

CASE STUDY

No longer under the radar

Leading tech pioneer in India
reaches new heights



Pushing the boundaries

Sisir Radar is pushing the boundaries of traditional remote sensing radar solutions by developing cutting-edge synthetic aperture radar (SAR) and ground-penetrating radar (GPR) aimed at giving India a geopolitical, strategic and commercial edge.

Case in point: In 2023 it became one of the first companies in its space to demonstrate low-altitude L-band (1-2 GHz) synthetic aperture radar (SAR) with sub-metric resolution in just 11 months of

operations—a significant achievement, explains Urmi Bhambhani, co-founder and chief technology officer. “The navigation system we used for this was provided by Trimble® and they had a huge part to play in this success we achieved at breakneck speed,” says Bhambhani. “The main difference between SAR and a regular radar is that to get fine resolution, SAR uses velocity of the platform to synthetically create a larger aperture for the radar. For a successful SAR product, the navigation system is extremely crucial.”



The image shows an aerial view of a city with a large, dark, textured SAR (Synthetic Aperture Radar) image overlay. The SAR image is semi-transparent, revealing the underlying optical image of the city, including buildings, roads, and green spaces. The title 'The significance of SAR' is written in large, white, bold letters across the top of the SAR image.

The significance of SAR

SAR is a unique kind of imaging radar technology that can provide extremely accurate high-resolution imagery of the terrain through clouds, smoke and dust—even in pitch-dark conditions. SAR imagery provides much higher resolution than other forms of remote sensing technology, such as hyperspectral and multispectral, making it a critical technology for strategic reconnaissance and planning, as well as disaster management.

It can penetrate vegetation (enabling monitoring of forest biomass, soil moisture and geological features), and also enables improved target detection due to sub-metric resolution that enable classification of smaller objects. Its low-altitude platforms provide greater flexibility in terms of flight paths and timing, compared to spaceborne SAR systems. This is especially important for disaster monitoring and humanitarian relief efforts.

Sisir Radar began working with Trimble two years ago and has been using the Trimble Applanix® APX-18 UAV to execute its novel concept of drone-based SAR. What distinguishes SAR from other radars is that it uses the motion of the platform / vehicle to synthetically create a long aperture and get very high resolution imaging. This has many advantages, namely when it comes to penetration capabilities through rain, clouds, foliage and vegetation, as well as from an all-weather, day and night remote sensing perspective.

“Since motion of the platform forms the basis of SAR, accurate navigation information is required not only for georeferencing the image, as is the case with optical / hyperspectral / LiDAR sensors, but for forming the image itself,” explains Bhambhani.

“Fortunately for us, with Trimble being the leader in navigation systems, we had to look no further.”

“We chose the dual antenna APX-18 board with the compatible helical antennas, which are both lightweight as well as powerful and were easy to mount on our drone,” Bhambhani says. “Even at an altitude of as low as 50 metres above the ground, we have been able to get accurate navigation data. You can see from the overlain SAR image that the building, roads and other features align perfectly with the optical image of the satellite, which can only happen if we have accurate navigation data. This can be said not just because geolocation of the image coordinates are accurately matched, but also since there are no perturbations and the SAR image looks perfectly formed, the underlying velocity information used for processing radar signals has to be accurate.”

Next frontier: CAR-SAR

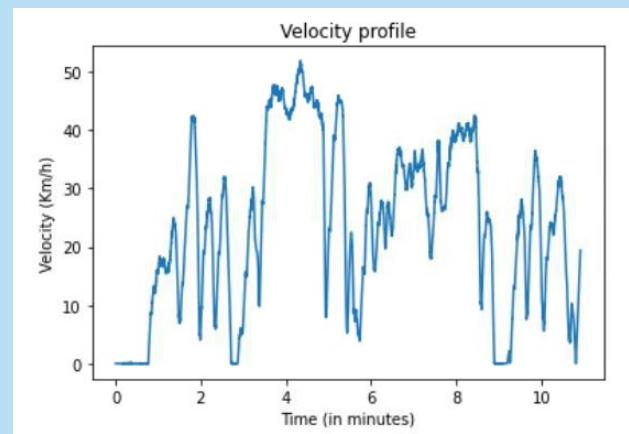


In January 2024, Sisir Radar came up with a new way to harness the power of SAR. Dubbed CAR-SAR, this technology involves mounting the SAR payload on a pickup truck and imaging sideways. "We have used Applanix equipment for accurate navigation data," says Bhambhani. "One can see the accurate velocity information as obtained from the Applanix system and the strength of algorithms that were able to create SAR images in spite of such variations in velocity!"

Bhambhani adds: "It has been a pleasure to work with the talented Applanix team. Their sales and support folks are quick to identify our requirements and needs and have a solid understanding of the products."

The innovation of CAR-SAR offers several benefits, such as flexibility and accessibility, cost-effectiveness, high-resolution imaging at lower speeds, direct operational control and repeatability, given the ease of revisiting sites with the logistics of coordinating aircraft.

This innovative technology, when mounted on a vehicle, is also enabling Sisir Radar to enhance safety and reduce the risks associated with operating aircraft, especially in difficult weather conditions or in regions where airspace access is restricted or dangerous. Vehicles can be quickly deployed, making CAR-SAR an ideal solution for time-sensitive applications such as disaster response, where timely data collection is crucial for effective decision-making.



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