

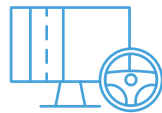
# Driverless Vehicle

## TELEOPERATION TAXONOMY

All driverless vehicles need some form of human support – Teleoperation. The mode of teleoperation depends on the use case, the design of the autonomous driver, and other safety considerations. We find the current terminology for human assistance confusing, as the terms are not well defined.

Here is a taxonomy of the different modes of teleoperation, based on the roles of the remote operator and of the vehicle's autonomous driver. We also included additional typical characteristics.

### Modes of Teleoperation



REMOTE DRIVING



TELE-ASSIST

Teleoperation Mode	T0 Direct Drive	T1 Low-level control	T2 High-level control	T3 Guide	T4 Advise	T5 Supervise
Remote operator role	Directly activates the actuators in the vehicle.	Controls trajectory and acceleration.	Controls lanes and target speed.	Assists the vehicle path planning process, e.g. provide waypoints, remove restrictions	Responds to queries and assistance requests from the vehicle AI. Near real-time.	Monitors the vehicle. Safe stop if needed
Vehicle role	Stop if connectivity is lost	Validates instructions and controls actuators. Safety and MRM*	Low-level control of trajectory and acceleration, Safety, and MRM.	Path planning, safety, and MRM.	Queries remote operator in edge cases. Safety and MRM.	Full responsibility for driving.
Who's in charge of safety?						
Input device						
Sample Latency	100msecs	100msecs	150msecs	200msecs	250msecs	300msecs
Sample use cases	Robots, Mining, Agriculture 	Low speed, Robots 	Highway 	Urban 	Mature AI, Complex cases 	Regulatory requirement 

\* MRM – minimal risk maneuver