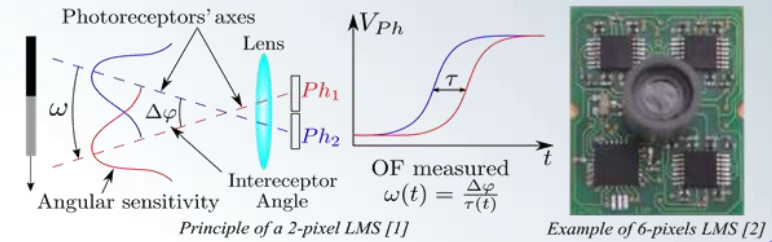


Towards an Automatic Parking Maneuver using 1-D Optical Flow

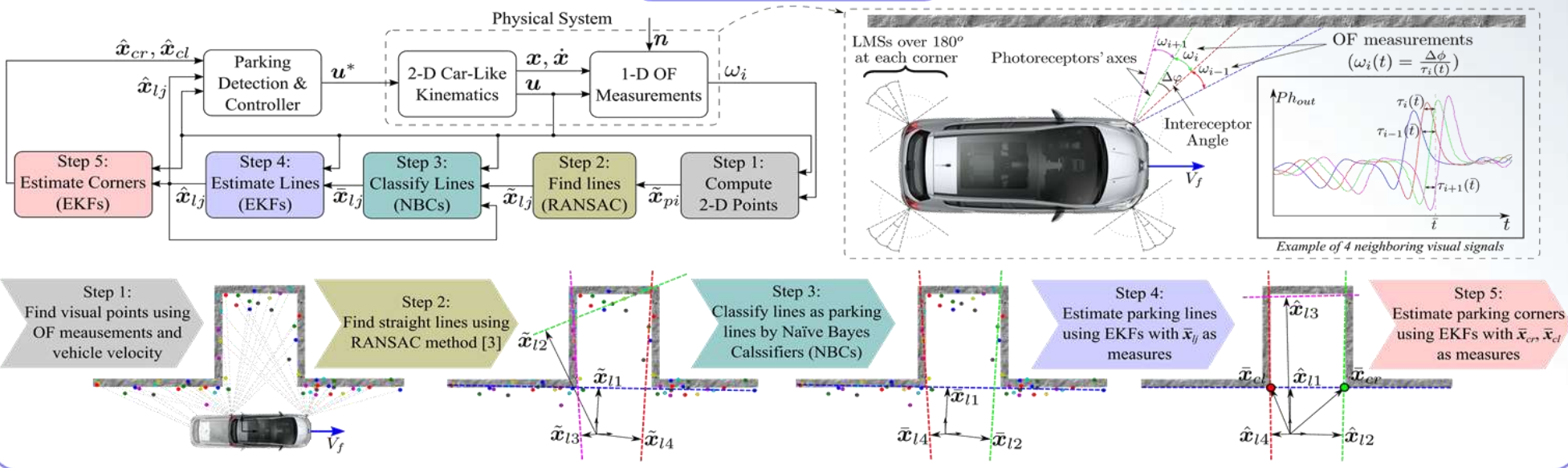
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Introduction

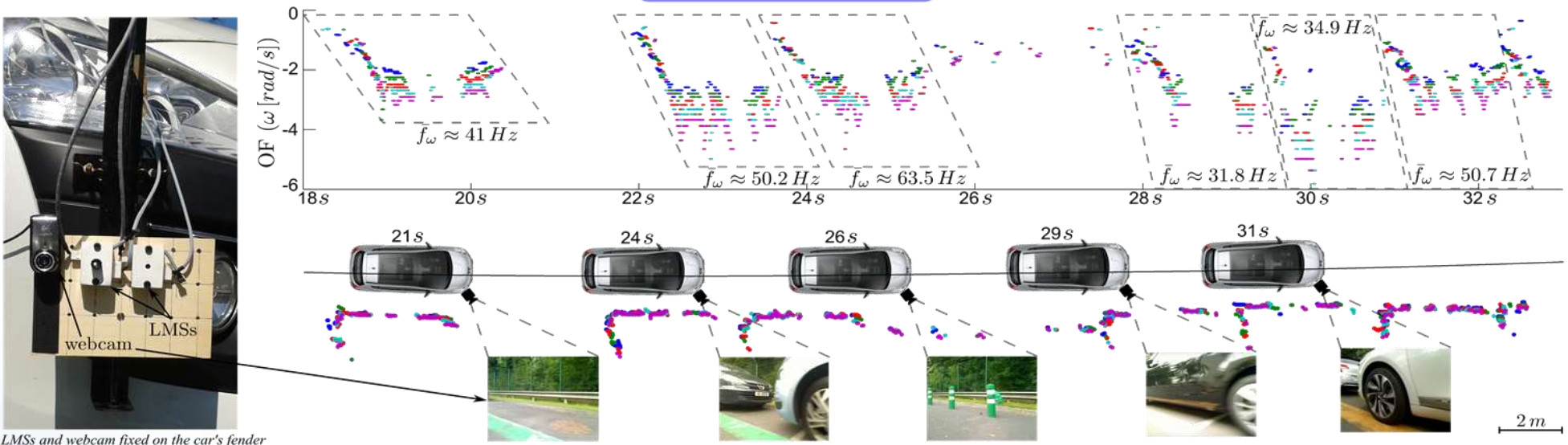
Although several (semi-) automatic parking systems has been proposed throughout the years, very few solutions have been found so far using on-the-market sensors for performing closed-loop maneuvers based on a real-time assessment of the parking spot. In the light of these observations, we investigated how Local Motion Sensors (LMSs) [1],[2] providing 1-D optical flow (OF) measurements could be used to improve automatic parking maneuvers. For this purpose, we propose a low computational-cost method to detect and track a parking spot in real time using 1-DOF measurements around the vehicle as well as the vehicle's longitudinal velocity and steering angle.



Methods



Results



Discussions

Local Motion Sensors on cars

Advantages:

- Low cost
- Fast response (up to 200 Hz)
- Custom field-of-view (such as 180°)
- Longer distance range than ultrasonic sensors
- Less computational cost than cameras

Disadvantages:

- Event-based measurement
- Pattern-based noise
- Need relative motion (car and/or environment)
- Information only on plane (depending on z position)

Advantages of the method proposed

- Detect candidate parking spot before overtaking it thanks to the long-distance and wide-angle view
- Track parking-spot in real time thanks to high-frequency measurements and low computational cost

References

- [1] F. Ruffier, S. Viollet, S. Amic, N. Franceschini, "Bio-inspired optical flow circuits for the visual guidance of micro air vehicles," in Proc. IEEE Int. Symp. Circuits Syst., 2003.
- [2] G. Sabiron, P. Chavent, T. Raharijaona, P. Fabiani, F. Ruffier, "Low-speed optic-flow sensor onboard an unmanned helicopter flying outside over fields," in Proc. IEEE Int. Conf. Robot. Autom., 2013.

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