: Distributed location detection in wireless sensor networks

Potential Applications:

- Internet of Things
- Machine-To-Machine Communications
- WSNs Used For:
  - Equipment Tracking
  - Pollution Monitoring
  - Safety & Security Systems
  - Self-Guided Tours

Benefits and Advantages:

- Efficient – Saves node power and reduces network bandwidth.
- Practical – Easier installation of additional sensor nodes.
- Reliable – Detects relevant nodes even amidst interference.