

LES ENJEUX TECHNIQUES DU VÉHICULE AUTONOME

QUI ME PARLE?

**GROUPE
RENAULT**

Constructeur
automobile



Laurette Guyonvarch

Direction de la
Recherche et de
l'Advance Engineering



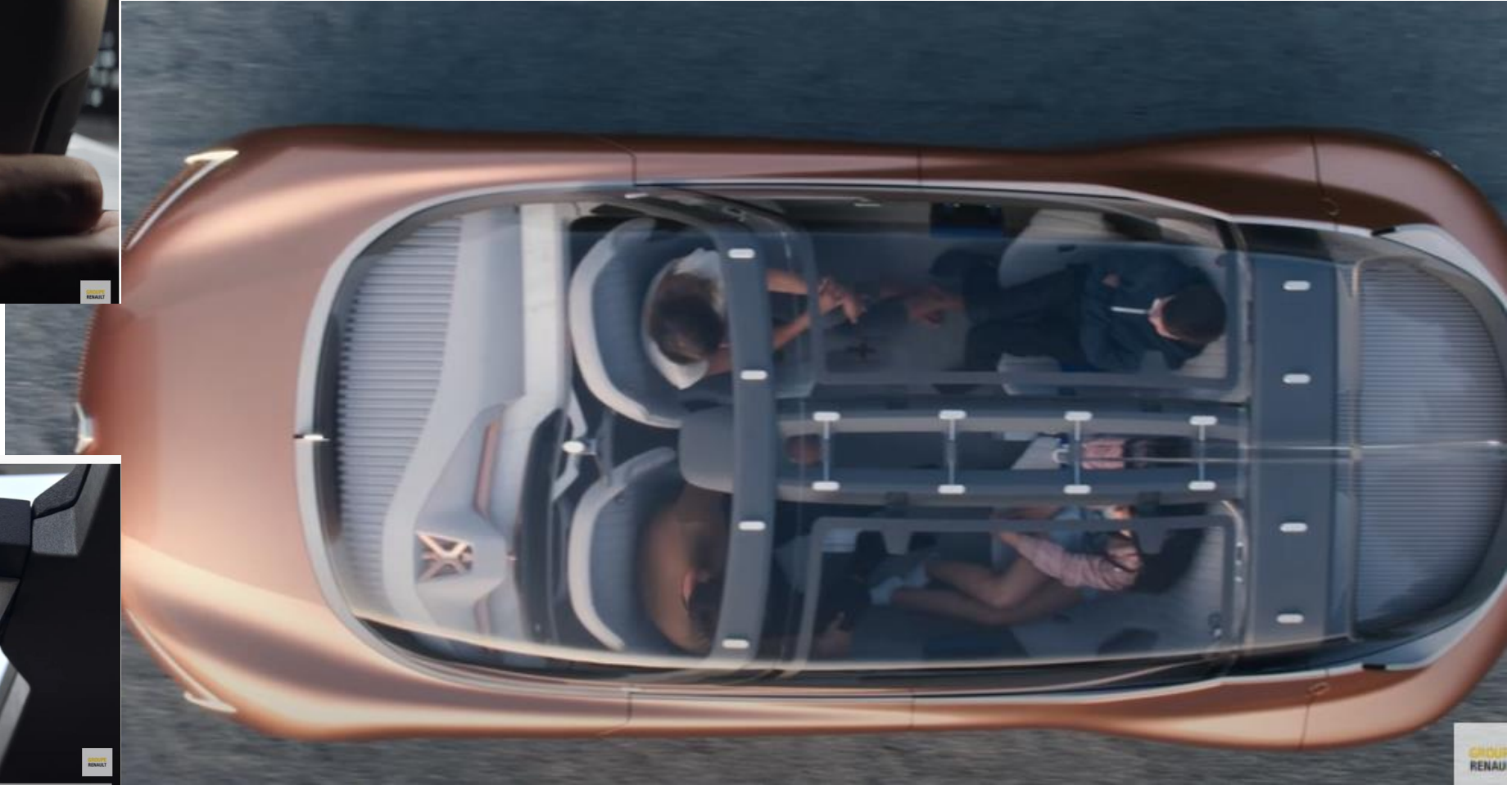
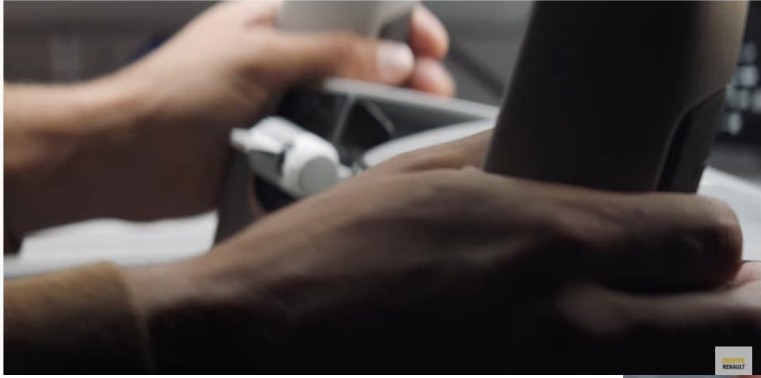
Direction de la
Stratégie



