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EXPLORE, DREAM, DISCOVER

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GENESIS

IGNITING THOUGHTS

CONTENTS

Vision:

To be recognized at the national and international level for excellence in education and research in Electronics and Communication Engineering.

Mission:

- Inculcating leadership qualities, adaptability, and ethical values
- Imparting quality education in the field of electronics, communication, and related areas to meet the challenges in the industry, academia, and research
- Nurture the growth of each individual by providing a dynamic and conducive learning environment.

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LET'S !

CONGRATULATE

Startup Ftechie Reached the finals of Samrambhaka Entrepreneurs Reality Show.

Team Members:

- Anita Shaji
- Archana
- Mentor
- Anuroop K B

CONGRATULATIONS

PLACEMENTS


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Congratulations!
For getting placed at
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BATCH
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CHRISTY K SHILLY
ASWANI M RAVI
ANANTHAKRISHNAN S BABU
KAVYA G PADIYAR

TEACHER'S ZONE

PRAJEESH P A
ASST PROESSOR

4D RADAR IMPROVES SAFETY AND ACCURACY IN AUTOMOTIVE AND INDUSTRIAL APPLICATIONS

There has been a lot of interest recently in the development of next-generation radar sensors for automotive and industrial applications. Unlike first-generation radar systems, which collected only speed, range, and angle-of-arrival, state-of-the-art 4D radar systems can determine an object's position in the range, azimuth, elevation, and relative speed, providing more detailed information.

4D radar sensors provide better resolution than previous radar versions and equal the performance of a LiDAR system, which is a much more expensive solution and suffers in poor visibility conditions such as rain and fog. By offering all-weather sub-degree horizontal and elevation spatial resolution on long-range around a wide field of view, 4D enhanced resolution and sensitivity unlock the potential of market-proven commercial radars.

The technology on which 4D radar systems are based can tell when and how fast a vehicle is moving in all types of weather and environmental conditions. Cameras can be harmed by strong sunlight or darkness, and depth and contrast issues can arise. In bad weather, standard radar works fine, but it can't detect objects in great detail. LiDARs are excellent for identifying objects in space. However, they are hampered by adverse weather.

STERADIAN 4D IMAGING RADAR

Steradian Semiconductor, a fabless semiconductor company headquartered in Bangalore (India), is focused on CMOS millimeter wave products for 4D radar imaging. Founded by industry experts with several years of experience in designing cellular/RF and microwave transceiver ICs, Steradian provides a multi-patented hardware and perception software 4D solution. The target markets for Steradian's products include applications ranging from automotive to industrial.

"We are primarily a solution provider, focusing on perception software and the hardware side," said the company's spokesperson. "That means we provide both the hardware, which includes semiconductors, modules, antennas, and the software solution."

Today, most of cars offer advanced driver assistance systems (ADAS), corresponding to level 2 of the driving automation scale. Autonomous or semi-autonomous vehicles require sensors able to provide a high level of safety that, for automotive applications, means the sensor shall be all-weather reliable and not be affected by weather conditions such as sun, rain, or fog. None of the above-mentioned parameters should impact the sensor behavior, and that is one of the main reasons why radar systems have been used in cars, from almost two decades.
Compared to a LiDAR solution, 4D radar imaging provides three major benefits:

- Cost: Radar cost is a fraction of LiDAR.
- Safety: Radar provides 300m+ visibility under all weather conditions.
- Reliability: Since 2019, more than 30 million conventional radars have been shipped.

Radar has a long history of use in the automotive industry. It is not a new technology like LiDARs or cameras, which which have appeared in recent years. As an example, in order to get the highest safety rating (5 stars) of the European New Car Assessment Programme (Euro NCAP), radar systems become mandatory."Next-generation sensors are expected to provide that safety feature and, at the same time, more real-time information about the surrounding," said the company's spokesperson.
According to Steradian, the current generation of radars, which is also referred to as 2.5D radar, does not provide any other information than the presence or absence of an object. It is a kind of binary information, and it lacks details such as the width, the height, or the shape of the object in front of the vehicle. Today, LiDARs and cameras are doing that, but this is not possible with conventional radars**.**

"This is where multiple dimensions need to come into the radar system so that it can identify the size, as well the posture of the objects, and being able to do much more than what it is doing today," said the company's spokesperson.
Steradian 4D imaging radar includes a front end operating in millimeter wave (mmWave) in the 76 to 81 GHz band, which pairs up their custom radar perception software. The radar IC (SVR) is an integrated 16 channel E-band MIMO radar transceiver that interfaces with the Imaging Radar Unit (IRU), shown in Figure 1, an E-band 256 channel MIMO Radar Module. The IRU is capable of 4D imaging thanks to its antenna array generating a 1.2° azimuth beam width and supports multimode through its wide field of view (FOV), 120° in azimuth and 30° in elevation.

