Our Technologies

Problem

Today radars and sensors are becoming more common due to the vast number of ways in which they can be used, including vehicles, drones, and even agriculture. However, the threat of interference, and thus malfunction, is extremely high with the current technology and can seriously impact performance and safety. Radars operate by emitting frequencies that can detect other frequencies in the vicinity. But if two radars are emitting the same frequency, they will interfere with each other and impact the ability to detect one another. With a higher number of radars in use, we need better technology.

Solution

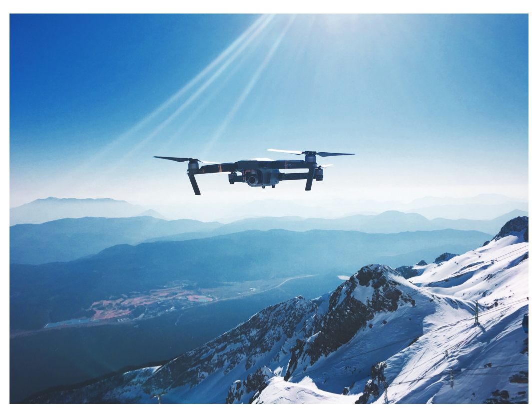
Ghostwave radars utilize our patented, pseudo-random radio frequency generator to solve the problems presented by other methods. By using pseudo-randomly generated radio frequencies, the likelihood of a nearby radar utilizing the exact same frequency at the exact time dramatically decreases.

Uses

Unmanned Aerial System

According to a Research and Markets report, the **Drone as a Service** market will be worth $3.6 billion by 2022. Due to this large and sudden increase, the Federal Aviation Administration will be enforcing strict guidelines by which the drones and other **Unmanned Aerial Systems** must oblige. However most **Detect and Avoid Systems** utilize either cameras or radars, both of which are inherently flawed. Cameras have the ability to recognize objects in proximity but falter as the distance between the camera and object increase, especially in poor weather conditions or other **Degraded Visual Environments**. Radars have greater range capabilities but other radars or radio frequencies can easily interfere.

Ghostwave's new technology combines camera and Ghostwave radar sensors to solve the problems faced when using just one type of sensor. Using an advanced electro-optical and infrared sensor package, our radars will have both near and distant detection abilities, as well as specific target object classification. Our patented, pseudo-random radio frequency generator ensures that the radar will not interfere with others nearby, also significantly decreasing (eliminating?) the likelihood of intentional jamming by another radar. The table below shows a comparison of several sensors, with the Ghostwave radar and sensor fusion proving most effective.



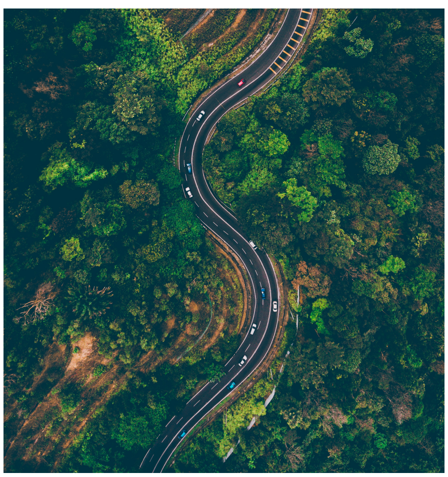
	EO/IR Camera	Lidar	Acoustic	Standard Radar	GhostWave Radar	EO/IR & GW Radar Fusion
Resolution	●	●	○	○	○	●
RF Jamming / Interference	●	●	●	○	●	●
Long Range	○	◉	○	●	●	●
Velocity	○	○	○	●	●	●
All Weather	○	○	○	●	●	●
Target Classification	●	◉	○	◉	◉	●
Size	●	○	●	◉	◉	●
Weight	●	○	●	◉	◉	◉
Power	●	◉	●	◉	◉	◉

○ Bad ◉ Medium ● Good

Table 1 Sensor Comparison (Acoustic and Lidar shown for competitive reasons only)

Automotive

In the United States, 70 million new cars are registered each year. If each car has 3 collision-detection sensors, there will be over 200 million on the road. The current radar based sensors are not protected from jamming and are highly susceptible to interference with other electrical devices within their range. Interference or jamming can lead to malfunction of the sensors, impacting safety, traffic flow, and driving convenience. Other camera or sound wave based sensors can detect when an object is getting close to the car, but do not work as well in poor weather or light conditions.



Ghostwave's patented radar technology is ideal for use in vehicles, especially in collision-detection devices. The RF Noise Radar uses a pseudo-random radio frequency generator and is significantly less susceptible to interference which increases safety while driving. The radars optimize the signal to clutter ratio, adapting to identify and classify specific targets but are not impeded by vegetation or other structures.

The Vehicle Obstacle Radar uses the RF Noise Radar and combines a radar array with our unique algorithm, producing a single continuous wave frequency. This frequency has very narrow bandwidth to prevent interference with other signals. The radar can detect distance, angle, position, size, and shape of objects, and can discriminate between "high" and "low" priority objects. Working through low-light, night-time, and inclement weather conditions, the sensors are able to detect obstacles especially when the driver cannot. The sensors are also easily hidden on the car's bumper, eliminating aesthetically unappealing and bulky sensors.

Bees

Honey bees today are subject to numerous natural and manmade pressures which are leading to colony loss and wild pollination extinction. Current methods for studying these interactions include applying treatment, evaluating hive health, and studying stressors require invasive sampling and jeopardize the flow of the colony. Advancement in monitoring will not only benefit the bees and thus our environment, but also have a positive economic impact on farmers. Sustaining hives will reduce rental price for farmers. In order to safely further the scientific study of stressors, identify threats, and determine the health of a colony, a non-invasive method is necessary.

While there are several non-invasive methods for studying bees but few accurately count the number of bees entering and leaving the hive, and none use sensors to measure the speed of the honey bee wings. Ghostwave is proposing a solution of the first radar-based, non-invasive hive monitoring system, utilizing our patented radar technology to safely measure the health of a colony. Low powered radars placed at hive entrances will detect Honey bees and any other species that may exit and enter the hive, while recording wing speed over time. Change in wing speed will indicate a change in hive health, whether it is from infection, predatory hornets, or man-made products. Bluetooth or Wi-Fi connectivity will allow the radars at different hives to form one centralized monitoring system that still has the capability of tracking individual hive health.