KEZKAO? VÉHICULE AUTONOME



UNE VOITURE AUTONOME?



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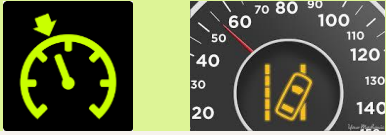







NIVEAUX D'AUTOMATISATION

Environnement
Commandes Problème Ou?

SAE level	Name	Narrative Definition	Execution of Steering and Acceleration/Deceleration	Monitoring of Driving Environment	Fallback Performance of Dynamic Driving Task	System Capability (Driving Modes)
Human driver monitors the driving environment						
0	No Automation	the full-time performance by the <i>human driver</i> of all aspects of the <i>dynamic driving task</i> , even when enhanced by warning or intervention systems	Human driver	Human driver	Human driver	n/a
1	Driver Assistance	the <i>driving mode</i> -specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	Human driver and system	Human driver	Human driver	Some driving modes
2	Partial Automation	the <i>driving mode</i> -specific execution by one or more driver assistance systems of both steering and acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	System	Human driver	Human driver	Some driving modes
Automated driving system ("system") monitors the driving environment						
3	Conditional Automation	the <i>driving mode</i> -specific performance by an <i>automated driving system</i> of all aspects of the dynamic driving task with the expectation that the <i>human driver</i> will respond appropriately to a <i>request to intervene</i>	System	System	Human driver	Some driving modes
4	High Automation	the <i>driving mode</i> -specific performance by an automated driving system of all aspects of the <i>dynamic driving task</i> , even if a <i>human driver</i> does not respond appropriately to a <i>request to intervene</i>	System	System	System	Some driving modes
5	Full Automation	the full-time performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> under all roadway and environmental conditions that can be managed by a <i>human driver</i>	System	System	System	All driving modes



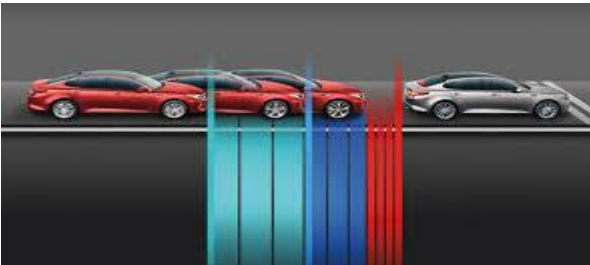
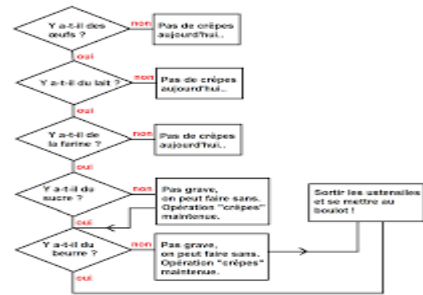
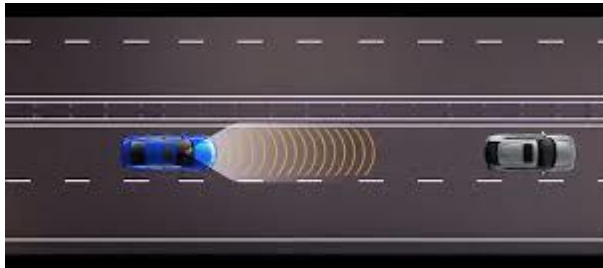
IN FRENCH?