The software can run on different processors, such as Nvidia or Renesas, depending on the specific platform. That allows a quick and easy migration from one platform to the other.

“If you can see till 40 meters, you can even achieve centimeter resolutions with our one-degree angular resolution,” saThe signal coming from the radar IC (Figure 2) is converted into something called point cloud, providing the necessary width, height, and shape. This format is very similar to what LiDARs used to provide earlier, but it comes at a fraction of the cost and it is possible in all weather conditions. The 4D Imaging Radar perception software, a 4D MIMO imaging radar processing stack and visualizer, provides the user with a high-density point cloud in 4D space for object dimensions and doppler. Featuring an accuracy of 0.1° in azimuth and 0.3° in elevation, the 4D imaging software is compatible with the most popular compute platforms, including Nvidia GPU. Steradian solutionid the company’s spokesperson. “That is one of the aspects of the solution where we are doing better than any other competitor today in the market.”

The hardware and the software come together to form the imaging radar unit, which can be used not only in automotive but even for the industrial market. Industrial applications include, for instance, the intelligent transportation system, which is a way to manage the traffic in various cities. Traffic monitoring allows to identify the vehicles approaching a road and to display their speed. Other applications are virtual docking guidance systems on airports, high-density traffic management with classification,precise guidance ,and parking of aircrafts,drones,monitoring of liquid level,and more.

STUDENTS ZONE

4D RADAR - BASICS AND APPLICATIONS

ASHLY SHIBU, S5 ECE A

4D radar is a technology that uses echolocation and a concept called time-of-flight measurement to map objects in a 3D environment. It is currently being tested in the autonomous vehicle industry to map the locations of items in a vehicle's path. It differs from the older technologies like Lidar, standard radar, and cameras because 4D radar can tell when a vehicle is moving and how fast in all types of weather and environmental conditions.

It is a relatively new technology that uses a large Radio Frequency (RF) channel array to detect the relative speed, distance, and azimuth of items in the roadway, as well as the height of the objects above the road. The fourth dimension does refer to time, but 4D radar doesn't really map time. Instead, it uses time in its calculations to determine the elevation of objects and their relative speed.

To map the environment around the vehicle in high-resolution, a 4D imaging radar uses a Multiple Input Multiple Output (MIMO) antenna array. This can include dozens of antennas that transmit signals to targets in the device's surrounding environment and then receive the signals as they bounce off-targets. The data that is received by the antennas are then used to generate a point cloud that represents the area surrounding the array. A large array enables accurate detection of both static and dynamic objects simultaneously in high detail. It can also capture doppler shifts in the environment and use them to indicate the direction an object is moving.

Because 4D radar sends dense signals out in all directions, it can work inside the cabin of a vehicle by classifying children and adults, monitoring vital signs, and detecting the position of occupants. This feature can be used to optimize the deployment of airbags, optimize the tensioner in seat belts, provide advance seat belt warnings, and detect intruders in or around the car.

Basics

- 4D radar uses a large Multiple Input Multiple Output (MIMO) antenna array for echolocation. It sends signals that bounce off objects in the environment and captures the results to calculate the size, location, direction, speed, and elevation of objects in the environment.
- 4D radar replaces older technologies like cameras, radar, and Lidar that are used for computer vision and autonomous driving in vehicles.
- 4D radar has the advantage of being able to work in any weather and any level of lighting, detect elevation, speed, and direction accurately, and detect targets behind other objects in the environment.

Applications

- Decision-making for vehicles to increase safety. In dynamic applications, the 4D imaging Radar offers enhanced availability and accuracy for safety and kinematic-based functions in all weather conditions.

- HEAVY MACHINERY

Personal safety and spatial awareness are key factors in environments where very large vehicles move and function. Other key factors when executing earthwork operations, large construction tasks, or agricultural and soil refinement are robustness and autonomy. Something that could be essential to increase efficiency and productivity. With a 2K ultra-high-resolution radar-equipped, scalable and affordable sensing solution jacked for every environmental scenario and geographic terrain is possible.

