



Communications

Real-Time Tracking System

Pinpointing emergency and military personnel in remote environments

A real-time locating system (RTLS) developed at the Johnson Space Center uses ultra-wideband (UWB) radio frequency (RF) signals for tracking and reporting the position of transmitter-equipped people and objects. The technology has 100 to 1,000 times finer granularity than conventional narrowband RF RTLS systems and achieves a tracking resolution of less than 1 percent of the range (tested up to 3,500 feet). The technology has a number of commercial applications including long-range tracking of emergency, military, and mining personnel in limited access or hostile environments where global positioning systems are not reliable. This method combines the advantages of accurate Time Difference of Arrival (TDOA) information achieved using UWB technology with the geometric advantages of two-cluster tracking to provide accurate location information at long ranges.

BENEFITS

- High performance - operates in proximity to other radio communication systems
- High resolution - offers high temporal resolution (on the order of picoseconds)
- Accurate - precise measurements of propagation time while transmitting data
- Scalable - offers ability to increase system range, with additional cells
- Dual use - simultaneous communication channel and precise locating capabilities

technology solution

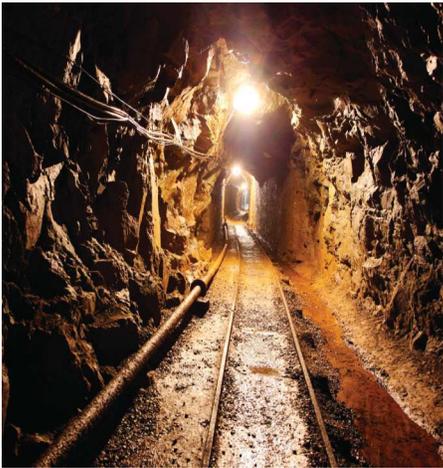


NASA Technology Transfer Program

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THE TECHNOLOGY

The innovation builds upon conventional UWB hardware by incorporating tracking methodology and algorithms in addition to external amplifiers for signal boost. The tracking methodology is a triangulation calculation consisting of Angle of Arrival (AOA) and Time Difference of Arrival (TDOA) using a cross-correlation peak detection method. By directly estimating TDOA information from UWB pulses, the method achieves the high temporal resolution (on the order of picoseconds) needed to measure AOA with extreme precision. The system uses a PC to synchronize and process data in real time from two receivers, or clusters, to display the position of the transmitter-equipped person or object. The interface software enables the PC to access the two data sets simultaneously through separate sockets. In the data collection process, data segments from each receiver are interleaved with those from the other receiver in chronological order of collection. Within the PC, the data segments are stored in a separate buffer; therefore, the contents of the buffers are representations of the same UWB pulse waveform arriving at the two receivers at approximately the same time. This data synchronization provides the separate and simultaneous collection of waveform data that the tracking algorithm requires for accurate real-time tracking.



The technology has applications in both the mining industry and on the battlefield.

APPLICATIONS

The technology has several potential applications:

- Aerospace rovers, robots and astronauts on exploratory missions
- Emergency workers in limited access areas where GPS is not reliable
- Military personnel and equipment on battlefields and in other hostile environments
- Mining industry to locate and communicate with underground personnel
- Oil companies for use in drilling operations
- High-value inventory tracking industry

PUBLICATIONS

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