Technology Watch at CES

<<Digital Transport>>

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Digital Transport at CES 2018

Abstract

Transportation as we know it today is on the verge to disappear. The digital revolution that shaped the new economy the last two decades through an exponential development of computational power and the arrival of big data is about to conquer and reshape old industries such as the cars, planes and trains ones. Of course, technology has already played a great role in the modernization of this field. We can find chips in all kind of transportation systems, from elevator to cars. But if it helped improving greatly the user experience and safety (2017 saw zero major plane accident for example), the interaction between humans and the machine has still remained roughly the same for the great majority. For example, the majority of drivers still needs to use a wheel, pedals, and has to park its own car.

Companies like Tesla already introduced a first taste to the public of what the near future will offer to our modern societies: self-driving cars, emergence of all-electric vehicles, powerful on-board computers that can analyse in real time the environment and take decisions faster and probably more rationally than a human being. Uber is already investigating and financing projects of driverless cars that would be almost completely autonomous new forms of taxis.

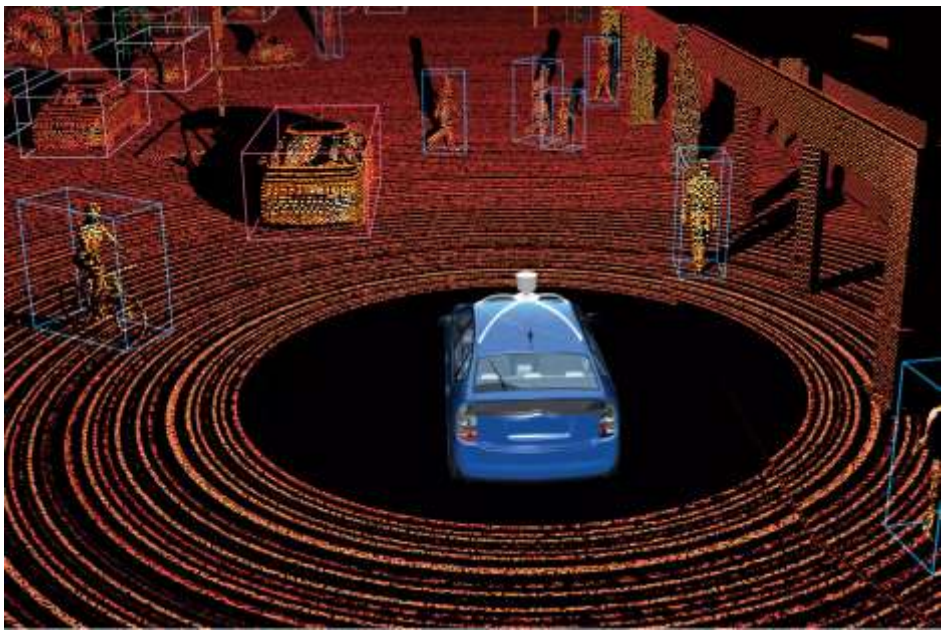
Many start-ups felt the opportunity to bring new technologies and services to this sector. The CES, which is held every January in Las Vegas, welcomes many of these companies and for this reason is a great place to meet the leading actors of this market and understand where the change is going. Considered as one of the top 10 auto shows according to USA Today, it gives a unique glimpse of the evolution of transportation technology.

This document will explore three main trends of the future of transportation:

- The next generation of connected systems and equipment
- The self-driving cars
- The new services offered by these evolutions

Our intent is to understand the main trends and identify the leading actors to make a visit at the CES the most profitable as possible. At the end of the visit, I hope to have a clearer vision of the possibilities and challenges to be an entrepreneur in this area.

A fully connected Car



Interestingly, an attendee of the CES 2018, Autoliv company, presents its contribution to the future of vehicles, the computer inside the car, as a "5th passenger". It plans to equip its clients' vehicles with a large array of sensors that will analyse the sound and behaviour of the passengers and driver. Through deep learning algorithms, the embedded system will allow a smarter and trust-worthy communication with them. This new type of available information aims to create a new ride atmosphere by addressing passengers' concern and entertainment as well as safety and the feeling of safety.

The major issue they are working on today is to find a solution to build a healthy trust and confidence in the smart computer embedded in the next generation cars. It is a very challenging task as drivers are still today skeptical about resting on a computer for their safety.

