Drones and low altitude remote sensing.

The power of a Satellite on a Drone.


Airborne Drones Hexacopter for heavy payloads

CAPE TOWN, WESTERN CAPE, SOUTH AFRICA, July 29, 2020 /EINPresswire.com/ -- Recent advances in remote sensing technologies have enabled low altitude Arial platforms such as sUAS (small Unmanned Arial Systems) to bring technologies, such as Synthetic Aperture Radar (SAR), previously only available on spaceborne or High Altitude airborne systems, much closer to ground level.

Automated Target Detection

Automatic target detection (ATD) is very important in security and surveillance applications and there are challenging problems with ground surveillance. The inability to achieve high detection rates and low false alarm rates for well-known challenges, such as the target type, weather conditions, and background clutter have put many a long range surveillance mission at risk. In addition, the target detection problem is more difficult if the surveillance area cannot be accessed directly and/or is covered without opaque foliage conditions.

Some UAV manufacturers have begun to integrate small UAV aerial solutions that brings the remote sensing power of SAR to much lower altitudes and very close to targets.

Synthetic Aperture Radar (SAR)

Environmental monitoring, earth-resource mapping, and surveillance and security systems require broad-area imaging at high resolutions. Often, this imagery must be acquired at night or during inclement weather. Synthetic Aperture Radar (SAR) provides such a capability. SAR systems take advantage of the long-range propagation characteristics of radar signals and the complex information processing capability of modern digital electronics to provide high resolution imagery. SAR complements photographic and other optical imaging capabilities because it is not limited by the time of day or atmospheric conditions and because of the unique

responses of terrain and cultural targets to radar frequencies.

SAR technology has provided terrain structural information to geologists for mineral exploration, oil spill boundaries on water to environmentalists, sea state and ice hazard maps to navigators, and reconnaissance and targeting information to military operations. Other applications for this technology, particularly civilian, have not yet been adequately explored because lower cost electronics are just beginning to make SAR technology economical for smaller scale uses at altitudes much closer to points of interest.

SAR is a mode run by a conventional radar system that is moving to artificially create a representation of an extremely large antenna with the help of clever signal processing. SAR techniques are used to achieve much greater angular antenna resolution, which can be used to generate highly detailed maps in situations and conditions when optical and infrared cameras or sensors are not adequate. Creating 2-D and 3-D images from radar reflections off the ground makes SAR ideal for identifying targets the size of a human body.

SAR relies on radio or microwaves rather than visible light and can see through haze, clouds, and even thick forest canopies.

SAR has become the go-to technique for planetary sciences, remote sensing, intelligence, earth observation, as well as surveillance airborne missions, for accurate and persistent data collection.

‘Noisy’ cluttered environments and weather conditions

Long-range ground targets are difficult to detect in a noisy cluttered environment for which synthetic aperture radar (SAR) images or infrared (IR) images are frequently used.

SAR can measure the electromagnetic scattering property of targets under any weather and light conditions. This method is used frequently to detect distant targets because it provides strong radar cross section (RCS) values and shape information of targets referred to as RCS signatures as opposed to the thermal signatures in the IR case. While both sensors have day and night capabilities the SAR sensor has weather-independency compared to the IR sensors that are strongly affected by weather conditions.

Foliage, Ground and Flame Penetration

Synthetic aperture radars further also offer the capability for penetrating materials, which are optically opaque and thus not visible by optical or IR techniques. Low-frequency SARs may be used under certain conditions to penetrate foliage and even soil. This provides the capability for imaging targets, normally hidden by trees, brush, and other ground cover.

Detecting the human body

The human body emits a narrow range of Infra-Red radiation and to-date IR has been the go-to sensor for detecting humans.

However the size of the human body is more in the range wave lengths of Radio or Microwaves making them ideal for detection by radar energy.

High Powered, Low Flying, Target Acquisition

Using the strong radar cross section (RCS) values of the human body and with complex SAR signal processing, it is possible to identify targets (represented by selected white dots in Figure 6) with 100% accuracy. The coordinates of the (human) target can also exactly be located because of the low altitudes that can only be achieved low flying sUAS.

Image signatures

IR/thermal
At remote sensing altitudes, the visual thermal signatures of people, animals, hot rocks or terrain would look exactly the same, with no way of distinguishing between them.

SAR
Whereas with SAR, from the same perspective, the preset RCS signatures along with the radio waves used, and signal processing software, enabled by the right learning software (AI), you will not only be able to automatically recognize a human, but with incremental values of SAR, also differentiate amongst various individuals.

Airborne Drones is a specialist manufacturer of long range drones and integrator of advanced remote sensing payloads onto UAV platforms.

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