



Sensors

Frequency Diversity Pulse Pair Algorithm for Mitigation of Radar Range-Doppler Ambiguity

[A solution for the well-known range ambiguity.](#)

Doppler radar is the go-to tool for moving target range and velocity detection but its limiting capabilities has caused some challenges onboard fast moving platforms. NASA Goddard has developed technology that mitigates some of these concerns in aggressive applications.

BENEFITS

- Enhanced accuracy on rapid moving platforms
- Reduced ambiguity

technology solution



THE TECHNOLOGY

This technology mitigates the Doppler ambiguity by creating an innovative frequency. This frequency diversity technique takes advantage of the recent development in digital waveform generation and digital receiver technologies by transmitting a pair of pulses (or more pulses) with slightly shifted center frequencies in each pulse repetition period. Radar return signals from these pulses can be separated by the digital filters implemented in the digital receiver. In Doppler radar operation, the maximum unambiguous range is determined by the radar transmission pulse repetition time. This unique frequency diversity technique is implemented by alternating the order of the pulse pair with center frequencies as f_1, f_2 , and f_2, f_1 , then integrate the phase estimates of f_1/f_2 pulse pair and f_2/f_1 pulse pair in equal numbers. This approach will cancel the phase shift as a function of range between the pulses to enable the retrieval of Doppler phase. Although this method is more advanced, it also has its inherent limits, such as increased phase error and increased complexity in radar hardware to transmit and receive dual polarized signals. Despite its faults, it is a step forward in the evolution of the Doppler radar and its growing applications.

APPLICATIONS

The technology has several potential applications:

- Weather Tracking
- Aviation
- Automotive

PUBLICATIONS

Patent Pending

National Aeronautics and Space Administration

Strategic Partnerships Office

Goddard Space Flight Center

Code 102
Greenbelt, MD 20771
301-286-5810
techtransfer@gssc.nasa.gov

<http://technology.nasa.gov/>

www.nasa.gov

NP-2015-04-1682-HQ

NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

GSC-17376-1
GSC-TOPS-90

