Automating and Electrification in Last Mile Deliveries

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3 REVOLUTIONS
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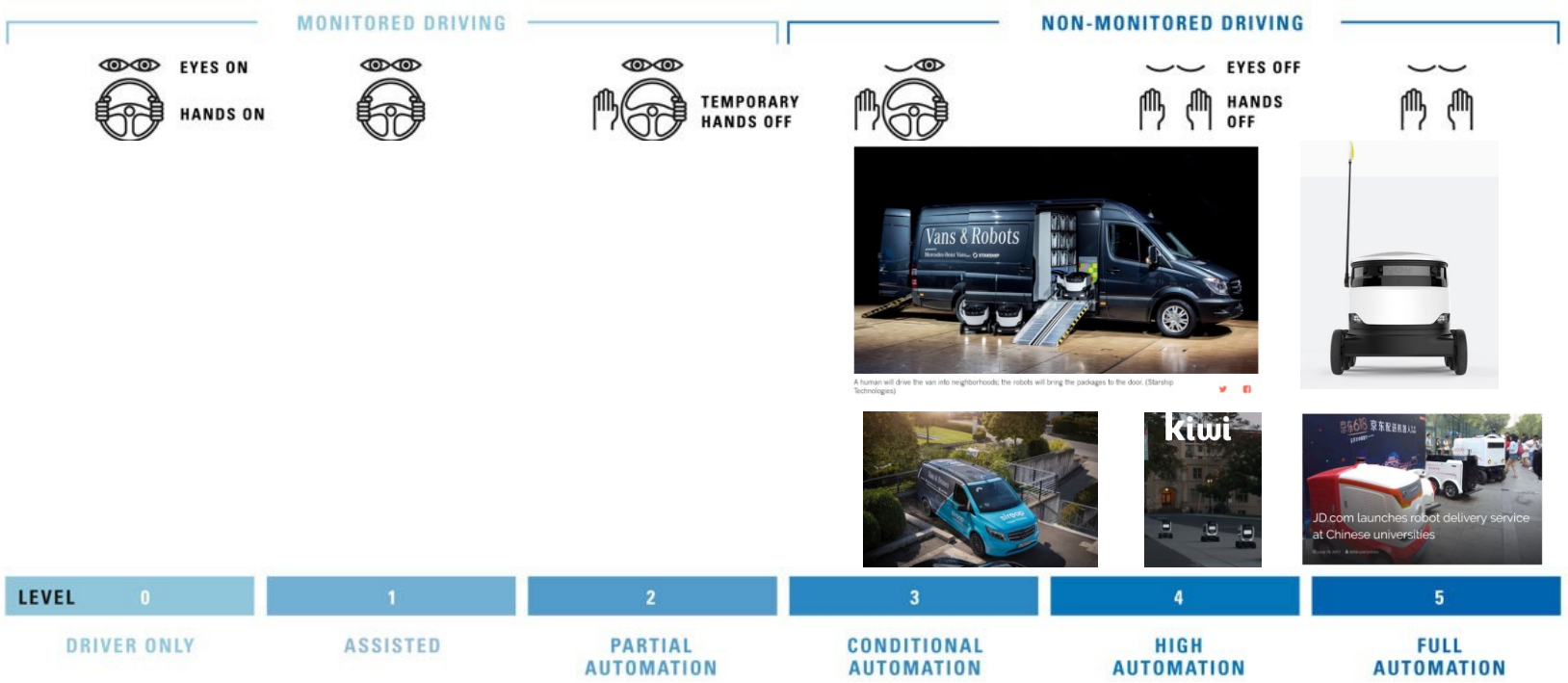
Automation/Electrification in the Last Mile



http://beta.latimes.com/business/autos/la-fi-hy-robovan-mercedes-20160907-snap-story.html

http://www.billbrucecommunications.com/article/jd-com-launches-robot-delivery-service-at-chinese-universities/

- E-Vans
- Cargo e-bikes
- Road Autonomous Delivery Vehicles (ADRs and RADRs)
- Unmanned Aerial Vehicles (drones)

Mode/Initiative	Strengths	Limitations/Drawbacks
E-Vans  **Comparable performance with traditional light vehicles. Market availability**	Light-medium duty could substitute 1:1 No infrastructure requirements Minimal regulatory barriers Public acceptability Zero tail-pipe emissions Range	Recharging infrastructures Purchase Cost Low fossil fuel prices Space and curb access/use Driver Congestion
E-Bikes/E-Cargo Bikes  **Motor-assisted bikes help reduce effort** **Currently used by some couriers**	Purchase cost Maneuverability Use of bike lanes Parking requirements No infrastructure requirements Public acceptability Zero tail-pipe emissions	Driver Cargo capacity Range Considered automotive (4-wheel) Conflicts/ right-of-way
Autonomous vans and RADRs  **Possibility of rescinding of drivers lowering costs, improving safety and efficiency**	Driverless Operational cost No road infrastructure requirements Safety 24/7 operations Range	Load/unload infrastructure Security/theft risk Labor paradigm Regulations (recent operational approvals) Conflicts/ right-of-way Congestion

Mode/Initiative	Strengths	Limitations/Drawbacks
UAVs/Drones  **Drones or UAVs can serve difficult access areas. Some show time and cost efficiencies.**	Driverless Travel time/distance/efficiency Serve areas without road access 24/7 operations Zero tail-pipe emissions	Noise Safety (technical error/sabotage) Risk of harm to humans or assets Energy efficiency Local ecology impacts (e.g., birdlife) Near ground air regulations Destination access
ADRs  **Major initiatives are still in development and testing. Commercial initiatives operate in controlled environments.**	Driverless Remote supervision Noise Parking requirements 24/7 operations Zero tail-pipe emissions Energy efficiency	Safety (technical error/sabotage) Risk of harm to humans or assets Curb space access Public acceptability Regulations Range Human dependency at destination

Summary of + and – Attributes

	ICE Trucks/Vans	E-Vans/trucks	E-cargo bikes	RADRs	ADRs	Drones
Required parking/landing space	---	=	+	-	++	-
Required space on the streets/bike line	---	=	-	=/-	-	++
Additional infrastructure	+++	-	-	+	-	-
Vehicle cost	-	---	++	-	++	++
Operational cost	+	+++	--	--	-	+**
Load Capacity	+++	++	--	--	---	---
Versatility in traffic	--	--	+	--	-	+++
Refueling/recharge times	+++	-	+	-	-	--
Noise	---	++	+++	++	++	--
Tailpipe emissions	---	+++	+++	+++	+++	+++
Congestion contribution	---	=	-	Unknown*		
Human dependency	---	=	=	@ destination***		

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= Similar to ICEs
* Can heavily congest the sidewalks, and create congestion at intersections, air
** Battery cycles
*** May require remote supervision, and loading and unloading actions

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