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Automotive Infrared Night Vision System Research Report, 2021

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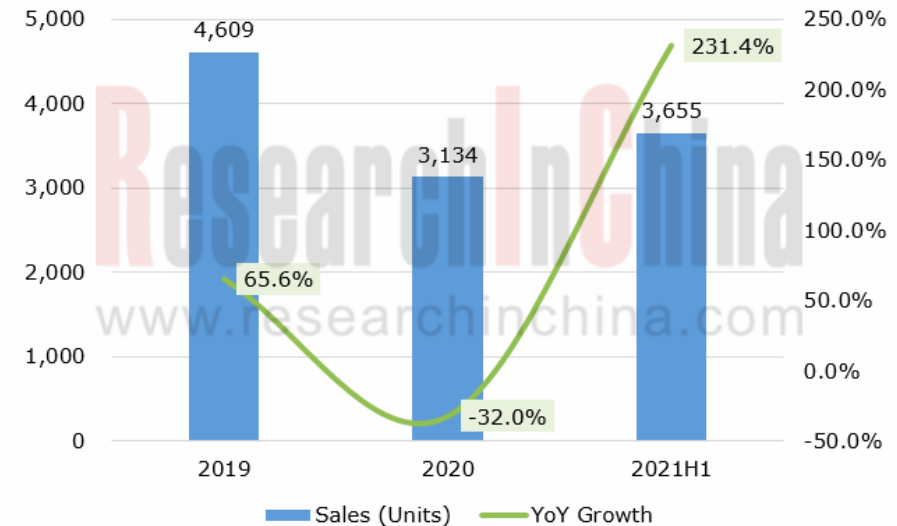
Infrared night vision research: as 60% traffic accidents happen at night, infrared imaging technology comes as an effective solution.

This report combs through development trends and market size of automotive infrared night vision, technology routes of main Chinese and foreign night vision system suppliers, and night vision system application of OEMs.

The statistics show that China saw nearly 200,000 traffic accidents happen every year in recent years, 60% of which took place at night and caused 50% of death toll. It is more dangerous to drive at night for the factors such as insufficient lighting and low visibility make drivers miss out or misjudge road conditions. Infrared thermography which is free of visible light can recognize targets with vital signs accurately either in the daytime or at night. With its anti-glare merit, this technology has great potential to protect driving safety at night.

In 2021H1, the sales of passenger cars equipped with night vision systems surged.

Sales of Passenger Cars with Night Vision Systems in China, 2019-2021



Source: ResearchInChina

From the sales of passenger cars packing night vision systems in China, it can be seen that despite an annualized plunge of 32.0% during the COVID-19 pandemic in 2020, the automobile industry has resumed production in China's efforts to control the outbreak, selling 3,655 cars with night vision systems in the first half of 2021 alone, a like-on-like spurt of 231.4%. Wherein, Cadillac, Audi and Volkswagen models were the key contributors to the soaring sales of night vision systems in this period.

In current stage, night vision systems still tend to be mounted on high-class models. Through the lens of the sales of passenger cars packing night vision systems in recent two years, those priced above RMB300,000 swept over 85% of the sales, of which the higher than RMB500,000 cars occupied over 60% share. Meanwhile, cars with prices ranging from RMB250,000 to RMB300,000 carried night vision systems as well, sharing 10.3% of the sales in 2020.

The declining cost of infrared detectors and the improving policies make automotive infrared night vision a promising market.

In the past, high price was an enduring constraint on wide adoption of automotive infrared night vision systems. The technology advances have driven down the cost fast:

- The maturing wafer-level and 3D packaging helps to lower the cost of detectors, a key component of infrared night vision system.
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- The homemade infrared sensors break the foreign monopoly, having a considerable cost advantage.
- Smaller pixel size drags down the cost of both infrared detector and system integration. Raytron Technology already develops the world's first large area array uncooled infrared detector with pixel spacing of 8 μ m and area array size of 1920 \times 1080, meeting the needs of high-end products that require high resolution and light weight.

Comparison of Product Performance between Major Night Vision System Suppliers Inside and Outside China

	Veoneer		Xuanyuan iDrive	SAT Infrared Technology	IRay Technology
Product	NV3 (3rd Generation)	NV4 (4th Generation)	Far Infrared Night Vision Obstacle Avoidance System	NV618S (5th Generation)	Xsafe-II Automotive Infrared Night Vision System (M6S)
Launch Time	2016	2020	2017	2021	2020
Technology	Far infrared		Far infrared	Far infrared + low light	Far infrared
Detector	Uncooled Vanadium Oxide		Uncooled focal plane array (UFPA)	Uncooled focal plane array (UFPA)	VOx uncooled focal plane array
Field of View	24°×18°	50°×39°	28°×21°	36°×27°	48°×36°
Resolution	336*256	320*256 and 640*512	384*288	384*288	640*512
Pixel Size	17μm	12μm	17μm	17μm	12μm
Pedestrian\Animal Recognition System	√	√	√	√	√
Detection Range	3 to 4 times the headlamps	200m for pedestrians	Up to 360 meters	200m for pedestrians	100m for pedestrians, 200m for objects
Size (mm)	60*86*82	35*40*47	75*58*68	89.5*116*70	36*36*61.75 (infrared camera size)

Source: ResearchInChina

The National Technical Committee of Auto Standardization has released the Automotive Active Infrared Detection System (Draft for Comments) and the Automotive Passive Infrared Detection System (Draft for Comments). The deadline for comments is September 27, 2021. The European New Car Assessment Program (E-NCAP) again introduced a range of new tests in the E-NCAP 2018, including AEB cyclist test, pedestrian detection in dark and hazy lighting conditions, and vehicle under test (VUT) hid by obstacles. As the relevant laws and regulations are further improved, the automotive night vision system market has a rosy prospect.