Fortunately, some of their executives and researchers will attend the CES 2018 and offer the opportunity to exchange with them about the future of cars and the remaining issues needing to be solved.

Autoliv

https://www.autoliv.com/

Few of the topics I would like to cover with the executives are:

- The vision system (road sign detection, forward collision warning, night vision enhancement)
- The System Integration for passive and active safety, especially as Autoliv is now in the process of launching its second version of its Electronic Control Unit
- The communication system such as vibrating seat bells or wheel to warn and protect passengers and drivers in emergency situations.

Another company that is working on connected car is Byton. Their belief is that the next generation of car will not focus on driving performance in terms of powerhouse but rather on connectivity and smart devices. To do so, they intend to include 4G to 5G mobile networks, the Internet of things, artificial intelligence and shared economy to bring the most import change in the industry in over 100 years of history.
Byton thinks a lot can be done to turn the average 90 minutes we spend in our cars into a truly productive and enjoyable moment.
During the CES, they will present their new concept creations and projects developments, and for the first time their own car.
In my opinion, it will be very profitable to attend their presentation and understand more in details their vision of the product. I would like to exchange with them about their desire to change the paradigm of cars from the traditional horsepower cylinders dream to a more private, unique and tailor-made digital interior experience. I am also curious to hear their creative team talk about how to build a new identity for cars as this is carrying a strong inspirational and bold envision of the future. The last topic I would like to cover is how they developed their Smart Intuitive Vehicle and how they believe they can compete with bigger companies such as Google or German car makers. What is their strategy to differentiate themselves?

BYTON

http://www.byton.com/

The self-driving car

Beyond a smarter interior environment and a passive and active driving assistance, some companies are already preparing a more impactful stage: a car that will take full control of the wheel and pedals.

We can divide 5 levels of automation:

1°) The car can control either the wheel or the pedals from time to time such as breaking when an impact is about to occur

2°) The car can control both of the wheel and the pedals during short periods such as traffic jams or auto parking

3°) The car controls both most of the time, but with some situation it cannot handle

4°) The car controls both all the time, but within limited geographical areas or conditions such as during daylight and good weather

5°) The car has full control everywhere and what ever the conditions of the road or weather

Level 1 has been achieved a decade ago. Level 2 few years ago (ex: Mercedes). Whereas level 3 has been introduced by Tesla not so long ago.

If we might have to wait few decades before 'level 5' cars appear due to issues met during bad weather conditions, level 4 is already in all car makers' mind and target.

As always CES is a main event to appreciate the progress toward this direction, as many major car manufacturers will attend the show. It will be very interesting to see the new technology involved and the solutions they came up with.

As a Deloitte report stated, the primary concern about self-driving cars should be safety and users' trust in the reliability of the integrated auto pilot system.

Moreover, this report reveals clients in major countries are not inclined to spend extra money for this feature yet.
(https://www2.deloitte.com/content/dam/Deloitte/us/Documents/manufacturing/us-manufacturing-consumer-opinions-on-advanced-vehicle-technology.pdf)

So, the CES is a great opportunity to meet executives of this industry to talk about their vision of the market development and how they plan to bring this technology as soon as possible in our daily routine.
One of my concerns is that today the cost of all the required sensors is often beyond the price of the car itself. So how will they solve this problem?

I am particularly enthusiastic to hear the conference of Ya-Qin Zhang, president of Baidu Inc, who will talk about the future of personal transportation. As the leader of a major tech company, he will provide to the audience great insights of the direction this evolution will take and how to implement it as smooth as possible. Considering the financial and human powerhouse Baidu has to fuel its ambition, He might lead the way to a clearer picture of what tomorrow transportation will look like.

Besides Baidu, I plan to meet executives from Nissan Motor and Daimler to create contacts and exchange ideas. It will help me to define more specifically my project and confirm the directions I am taking. It will also be valuable to keep contacts once back in Europe.

Furthermore, I intend to experience by myself the feelings of future automated cars in order to anchor the requirements of this technology in my own perspective.