- ROBOT SHUTTLES & TAXIS

On-demand transportation services operate in dense urban environments surrounded by numerous static and moving obstacles. The ability to maneuver efficiently and safely is paramount, ensuring vulnerable road users (VRUs) are protected at all times. Arbe's 4D Imaging Radar operates in 2K resolution, tracking hundreds of objects in real-time, ensuring the road ahead is safe when it matters most.

- Static Applications

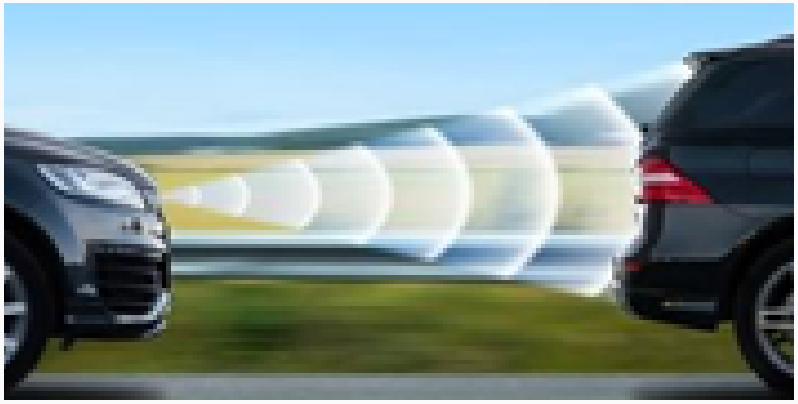
data collections for optimization and decision making In static applications for monitoring and surveillance services the Ultra High Resolution Radar offers real time zone protection, enhanced personal safety, traffic flow optimization and adaptive decision making.

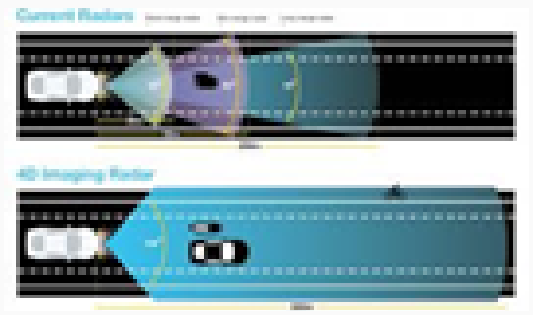
- SMART CITIES

Infrastructural growth and technological progress are making cities more intelligent. The process to monitor parking spaces and traffic is often automated and harsh weather conditions and bad lightning can reduce visibility, efficiency, and I worse case safety. Delivering 2K resolution, the 4D imaging radar is fully operational in all weather and lighting conditions, ensuring always-on functionality and intelligent support.

- CONSTRUCTION SITE SAFETY

Security and safety on a construction site are crucial. The 4D Imaging Radars can monitor movement patterns and behaviors in predefined areas to provide real-time safety or security breach warnings. Operational in all weather and lighting conditions, Arbe radar is the ideal solution for full-site monitoring and surveillance, ensuring crew safety and site integrity. Also, the information on the position, speed, movement direction, distance and angle is helpful for predicting the position sequence of a detected object.





STAFF ACHIEVEMENTS

NEETHU SUMAN

•Attended AICTE Training And Learning (ATAL) Academy Online Elementary FDP on "Advancement of Digital Health and Medical Innovations during Pandemic" from 06/12/2021 to 10/12/2021 conducted by Model Engineering College.

ASWATHY N

•Attended IEEE Annual General Meeting 2021 Kochi subsection on 15th January 2022.
·Published a paper titled " Implementation of a Multitudinous Face Recognition using VOLO. V3" in IEEE Xplore on January 20th at 2021 Fourth International Conference (ICMSS).

ANJU GEORGE

•Published a paper titled " Implementation of a Multitudinous Face Recognition using VOLO. V3" in IEEE Xplore on January 20th at 2021 Fourth International Conference (ICMSS).

STUDENT ACHIEVEMENTS

FATHIMA MUHSINA V. A (2020-24 BATCH)

Attended the program "Suraksha, Say yes to life" conducted by NSS, Narcotics Control Bureau on 1/17/2022.

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