

New Headlamp Levelling System for Adaptation of the Light Distribution to the vertical Road Curvature

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Abstract:

Low beam headlight is widely used as an illumination system for safe night driving namely in areas with low visibility. The distribution of the low beam consists of two main areas separated by a cut-off line. The bright area below the cut-off line is devoted to enhance the perception conditions while the dark area above the cut-off line prevents glare to oncoming drivers. The dynamic levelling system that monitors low beam vertically compensates the pitch angle of the car body, which prevents glare and provides headlight range control. Bending light offers on the other hand a better illumination of curved roads.

Yet, there is still a need for an additional headlamp levelling system that adapts the light distribution to the vertical road curvature. Indeed, light distribution is affected by dips and crests on the roads leading respectively to small headlight range and glare to oncoming traffic.

In this context, the present work is devoted to the development of a headlamp levelling system that allows the adaptation of the light distribution to the vertical road curvature. It was performed as follows:

- The influence of the crests and dips on the light distribution and its consequences on the driver and the oncoming traffic was fully investigated.
- A range of sensors used to detect the dips and crests were explored.
- New algorithms for vertical headlight control have been simulated and developed using geometrical calculations.
- Measurements and tests in real conditions, both in laboratory and roadways were carried out and showed an increase in the headlamp range and reduction of glare.

Keywords:

Adaptive Headlight Levelling System, Bending Light, Headlamp Control, Road Curvature, Dips, Crests.