A new set of services

Enabling citizen wellbeing by developing
sustainable infrastructure and providing **high quality services**

The arrival of fully connected and autonomous cars is changing our vision of the car and transportation. Combined with smart cities, we can imagine a world without congestion based on a mass ride-sharing and smart public transport. Parking spaces will not be a problem anymore: cars will be able to park themselves away from home and be called with our smartphones to come pick us up.
One goal is to achieve a 100% shared mobility for the entire population across countries internationally in a new sharing economy paradigm.
Many services will be improved: from planes with petabytes of data still unexploited, to logistics and daily commuting to work.

So we are facing a future based on connected, data-driven communities where pollution, traffic flows, and public safety will be at their best.

To explore more deeply all the possibilities and ideas relying on smart cities, the CES 2018 will have a complete exhibition centre on this topic.
The exciting aspect of this field is there is so much to do. We are only on the first stage of this revolution.
Especially, I will greatly enjoy meeting:

- The European Commission represented by Deloitte Consul and its 15 cutting-edge Smart Tech innovators.

- Ericsson and their ideas on how to reinvent how we interact with people, content and devices in a networked society

I hope to meet inspirational people who will fuel my own ideas and concepts of a better society and discuss about their innovative products. I would like to understand in particularly how they work with authorities to promote and implement their solutions and hear their advice on the development of my career.

Hyperloop

http://www.spacex.com/hyperloop
https://hyperloop-one.com/

Every car-owner of big cities experienced at least once the troubles of endless traffic jams. Alternatives exist: trains, planes, underground. These ones have been around for decades and played a fair role to offer faster and reliable transportation solutions.
Today's state of technology is allowing a new concept of high-speed transportation with attractive core characteristics:

- Twice as fast as a plane
- Downtown platform exchange
- Immune to weather conditions
- No collision risks
- High power efficiency

This so-called "fifth mode of transport" has been promoted by Elon Musk under the name of Hyperloop since 2012. It received a strong support by Tesla and SpaceX companies but has been open-sourced by its developers to push other parties to bring this concept to reality. As a consequence, few companies are taking up the challenge: Hyperloop One (Virgin) and Hyperloop Transportation Technologies (HTT) are some of them.
A major case study as an illustration of the feasibility of the project is a route between Los Angeles and San Francisco. It would be 550km long, with a top speed of 1200 km/h enabling a 35 minutes travel trip. Others include routes between Los Angeles and Las Vegas or Dubai and Abu Dhabi.

Hyperloop project is divided into 3 main development components:

- The capsule
- The infrastructure
- The station

The capsule will include propulsion based on linear induction motor allowing a frictionless magnetic cushion and powered by embedded rechargeable batteries. On a ecologic perspective, hyperloop is promoted as an emission-free solution. In terms of capacity, each capsule should carry about 35 persons, for a total of 150000 persons a day per line at full capacity (1 departure every 40s). Cargo capsules are also under study.
The structure will be tubes made out of steel, concrete and carbon fibres. The common approach is to place them above the ground, with ground or underground segments if necessary. This choice is made out of economic and safety reasons (earthquakes and collisions with roads). As a consequence, dense

regions will be more difficult to equipped. The main characteristics of the tube will be a low-pressure inner atmosphere to reduce drag forces and an automation system to improve reliability and efficiency.
Finally, the stations as shown by the involved companies are said to be a new kind of transit hub with energy-efficient design and integrated with urban centres.

Toyota's E-Palette

Toyota, the second largest carmaker in the world, presented during the CES 2018 its own vision of the future of urban transportation, services and versatility. Their solution is called E-Palette and described as a "fully-automated, next generation battery electric vehicle designed to be scalable and customizable for a range of Mobility-as-a-Service businesses".
It intends to offer usual transportation services such as ride-sharing and carpooling in an autonomous and optimized system. This service will be fully adaptable to the situation and request: school transportation, events organization, taxi… In the sense, it could replace bus and taxis at the same time with a float of vehicles meeting the demand where it rises and reconfigure itself according to the time of the day or the week-end versus week days.
The second purpose is a more ground-breaking one: mobile spaces. Each vehicle will have a unique design to bring services directly to the user. It includes mobile offices, logistics parcels services, e-commerce shops, mobile clinics or food trucks. As examples, a customer could express interest in some products and ask for a private showroom directly in his residential area, or fleet of mobile services (restaurants, info points, police, shops) could be deployed to cover large events. To demonstrate its concept, Toyota expect to be ready for a the 2020 Olympics Games in Tokyo.