		DEGRÉS D'AUTONOMIE DU VÉHICULE À CONDUITE DÉLÉGUÉE (ADAPTÉS DE LA SOCIETY OF AUTOMOTIVE ENGINEERS [SAE])		
Véhicules déjà disponibles	0			 <p>yeux ouverts mains sur le volant</p>
	1	 		 <p>yeux ouverts mains sur le volant</p>
	2			 <p>yeux temporairement fermés</p>
Véhicules du futur	3	<p>Le système de conduite se...</p> <p>de la conduite se... doit...</p>	<p>àches</p> <p>conducteur</p>	 <p>yeux temporairement fermés</p>
	4	<p>Le système de...</p> <p>de la conduite selon les circonstances et les réseaux circulaires même si le conducteur n'est pas disponible pour intervenir et conduire au besoin</p>	<p>àches</p>	 <p>yeux fermés mains libres</p>
	5	<p>Automatisation complète</p> <p>Le système de conduite automatisé accomplit la totalité de la conduite dans toutes les circonstances sans la nécessité de l'intervention du conducteur</p>		 <p>yeux fermés mains libres</p>

UN EXEMPLE FACILE



AD L1



ACC enclenché,
le radar détecte
la voiture qui
précède

L'interdistance
est plus faible
que la consigne

Le véhicule freine
jusqu'à ce que
l'interdistance
soit à la consigne

UN EXEMPLE QUI S'EST MOINS BIEN PASSÉ

Détection

Décision

Action

AD L2

HANDS
ON?

HANDS
OFF?

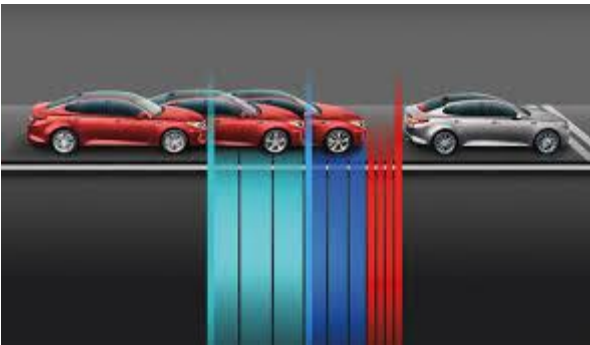
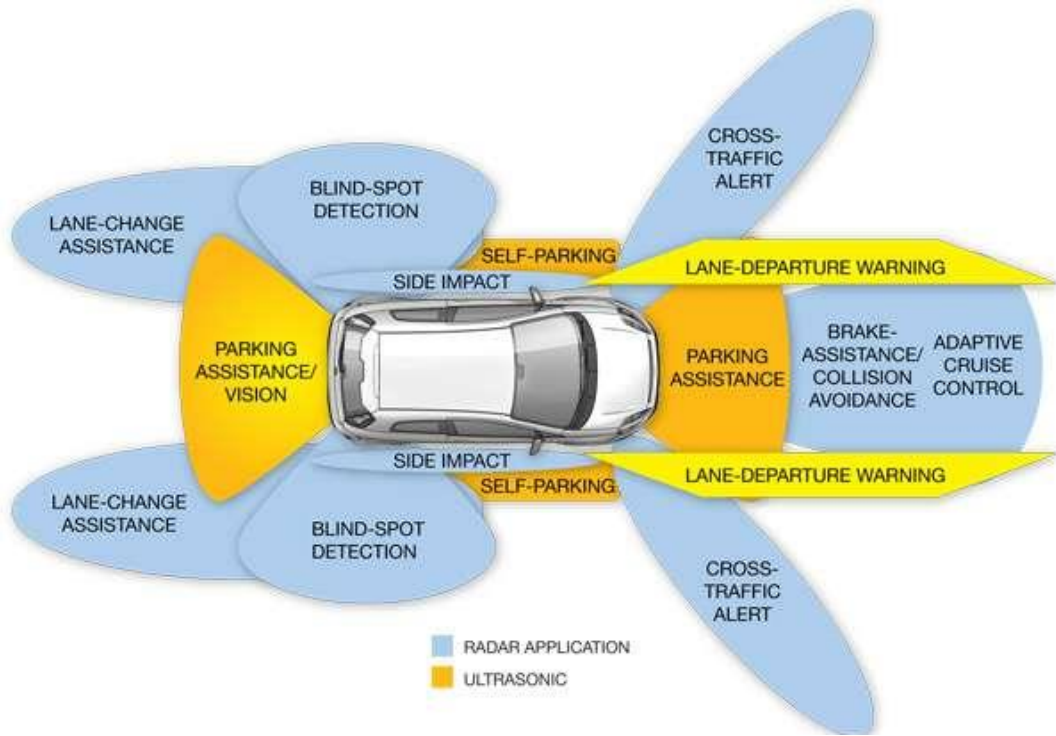


