

Implementing the Unified System of Photometry in Driving Contexts

The unified system of photometry represents the stimulus for visual performance experiments under different light levels and spectral power distributions (SPDs) in the peripheral visual field, but not necessarily in the central (foveal) visual field.

The LRC conducted a study to determine how foveal vision is affected for different SPDs but for the same unified luminance.

Experiment

Study subjects performed a foveal tracking task and a peripheral target detection task simultaneously, simulating nighttime multi-tasking driving activities.

LRC researchers compared three lighting conditions using a high-pressure sodium (HPS) lamp and a 6500 K fluorescent lamp. The FLH (fluorescent high luminance) lighting condition provided the same photopic luminance for the foveal and peripheral targets as the HPS condition. The FLL (fluorescent low luminance) condition provided a lower photopic luminance but the same unified luminance as HPS.

The difficulty level of the foveal task was changed in three levels. The contrast of the foveal tracking task against its background was low in the "difficult" level and high in the "easy" level. The "easiest" level did not require the tracking task.

Lighting condition	S/P ratio	Photopic luminance (cd/m ²)	Unified luminance (cd/m ²)
1. HPS	0.44	0.10	0.06
2. FLH	1.97	0.10	0.15
3. FLL	1.97	0.03	0.06

Lighting conditions used in experiment

Sponsors

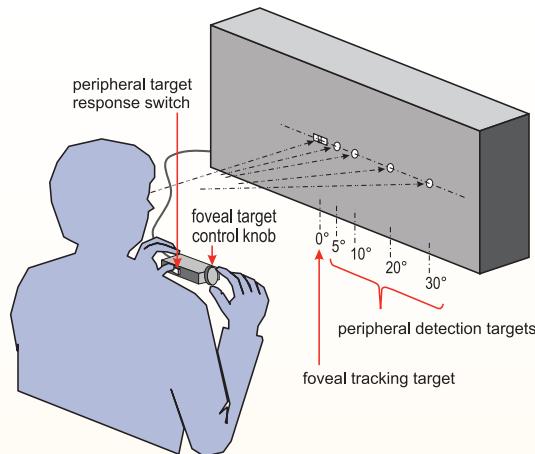
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Results

Unified luminance is a suitable rectifying variable for characterizing peripheral visual performance under different light levels and different light sources. The performance in the "easy" foveal task was not affected by the reduction in photopic light level. However, photopic luminance may still be an appropriate way to represent light when the foveal task is "difficult."

During "difficult" tasks, interference occurred between foveal and peripheral tasks. The difficulty encountered when performing the foveal tracking task in the FLL condition made it harder to respond to the peripheral targets than when performing the same task in the HPS condition, which had a higher photopic light level.

