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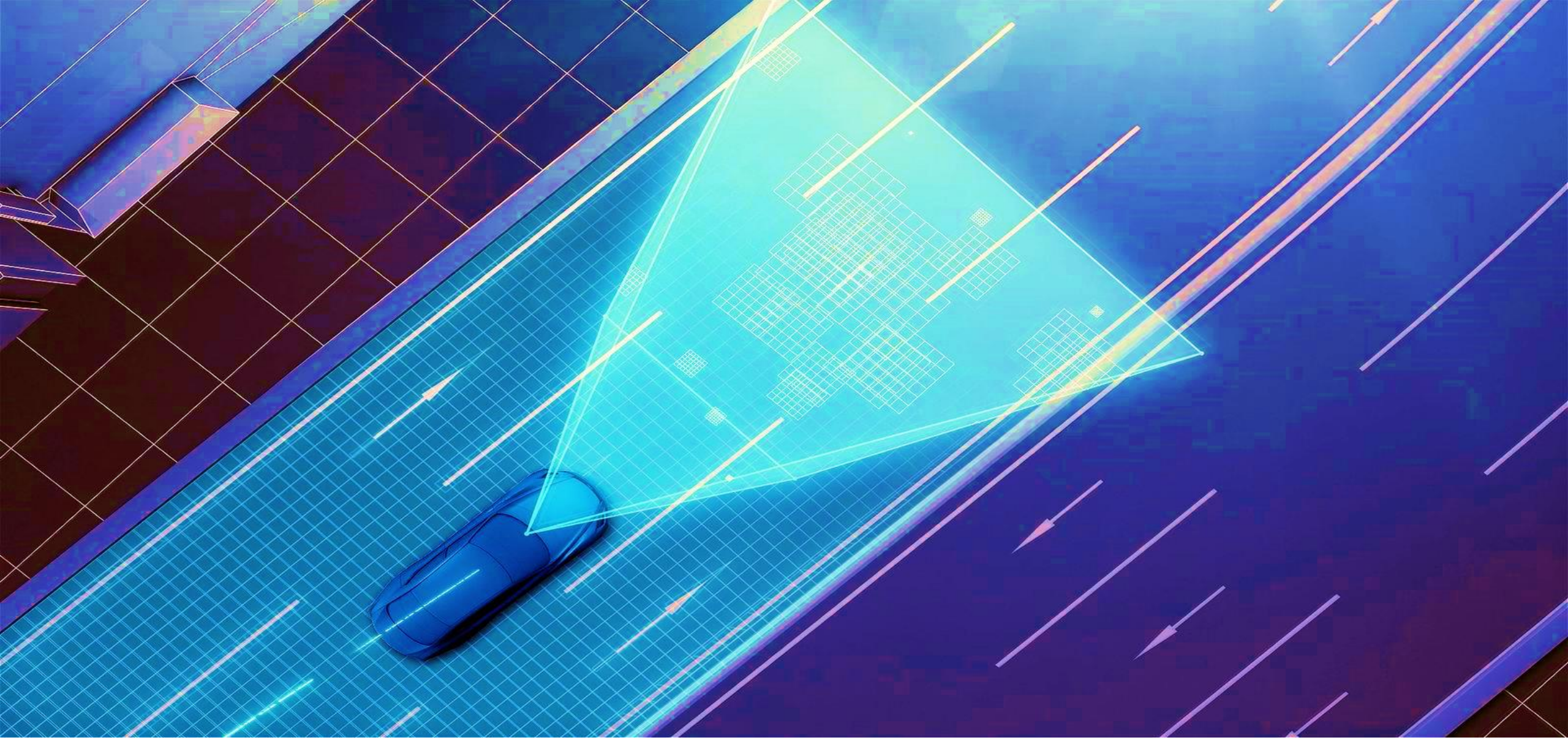
TECH DRIVEN FUTURE

- AUTONOMOUS CARS | EMERGING TECH SERIES



TECH DRIVEN FUTURE

Big Blue Banyan, a Singapore based analyst firm focused on emerging technologies and markets, providing direction on disruptive technologies and opportunities in today's fast changing world.

