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ARRIVE SMARTLY SOFTWARE FUNCTION AS PART OF A E-VEHICLE NAVIGATION SOFTWARE

Verena Blunder
Bertrandt Ingenieurbüro GmbH

"ARRIVE SMARTLY" SOFTWARE FUNCTION AS PART OF A E-VEHICLE NAVIGATION SOFTWARE

Technical task:
The invention calculates the range as well as the required driving style to reach a driving target as quickly as possible.

Initial situation:
To determine the remaining range of an electric vehicle, an algorithm is used that dynamically takes into account only the electrical consumption of the previously covered distance. This mainly includes the electrical consumption of the drive, which is largely influenced by the driver's previous driving style (load, speed, recuperation, etc.). The driver must estimate whether or not he can reach his desired destination on the basis of the range still available.
In some vehicle models, the navigation system takes over this estimation and, if necessary, recommends a loading stop or reports back that the destination will probably not be reached.
The driver's assessment of the remaining range means that he will generally drive much more cautiously so that he can reach his destination safely. As a result, the driving time is usually longer and he may reach his destination using a buffer provided by the remaining capacity of the battery. The driver has the disadvantage here that, due to his fear of no longer reaching his destination with the remaining range, he adopts a correspondingly voluntarily chosen defensive driving style and thus has a longer driving time.
The patent applications DE102018209997A1, DE102014201062A1 and DE102018210357A1 already exist in this area. The applications DE102018209997A1 and DE102018210357A1 differ from the invention listed here in that they do not take into account differences in topology, recuperation on gradients, outside temperature, traffic situation and tyre pressure. The patent application DE102014201062A1 rather focuses on an optimal energy balance when reaching a target and does not take into account topology differences, outside temperature and power loss of the E-axis.

Solution:
The "Arrive smartly" software function in the navigation system, in which the driver has stored his destination, does not take into account the driver's driving style in the past, but looks to the future. The algorithm gives the driver e.g. the optimum speed, taking into account the STGVO and, if necessary, the traffic situation, in order to reach his entered destination as quickly as possible, while constantly taking into account the battery capacity.

Advantages:
The driver can be sure that if he follows the driving instructions, he will reach his destination in the most efficient and fastest way. He no longer needs to adjust his driving style himself based on the remaining range indicator.

