Urban planning and traffic safety at night

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Abstract. Urban planning including traffic signs serve vital functions, providing road users with regulatory, warning and guidance information about the roadway and surrounding environment. There are a large number of signs and even more guidelines on how these signs should be designed, installed, and maintained in concordance with on road surface traffic signs. More requirements for signs are made for night urban traffic, including appearance (size, shape, colour), placement (height, lateral, and longitudinal), maintenance (visibility, position, damage) and signs light and retroreflective. In the night, traffic signs visibility can interact by on pedestrian visibility and diminish urban traffic safety.

The main aim of this paper are the scientific determination of an urban specific zone visibility for evaluate at night real conditions in case of a traffic accident in the Brașov city area. The night visibility study was made using PC-Rect version 4.2. Other goal of the paper was to modify some urban planning solution in order to increase the urban safety in Brașov.

1. Introduction

On road visibility is used as a performance index by both road lighting and automobile lighting engineers. In the urban area the night visibility can negative interact with regulatory, warning and guidance information about the roadway and surrounding environment.

A road area next to the pedestrian crossing way of Brașov city was used for these visibility study in relations with local urban planning.

In urban night condition driving on a dark street, the perceptibility is mainly due to the car’s own headlights. Only the feet of the darkly dressed person are visible at a distance of approx. 20m whereas the whole of the brightly dressed person is visible [1].

The contextual visibility is change if the road is lighting by urban night lighting system (figures 1 and 2). To many traffic sign and night-time retro reflectivity can dramatically affect the visibility of car driver.

In a particular case, on a street from Brașov, in night-time condition, the papers authors were analysing the luminance/visibility of a driver in forward direction, in the neighbourhood of a pedestrian crossing way.

The chosen area is showed in figure 1 and detail next to the pedestrian crossing way in the night can be seen in figures 2 and 3. To calculate the luminance of images in PC-Rect, camera needs to be calibrated by the company Image Engineering in Germany (www.image-engineering.de).

Our cameras were also calibrated by Image engineering.
Figure 1. The urban Brașov road and pedestrian crossing way subject of visibility study.

Figure 2. Details of pedestrian crossing way in the night visibility condition.
2. Experimental research and results
Experimental visibility research was made, in the night condition, in neighbourhood of the pedestrian crossing way, as can see in figure 4. Five luminance/visibility measurements were proceed from on board car driver place. In figures 5 – 9 are presented the positions and the results of luminance/visibility measurements relative of the beginning of crossing way (from right).

Figure 4. Design of the experiment.
Figure 5. Results of luminance amounts from inside the car at 10 m from pedestrian crossing way.

Figure 6. Results of luminance measurements from inside the car at 20 m from pedestrian crossing way.
**Figure 7.** Results of luminance measurements from inside the car at 30 m from pedestrian crossing way.

![Luminance graph](image)

**Figure 8.** Results of luminance measurements from inside the car at 40 m from pedestrian crossing way.

![Luminance graph](image)
Figure 9. Results of luminance measurements from inside the car at 50 m from pedestrian crossing way.

All luminance/visibility determination were realised on driver forward direction, at 10m (figure 5), 20m (figure 6), 30m (figure 7), 40m (figure 8), and 50m (figure10) next to right beginning of the pedestrian crossing way.

After we choose the interest area, in PCRect4.2, we use the option opens in the window "Luminance/Visibility" where the evaluation areas, which were already denied before, are assigned to a background area. All other values, displayed in this window are calculated automatically.

All of luminance/visibility results are significant influenced by the driver’s age. [2]. Pedestrian clothing colour have importance over the distance recognitions. [2].

3. Conclusion
If the perception/reaction time is about 1.4s (in urban night/visibility time), if car velocity was 50km/h, the car traveling distance corresponding to perception reaction time was 19.44m. For the same velocity, the car stop distance is approximatively 14 m. In terms of objective information selection, particular information content is captured and used for subjective information processing. Only thereafter are the actions and reactions set and implemented, as for instance maintaining or changing the state of motion (danger recognition). Due to poorer information content, the navigational distribution and danger recognition at night is highly reduced. In daytime, high distribution of navigational points causes relatively high complexity. There is always only a partial quantity of navigational points at night. During the day and night, all lights have perception priority and cause long visual attention [3]. The difference between the observability threshold and the available maneuverer distance is the time available for perception and reaction. Assuming/determining the
speed of the approaching vehicle and the time and distance required to avoid a hazard in the roadway can be accomplished through the use of standard accident reconstruction techniques [4]. If the observability threshold can be established, then the available perception-response distance can be determined [4]. As can view in the figure 10, In urban night-time condition of luminance/visibility large number of signs and even more guidelines and signs light and retroreflective can interact by on pedestrian visibility and diminish urban traffic safety.

![Image 1](image1.png)

**Figure 10.** Forward view of pedestrian crossing way (negative image bottom) from approx. 32m to right beginning.
4. References

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