Autopilot enclenché,
la camera ne
détecte pas le
camion blanc sur
ciel blanc

Le conducteur
n'intervient pas, pas
de modification de la
consigne

Pas d'action

LES CHALLENGES TECHNIQUES



QUELQUES CHALLENGES, EN VRAC

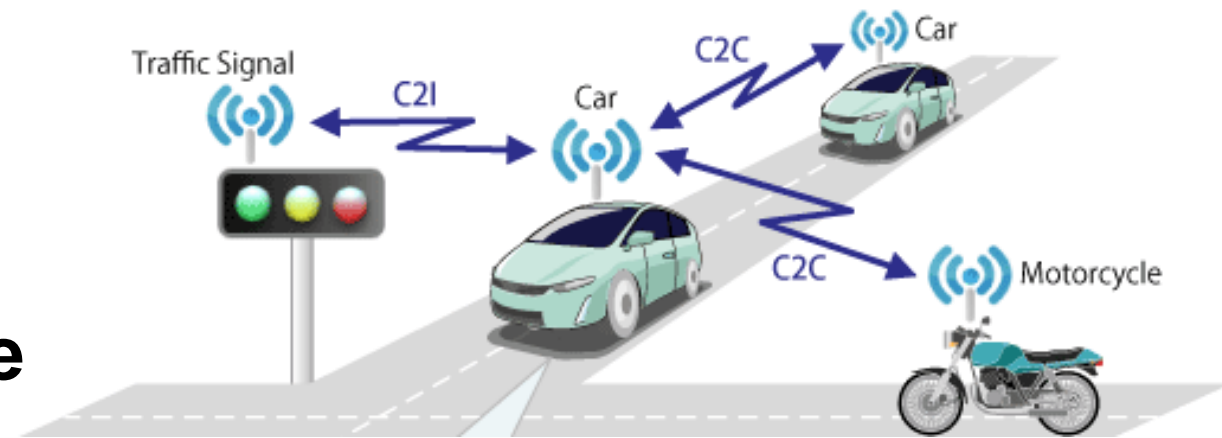
■ Capteurs

- Performants
- Fiables
- économiques

■ Systèmes communicants

■ Validation du système autonome

- Bases de données
- Facteur humain



D'AUTRES CHALLENGES, EN VRAC



DES APPLICATIONS PLUS RÉALISTES A COURT TERME

■ Navettes autonomes

- Domaine de fonctionnement limité, apprentissage de la trajectoire
- Safety driver

■ Droides

- Faibles vitesses, « follow me »
- Opérateur de sécurité

■ Alibaba en Chine

- Infrastructure adaptée
- Comportement



TAKE HOME MESSAGE

- Les challenges techniques du VA

- Niveaux d'automatisation
- Challenges techniques
- Facteur humain

ET BEAUCOUP D'AUTRES

- Automatisation: c'est déjà demain

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