Optical Design and Optimization of Adaptive Automobile Headlight with Liquid Optical Element and Freeform

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Abstract content
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This research proposed a new optical design concept of advanced Mechanical Adaptive Steering Automobile Headlight System in order to tune up light efficiency, reduce volumetric size and the most important, get rid of complicated mechanical system. All research are mainly focus on (1) Optical Design of Freefrom Surface technology.(2) Image technology of DMD . (3) Human Vision characteristic .(4) Digital Signal Processing and its application with GPS

Traditionally Automotive headlight employ a plate to create the light shape, which meet the rule of road safety, According to our new design, no more plate is required. Therefore, great improvement of light efficiency will be expected up to 30%, Besides, volumetric size will be further reduced. More details, please refer to "Optical design of automotive headlight system incorporating digital micromirror device," APPLIED OPTICS, Vol. 49 No. 22(SCI), 2010,pp.4182⁻4187".

First year, we mainly study optical design of advanced LED automotive headlight design and optimization with assistance of freefrom surface. New concept of optical design with DMD might greatly reduce volumetric size of headlight system,

In second year, individual human vision characteristic will be considered as a part of automotive headlight system in my research in order to improve safety of road drive. Many experimental work and simulation analysis will be studied and compared in order to achieve best performance of automotive headlight system according to human vision.

In third year, GPS will be optimized with DMD and infrared image from cameras in the car in order to achieve best performance during extremely driving situation. All are based on research of first and second year, optical design and human vision characteristic. With assistance of GPS and night vision camera, all road data will be fast optimized according to human characteristic of individual driver. Then DMD will deliver the best-projected illumination for driver during extremely situation.

Keyword: light efficiency DMD Human Vision GPS Digital Signal Processing Freefrom surface

Primary author: Prof. FANG, YiChin (Head of Department)

Presenter: Prof. FANG, YiChin (Head of Department)

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