Intel and Volocopter

https://www.volocopter.com

In January 2018, the CEO of Intel said: "Imagine pulling out your phone, opening up a transportation app and summoning your own personalized ride by air taxi. That sci-fi vision of the future is actually much closer than you might think."
Volocopter, in partnership with intel, is working to make this ambition a reality. The VC200 prototype they presented is already said to be stable and safe to fly two passengers with zero emission. The second stage in their current development is to make it completely autonomous. This is where Intel plays a crucial role. Indeed, its team created dedicated processors to monitor flight data, turbulences and wind shear and act accordingly on the 18 rotors.
For the time being, Volocopter is aiming for urban transportation in dense cities such as New York or Dubai. Its V2X model features a flight autonomy of 30 minutes allowing it to travel around 25 kilometres due to battery capacity. To cover longer distance, the company imagined swappable batteries.
Moreover, Volocopter can benefit from the experience Intel has gained in small-scaled drones whose demonstration during the opening of the South Korean Olympic games amazed the audience and reveal their profound skills in this technology. Especially, they accumulated enough redundancy in the drone so it can stay in the air if multiples failures would emerge.
To avoid crash, the drone uses 9 separated and independent battery packs and dual redundant GPS and navigation system. Finally, if the integrity of the whole system is at risk, a ballistic parachute in the top is ready to be deployed to bring safely passengers on the ground.
The commercial model is set to be launched in the early 2020's.

Surefly by Workorse

http://workhorse.com/surefly

Surefly is a two-seats personal helicopter with eight independent motors each driving a single carbon fiber monopropeller, a battery pack and a ballistic parachute in case of emergency landing. The company's motto is to bring an affordable and easy-to-pilot flying experience to its customers.
It presents few differences from its competitors. First, Surefly targets directly customers: whereas some like Velicopter are developing a service business, here every licensed pilot would be able to purchase one. To facilitate this purchase, the aircraft is able to fold itself and occupy roughly the volume of a 4 wheels drive. Secondly, the current models are not autonomous. So, legislation constraints are lower and offer a quicker access to the market. Finally, the choice of gasoline engines gives a range capacity much more appreciable for personal purposes (1 hour autonomy for a full tank).
In terms of safety, Surefly has like all competitors redundancies on all critical system. It also embarks emergency batteries for landing if gasoline engines fails and a ballistic parachute.
The multiple propellers systems offer an easier flying control compared to traditional helicopter. There is no longer wings tail, tilt rotor or tilt wings. This is a key selling argument: an helicopter flying experience with a less challenging skill learning curve.
Finally, the company is also exploring new markets. It goes from agriculture precision tasks to emergency responders or military uses.

The model is currently bookable and will be available at around 200000$ in the near future.

Bell Air Taxi

http://www.bellflight.com/company/innovation/air-taxi

Bell, an American helicopter manufacturer leader, also came to the CES in Las Vegas in 2018 to unveil its futuristic concept of electric flying taxi. During the show, only the cabin was displayed in an effort to highlight the experience from a passenger's perspective. The company announced the full aircraft would be showed to the public at a later date.

The qualities Bell has to offer are pivoting around a unique moment in a relaxing and comforting place. They are also focusing on bring the Internet of Things on-board: the passenger will receive multiple information on its surroundings, its destination and will be able to connect with friends, workers, colleagues… He will be able to follow the news, hold conference calls and work on documents.

A key aspect of their research was to imagine an environment suitable for everyone, such as a taxi, whereas today helicopters users are mainly very wealthy people only.

To be one of the disrupters of this market, Bell announced a partnership with Uber. They plan to commercialize their first flight services in 2025.

Issues of transportation innovations

The new transportation modes that will emerge in a close future will raise important questions in terms of regulations, cities development, costs and ethics.