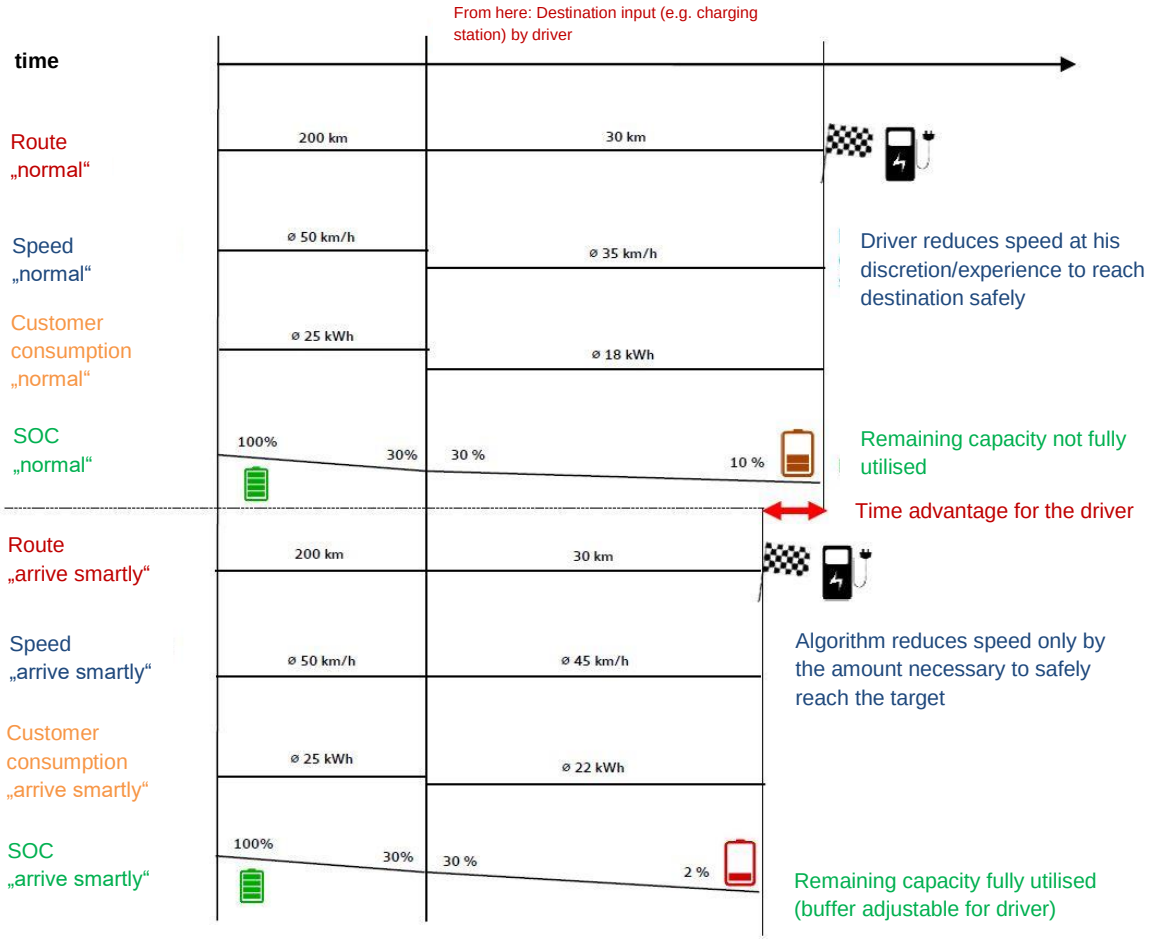

Figure 1

Possible application:
On the basis of stored maps, which are created during the validation of the drive and the electrical components, such as consumption maps depending on load (torque), rotational speed (vehicle speed), outside temperature, electrical consumers (e.g. heat pump, seat heating, etc.), the algorithm calculates the optimum speed, taking into account the STGVO that the driver should drive in order to reach his destination entered in the navigation system with minimum SOC (State of charge -> battery condition).
A SOC buffer can be individually configured under "Settings", e.g. 2 %. Furthermore, comfort restriction recommendations can also be displayed, e.g. turn down the heating, etc.

The algorithm continues to take into account all vehicle information available today anyway, such as
- SOC
- selected route (navigation destination) incl. traffic volume (TOC, Google traffic, ...)
- Speed specifications through sign recognition
- Height differences on the route (topology) -> recuperation share on downhill runs, higher load shares due to gradients
- Outdoor temperature
- set indoor temperature -> electrical consumption of the heating or heat pump
- Tyre pressure
- …

The method of calculation is based on a statistical target value optimization:

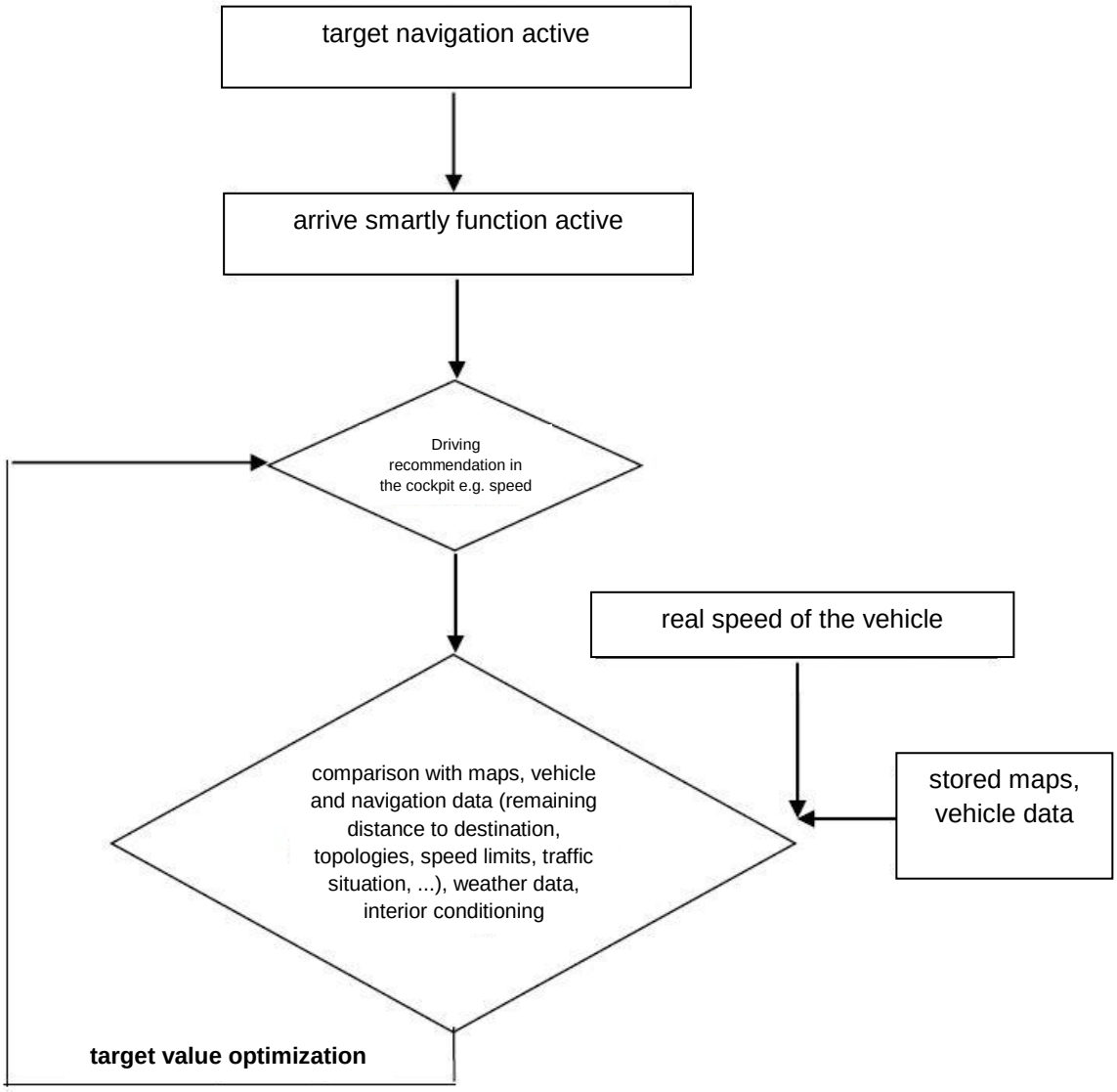
target navigation active
arrive smartly function active
Driving recommendation in the cockpit e.g. speed
real speed of the vehicle
comparison with maps, vehicle and navigation data (remaining distance to destination, topologies, speed limits, traffic situation, ...), weather data, interior conditioning
stored maps, vehicle data
target value optimization

Figure 2