Big Blue Banyan helps clients large and small with information, insight and intelligence required for planning and strategy, business decision making, as an independent advisory firm.

Samson Fernandes serves as an Analyst covering Emerging technologies and trends shaping tomorrow's world. As an in-market, on-hands Analyst, Samson also specializes in Statistics, bringing in diverse experience and robust perspective.

Q. Do you really see Autonomous cars as Disruptive in Auto industry today?

Autonomous cars or Driverless cars extensively depend on software integrated with cameras, sensors and radars to sense their surrounding area and thus navigate with minimum or no human intervention; which means, yes, there is tremendous potential to be disruptive as it challenges convention. And for something of this magnitude, we must appreciate the R&D which goes in, which started about 40 years ago at Tsukuba Mechanical Engineering Lab in Japan, which created the first autonomous and intelligent vehicle in 1977. It tracked white street markers and achieved speeds up to 30kmph.

Further, Ernst Dickmanns and his group at University Bundeewehr Munich, built robot cars in 1980 using saccadic vision and parallel computers, which registered 96kmph on an empty street. And in 1995, Mercedes-Benz model made it from Munich to Copenhagen and back, clocking above 1000 autonomous miles on a highway, and exceeded speeds of 177kmph.

And around 2007, tech makers began to leverage more advanced sensor systems which make collision avoidance and lane recognition possible. And very recently, we had NIO EP9 set a new record this year for the fastest autonomous car achieving a top speed of 258kmph.

While this is at an early stage, Autonomous cars undoubtedly have the potential to defy convention and prove to be Disruptive; however, the penetration is likely to get noticed first in more advanced markets, which are more infrastructure ready.

Q. Is there someone in particular leading this space, already, from R&D perspective?

While there are over 40 companies associated with this technology, Tesla is the most famous level 2 (The driver must always be ready to intervene if the automated system fails to respond properly) autonomous car in the market, with Volvo and Google following. The latter has been testing driverless cars longer than any other company.

None of the companies have been able to achieve level 3 (The driver must still be prepared to intervene within some limited time, specified by the manufacturer, when called upon by the vehicle to do so) yet.

There's more for us to watch out – Mobileye and Delphi teamed up in 2016 to develop driverless vehicle technology announcing they will deliver autonomous technology capable of level 4 (As level 3, but no driver attention is ever required for safety) autonomy to automakers by 2019; and Ford announced that they would skip level 3 and come up with level 4 cars in the market by 2021. Intel, BMW, Audi, Bosch and Uber are also in the run of developing autonomous cars.

So, while Tesla, Volvo and Google are prominent from R&D perspective, others can be fast runners!

Q. What are some of the most significant investments and developments lately?

Uber's recent deal with Volvo to develop fully autonomous vehicles is one, under which Volvo and Uber will contribute $300 million to the project with Uber making 100 of Volvo's newest semi-autonomous vehicles available to its Pittsburgh customers. Also, Uber's acquisition of Otto, a driverless trucking company, for US$ 680 Million is another example.

Chipmaker Intel's venture capital arm is investing $250 million over the next two years into autonomous vehicle technology, towards mitigating risks, improving safety, mobility and efficiency at a reduced cost.

Another significant investment is that of General Motors in acquiring self-driving software startup Cruise Automation in March, 2016.

We see partnerships building up and lot of investments into the autonomous car industry, which is mainly enabled by Software; and so the biggest opportunity in this emerging space is for Software companies working in this space.

Q. What opportunities do you see for Software developers and companies?

Software is accounted for approximately 70% of the total autonomous car value and it is this software that differentiates and makes a car autonomous.