Regulations

Transportation business proposals as seen during the CES 2018 imply new ways to interact with our environment and with others. Thus, they are not necessarily compatible with current regulations. To push new technologies and boost the economy, new laws need to be implemented in cooperation with the involved parties and the population. For instance, autonomous cars are not allowed for obvious reasons in our streets yet. Authorities will have to set a clear frame to prevent legal loopholes, help car makers to be able to test their prototypes in real conditions and to design their future commercial cars, regulate the market and define the safety standards.
The same applies of course to the examples of this document. Developing new hyperloop routes will need a close relationship with the authorities: where will they build the line? How to harmonize the new offer with the existing ones? How the responsibilities will be divided between private and public parties? Concerning the future flying aircrafts, the FAA in the USA or the equivalent in other countries will have to define who can fly, with what kind of license and where. In a very monitored and prone to hazard field, bringing thousands new kind of aircrafts in the air could destabilize the whole activity. The abusive use of personal drones is here to remind us the risk it could generate on our safety and privacy.
Finally, to penetrate the market, confidence needs to be built among future customers. To do so, a clear vision of insurance status will have to emerge. In case of accident or casualties, will the concerned persons be correctly compensated? Will it be from the manufacturer of from a private insurance?

Costs

Bringing innovation in transportation is expensive, as it was for today's transportation modes.
Hyperloop's line from Los Angeles to Las Vegas will cost at least 6.5B$. Some experts predict the price could be twice this one. In this case, the business risk is high and the distribution of costs among private companies and the states is an intense topic of negotiations. The break-even point is planned to be reached in 20 years. Many companies will request subsidies from local and national governments to promote their projects, arguing the benefits for the citizens and the development of the economy. Who will build the lines and who will exploit them is still unclear but should find answers in the next few years.
On the autonomous transportation solutions, the costs will be on two levels. The manufacturer will finance the technology and the authorities will build the required infrastructures (guidance system, docking ports, signaletics…). The costs finance plan and the adoption of an agreement will take time to be set as it is the cities organizations that will need to be completely reshaped.

Ethics

More connected cities and modes of transportation raise concerns about privacy and personal data management. Customers' personal information is at the centre of the future innovations' features. A risk that they will be monetized, used to discriminate users or shared will appear if no regulations fix the limits and the legal utilization of them by private companies.
For instance, the GDPR is a regulation adopted in April 2016 by the European Parliament to strengthen and unify data protection for all individuals within the European Union Zone. It will be fully enforceable from the 25 of May 2018 after a two years transition with no further approval from national governments. Its title is "Regulation on the protection of natural persons with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC". Its purpose is to give citizens rights about the control of their data. It also helps the emergence of new technologies in our societies in a more transparent and worriless manner, helping the transition in a peaceful pace.

Benefits

New technologies are full of promise, and as we saw contain potentials threats to our societies.
Transportation is important in our life. It is part of our daily routine and consumes a fair amount of our time. Making it faster, more adaptable to our needs and offering new types of services is seducing.
In terms of travel time, hyperloop projects could be a great change, reducing it greatly, even compared to planes, and at an affordable price. This would change our vision of geography by narrowing distances and giving more mobility and profitable time to workers or casual travelers. Associated with autonomous cars, remote areas would become more attractive: daily travel from home to work will not be such an important criterion in our decision of location. In this way, more peaceful environment at a cheaper price will be a reality. Having a 50mn ride in a car where you could relax, sleep or work is not as discouraging as having to drive for 50mn in traffic jam every day.
It will also give new opportunities for time constraint workers to meet their agenda by using flying mode of transportation from one area to the other with faster and less troublesome travel schemes.
Innovative companies will create new services too. The E-palette is a great solution to gather the brick and mortar shop experience with the time saving and vast catalogue of e-businesses. In this manner, an individual will receive an immediate benefit for a reasonable extra price.
Finally, in a world where ecology and climate change are of such a great concern, zero-emission modes of transportation and reduction of traffic jams will be a positive externality for the next generation.

Conclusion

The CES 2018 gave us a taste of a more efficient world. Less time commuting or driving, more time for our own interests. It will require a period of adaptation and strong investments in infrastructures. It will take time to develop safe solutions and set the correct legal environment to see autonomous cars and services in our streets and private drone helicopters in our skies. But serious and passionate innovators are working on it. They will be a milestone in the emergence of smart cities where individual will be ultra-connected and avid of time saving habits. Some predict it will end the idea of privacy and raise a way of life pivoting around consumerism and the infinite quest of speed and efficiency. But it belong to us to define what the future will look like.