Infrared imaging technology finds ever wider application in autonomous driving.

Autonomous Bus with FLIR Thermal Imaging Camera

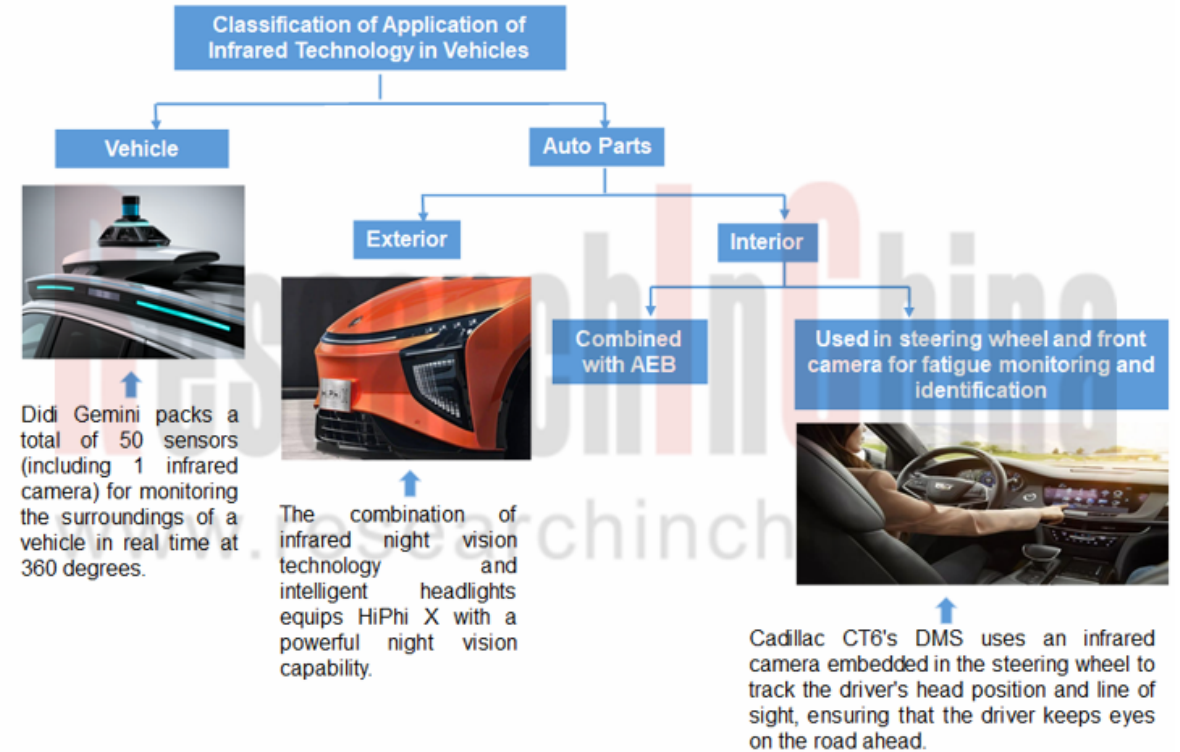


Source: FLIR

The application of infrared imaging technology in autonomous driving has become more widespread over the past years, for example:

1. In December 2020, Zoox introduced its first autonomous battery electric vehicle equipped with the thermal imaging camera provided by Teledyne FLIR. This device can accurately recognize and classify objects in urban streets around the clock.
2. In March 2021, Apple was granted a patent for the night vision system that combines visible light, near-infrared (NIR), and long-wave infrared (LWIR) sensors. The system is applicable to autonomous vehicles.
3. On the first day of the Auto Shanghai 2021, Didi Autonomous Driving and Volvo jointly launched “DiDi Gemini”, a new-generation L4 autonomous test vehicle which packs a total of 50 sensors including 1 infrared camera.
4. In May 2021, ADASTEC integrated two Teledyne FLIR thermal imagers into its flowride.ai automation platform, with the primary focus on improving detection and safety of all vulnerable road users on or near the road and at bus stops.

Application of Infrared Imaging Technology in Vehicles



Source: ResearchInChina

Safety is a frequent topic of autonomous driving. Also, autonomous driving needs to have the ability to perceive beyond visual range and work 24/7, in all weather conditions. Infrared imaging technology can meet its needs.

Infrared sensors are a complement to visible light cameras that fail to detect pedestrians in dark conditions. They are not only more affordable than LiDAR but a remedy for the natural defect of LiDAR that it cannot classify objects.

Moreover, infrared sensors can work all day long, which is required by autonomous driving, and provides a longer visual range (the average active vehicle infrared night vision system detects 150m to 200m, and the average passive vehicle infrared night vision system up to 300m). Infrared thermography thus becomes an indispensable technology in the autonomous driving night vision field. The technology will fuse and work with other sensors to make driving safer by playing their respective role. As its price goes down, it will expedite the application of autonomous driving technologies.

As Adasky, an infrared night vision device vendor, said, its Viper infrared thermal imager is not launched to replace a certain type of sensor but works with this sensor to fill the targeted gaps left by other solutions in autonomous driving, so that vehicles have a stronger ability to perceive the surroundings and make decisions.

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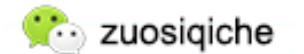
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