If you've ever seen an autonomous vehicle you may have noticed a rapidly spinning tube mounted on its roof. This is a lidar unit. Its role is to measure the distance of objects relative to the position of the car in 3-D. Lidar works with radar to cross validate data. Radar uses radio waves to determine the velocity, range and angle of objects. Unlike both lidar and radar, cameras can see color, making them the best for scene interpretation. Autonomous cars also need wireless communication for which V2X is used to communicate from vehicle to other vehicles, infrastructures and pedestrians.

Mapping is another important software that has to be very minutely detailed compared to conventional maps. Other than this we have software such as security software, embedded controls, HMI (Human-machine interface), embedded modems and few more.

So, the opportunities are immense around these software; and another huge opportunity is in seamless integration of all these applications.

Since the number of car makers is very limited and the players being very large with in-house capabilities, the specialization and unique proposition the developers have to offer will be the key for software developers/companies.

Q. Are there any examples of Software companies seizing these opportunities?

There's quite a few examples; there are companies that are partnering with auto makers, few being Toyota-Uber and Fiat-Google, the latter will work together on manufacturing 100 specially designed Pacifica minivans which will be fitted with Google's automation equipment.

Another example is Cruise Automation' acquisition by GM for US$ 1 Billion last year (2016).

Few companies were in news for investments raised – nuTonomy is developing the first-of-its-kind complete solution for providing point-to-point mobility via large fleets of autonomous vehicles and has raised $16M last year in its Series A after a $3.6M seed round in January; and Zoox, a robotics company pioneering autonomous mobility raised a massive $250 million funding last year. George Hotz's Comma.ai, a US-based startup in to autonomous driving software received a $3.1M seed investment last year in the month of March.

Mobileye and Delphi's partnership is another example of two software entities coming together.

Q. How do you see the potential of this market evolving or changing?

Software is estimated currently at US$ 14.6 Billion and by 2030, is expected to reach US$ 160.26 Billion, at a CAGR of 18.66%.

In Software, Lidar as a segment will lead the software market (about 30% of overall software market), is estimated to grow from US$ 4.61 Billion in 2016 to US$ 50.37 Billion by 2030.

Other Software – such as radar will grow from US$ 1.59 Billion to US$ 17.36 Billion, V2X from US$ 1.57 Billion to US$ 17.15 Billion, Camera/Imaging from US$ 1.33 Billion to US$ 14.59 Billion, Mapping from US$ 1.15 Billion to US$ 12.59 Billion, all of this from the year 2016 to 2030.

America, at over US$ 7 Billion, holds over 50% of the total global software market in 2016; and Europe accounts for over US$ 5 Billion and is expected to exceed US$ 40 Billion by 2030.

Other countries haven't really entered the game yet, accounting for not more than 20% of the total global software market in 2016. This however might change in the coming years given the increasing potential of APAC.

Q. How does this technology mark out different geographical markets?

The global autonomous car market standing at a value of US$ 21.01 Billion will grow almost 10 times by the year 2030 crossing US$ 200 Billion at a CAGR of over 18%. America accounted for over 45% of the total value in 2016 which is US$ 11.6 Billion, which is expected to grow over US$ 100 Billion by 2030.

Europe accounting for US$ 8.2 Billion in 2016, holds a little over 40% of the total market value and will grow to nearly US$ 90 Billion by 2030. Others hold about 12% of the total market share and this should increase to almost 20% by 2030 crossing US$ 20 Billion.

Speaking about the hardware market specifically, globally it stood at US$ 6.35 Billion in 2016 and accounts for approximately 30% of the total autonomous market value. This market will almost touch USD 70 Billion by 2030. On Hardware too, America will be leading the market, valued at US$ 3.5 Billion in 2016 and projected to US$ 35 Billion by 2030.

A significant factor which will mark out the penetration of this technology is the regulatory environment in respective markets, in view of greater safety, improved traffic management and fuel efficiencies, indirectly contributing to emission targets made possible by Autonomous cars.

THANK YOU!

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