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Scalable Algorithms for Sensor Localization

The market for wireless sensor networks is quickly expanding. It is estimated that within a few years there could be 100 million wireless sensors in use in a billion-dollar worldwide market. Sensor networks are especially needed for applications dependent upon real-time monitoring, such as forest fire detection, building automation, or security services. In these services it is important to know the exact locations of all the sensors. Yet even for small networks, determining sensor locations accurately and efficiently has been a difficult computational problem. In the past, systems for sensor localization were found to deteriorate rapidly in both speed and accuracy with increases in network size.

Stanford researchers have developed a range of algorithms to estimate sensor positions in static, dynamic, and distributed of much greater size. The researchers have achieved a breakthrough in scalability and accuracy by developing an algorithm that maintains efficient and accurate position estimation for networks containing tens of thousands of sensors and beyond. These algorithms help in achieving the speed necessary for real-time large network applications, without sacrificing accuracy in the estimated locations.

Applications

- Military: target detection, battlefield surveillance
- Environment: habitat monitoring, forest fire detection
- Building automation: industrial and home
- Security services
- Vehicle localization: traffic control, police car and taxi monitoring
- Handheld navigation
- WiFi network location tracking
- Cell phone network location tracking

Advantages

- Breakthrough Speed: capable of localizing ten thousand nodes in a minute
- Unprecedented Scalability: does not deteriorate with size and can work in networks with tens of thousands nodes and beyond
- Real-time Capability: fast and accurate node localization and tracking in real-time
- Excelled Accuracy: can localize low anchor density networks that traditional methods can not achieve

Publications

- Poster Presentation - Scalable Algorithms for Sensor Localization

Patents

- Published Application: WO2007002286
- Published Application: 20070005292
- Published Application: 20110218759

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