

Q&A for RCP with alternative HMI

(explanatory memorandum)

Q1: What is the benefit with this alternative HMI from a user experience perspective?

A1: The user experience benefits of the alternative HMI (Virtual Leash) compared to regular phone HMI are:

1. Your hands might be occupied by carrying bags, holding children's hands etc.
2. In rainy conditions there are several benefits:
 - a. It might be difficult to operate a wet screen.
 - b. If you are carrying bags or a package that you want to put into the parked car, but you don't want to put the package down on the wet ground while pulling the car out.
 - c. Extension of b., valid on cars with foot opening of the trunk. If you want to put your stuff in the trunk, you simply pull it out a little bit further, kick open the trunk and put it down inside.
3. In cold weather you might want to keep your gloves on, and they might not be touch screen sensitive.
4. In a remote park-in use case, starting with the driver in the car, the benefit is that you only need to interact with your phone while still in the car. When stepping out, both hands are free.
5. "The best interface is no interface" (Golden Krishna, Google design strategist).

Q2: How can you know that the moving object actually is the driver?

A2: The driver is declared by associating two pieces of information to one another:

1. Exactly one authentic key is detected close to the car
2. Exactly one moving obstacle is detected in the same zone as the key

The object and the associated key must be detected at the same spot, in the proximity of the car.

If the key cannot be associated with only one object, the RCP manoeuvre cannot take place.

Q3: In a regular RCP system, the phone works as a dead man's switch, stopping the car when the finger is removed from the phone display. Is there an equivalent means to stop the car with the alternative HMI?

A3: Yes, the fundamental difference is that in the alternative HMI the driver operates the dead man's switch through body movement, as opposed to finger movement on the phone display in case of regular RCP. Knowing that the obstacle is the driver, by the means described in Q2, the RCP controller allows vehicle movement only for as long as the driver is "holding the leash"

Q4: How can you know that the driver is in the proximity with the actual intention to use the RCP?

A4: Prior to the declaration of the driver described in A3, a request to use RCP must have been sent from a phone, paired to the car, not more than 10 minutes ago (approximate figure, part of safety argumentation). At the point of driver declaration, the same phone that previously requested RCP is now close enough to perform short range communication with the car. This assumes that the phone also is the key. In case regular key fob is used, you can instead work with valid combinations of phone and key fob.

Q5: What if several keys are detected?

A5: See A4. Only the key that is associated with the phone that requested the manoeuvre is valid.

Q6: What if the driver is correctly declared and tracked, but during the manoeuvre, another person or object comes so close that it is no longer possible to distinguish the driver?

A6: The car is only allowed to move if the driver is constantly moving in the direction of the parking manoeuvre. This means, if the driver is no longer possible to distinguish, the car must stop. Merging of previously detected separate obstacles during the manoeuvre also makes the vehicle stop.

Q7: How can it be equally safe to manoeuvre the car with the alternative HMI. Will it not be difficult to both ensure that the car stays on the correct path and at the same time check the surroundings?

A7: The car does not take any orders from the driver other than to stop on demand, it knows where to go. It will move maximum one car length, but the purpose is for the driver to stop as soon as the door is accessible. The driver shall focus on the surroundings. Some short check-ups of the car are needed to know when the door of choice is accessible, but we do not assess that to be a safety risk. Also, it is the driver's duty to check that the manoeuvre area is free from objects before activation, and if the situation is too hard to handle, the driver is likely to stop until the situation calms down.

Q8: What if the driver is focused on the surroundings and gets too close to the car or even stumbles and falls in front of the car?

A8: Any of the following cases shall lead to that the vehicle stops immediately:

1. Driver walks in front of the car. It is still a forbidden zone in front of the car, and the driver is now considered an obstacle to stop for.
2. Driver stumbles and falls in front of the car. The delta speed between the driver and the car is constantly monitored, and the fall of the driver will immediately render a high delta speed. This will stop the car.

Q9: What if a system failure occurs during the manoeuvre?

A9: Any system failure shall lead to an immediate vehicle stop.

Q10: What if, in case of separate phone and key fob, there is a mix-up, and the manoeuvre is disapproved due to wrong combination?

A10: If the car is not equipped with phone as a key, there must be a simple means to re-associate the phone and the key fob, e.g by pressing the key fob while the phone is still connected to the car after a failed initialization.
