SYSTEM FOR EXTERNALLY CONTROLLED PEDESTRIAN NAVIGATION IN TUNNELS AND UNDERGROUND GARAGES

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Recommended Citation
Blunder, Verena, "SYSTEM FOR EXTERNALLY CONTROLLED PEDESTRIAN NAVIGATION IN TUNNELS AND UNDERGROUND GARAGES", Technical Disclosure Commons, (July 31, 2020)
https://www.tdcommons.org/dpubs_series/3474

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SYSTEM FOR EXTERNALLY CONTROLLED PEDESTRIAN NAVIGATION IN TUNNELS AND UNDERGROUND GARAGES

Technical task:
In numerous tunnels and underground car parks, GPS positioning of objects is not possible or only very imprecisely. Therefore, only sketchy site plans are currently provided in the sense of indoor navigation for pedestrians in underground car parks or emergency assistance in tunnels and underground car parks.

For this reason, technical solutions are currently being sought in order to plausibilise the position of vehicles or pedestrians in these situations (e.g. in a multi-storey car park: which level, which parking position) and to enable turn-by-turn navigation, for example.

Initial situation:
At present, it is generally not possible to provide precise GPS positioning of vehicles, pedestrians or mobile devices (e.g. Smartphone, Smartwatch) in tunnels and underground car parks. Therefore, neither a localization of vehicles and their occupants nor a plausible indoor navigation for pedestrians after leaving the vehicle is possible.

Solution:
In order to avoid the above disadvantages, a system of pedestrian navigation in tunnels and underground car parks is proposed, using displays on other vehicles and/or in the infrastructure

- As soon as an occupant leaves the vehicle and moves away from it, the relative position of the passer-by in the tunnel/underground car park is detected, e.g. by sensors in mobile devices, mobile devices, beacons on the pedestrian, camera systems in the tunnel/underground car park and/or sensors of parked/standing vehicles.
- If the pedestrian approaches a display unit (e.g. at a vehicle, at a pillar/wall), individual navigation information (e.g. arrows, texts), an interactive map with current position, etc. is displayed on this unit.

The pedestrian can then use this information to orientate himself in the car park or tunnel and move around in a targeted manner.

A prerequisite for this idea is that both the parked/standing vehicles and the tunnel/parking garage infrastructure

(a) know their position within the tunnel/underground car park
(b) detect the position of pedestrians in the vicinity,
(c) relate the own position to the position of the pedestrian and
(d) finally, present suitable advertisements.

Possible display variants are:
- Display on the vehicle (e.g. superimposed icons in vehicle lighting, projections in vehicle windows or on the floor)
- Display for infrastructure (e.g. LED strips, arrows, animations on columns, walls, floors)
The individual navigation for the pedestrian can be calculated both in the respective vehicles and in the infrastructure elements. For a coordination of the presented navigation instructions, a transmission of the information to a backend server would be conceivable, which calculates an individual turn-by-turn navigation and, based on this, provides the corresponding information to the vehicles, the infrastructure elements and/or the mobile device of the pedestrian.

Alternatively, these navigation contents can also be transmitted to the pedestrian's mobile device, thus enabling a turn-by-turn navigation for the pedestrian running on the device.

Such a system can either be activated or offered automatically when pedestrians are detected in tunnels and underground car parks. Alternatively, such activation can be initiated by the occupant when leaving the vehicle.

Advantages:

The aim of this system is thus to enable real-time indoor navigation in tunnels and underground car parks for pedestrians. This makes orientation in tunnels and underground car parks easier and allows a destination to be reached efficiently and safely. In the best case, rescue in tunnel emergencies can be accelerated and made safer.

Possible application:
The core of this idea is

(a) Position of parked/standing vehicles and display units in tunnel/underground car park is known
(b) Detection of the relative position of pedestrians (e.g. via sensors in mobile devices, mobile devices, beacons on pedestrians, camera systems in tunnels and underground car parks and/or sensors of parked/standing vehicles).
(c) Calculation of individual indoor navigation for pedestrians in parked/standing vehicles, in infrastructure and/or in the backend
(d) Technical equipment of vehicles and/or infrastructure to enable displays
(e) Display of individual navigation information (e.g. arrows, texts), an interactive map with current position or similar on display unit on vehicle/infrastructure
(f) Possible transmission of the navigation information to the pedestrian's digital device