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A GPS-less Method to Find Your Parked Car

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ABSTRACT

We propose a new way to find a car on a large parking area: By pressing a button on the key fob that is usually used to remotely lock or unlock the car, cars in the vicinity of the user form a running-light by switching on and off their lights and thus leading the user's attention from their current position to the position of their car. This somewhat resembles the emergency floor path marking in airplanes guiding passengers to the nearest exits.

1. INTRODUCTION

Finding one's car in a vast parking area or parking deck can be a difficult task. Often, people use the remote control of their car's central locking system, to let the car's lights blink and to thus gain a visual clue for the whereabout of their car. This approach has a few drawbacks: There is no feedback if the car is out of the remote's coverage and even if it is in range, the car could be out of the line of sight of the user.
We propose a convenient way to navigate a user to their car, by having surrounding cars forming a running-light.

2. OUR APPROACH

Car2X [1] capable cars have the ability to establish an ad-hoc communication with nearby cars. Thus, a parking area with a sufficiently high number of communication enabled cars can be seen as a large ad-hoc network, where each car is a network node. When pressing a button on the remote control (usually built into the car key), a sort of search command (like a 'ping' or 'traceroute') including the carID is issued that can be picked up by any car in the vicinity. Receiving cars check whether the sent carID matches their own and if not, they add their own ad-hoc network-ID and a timestamp to the command and forward it to nearby cars. Single cars dismiss a search command if a certain time threshold is expired or if the concatenated list of cars gets too long. The target car collects the incoming commands and analyzes the contained list of network-IDs and timestamps in order to find the shortest network route back to the user. In contrast to established use-cases in the Car2Car community, e.g., hazard warnings [2], where a warning is broadcasted over the network in our novel approach information is explicitly requested by the user.

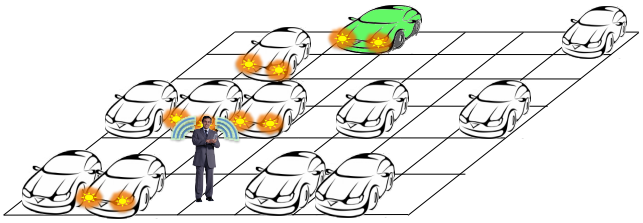

Figure 1: A user on a parking area initializing a running-light formed by other parking cars. The running-light attracts the attention of the user and guides him to his car.

Once the car has determined a network route, it can orchestrate a running-light, by sending out commands to the cars on this route, causing them to blink their lights. Given the simple algorithm described above, the determined route is not necessarily the shortest path to the destined car. In order to help the user to find their car, it is sufficient to pick up the attention of the user and to guide it appropriately, i.e. the first blinking cars should be in the visual field of the user and the own car should be the last one blinking. Once the user has spotted his car, he can easily find a good route himself.

To ensure the security of such a system, the same approach that it used in current remote controlled central systems can be used. Most of these systems use the same radio frequency (433.92 MHz in Europe and 315 MHz in North America and Japan) and thus the code that is transmitted by the key fob is received by most cars in range. In order to gain security, a 40 bit (or more) rolling code is used that is synchronized every time the car gets successfully locked or unlocked.

The described system requires continuous running Car2X routers, which indicates that it is more suited for electric cars, since these are more likely to be in a stand-by mode than a traditional fuel powered car.

3. REFERENCES

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[2] G. Noecker et al. Willwarn final report. in the European Integrated Project PReVENT, 2007.