Improved Night Driving: A System for Detecting Angle to Turn Head Lights of a Vehicle around Bends

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The objective of the research was to develop a system for turning head lights of a vehicle around bends, according to the bend angle, to improve night driving. This paper presents a system for detecting angle to turn head lights of a vehicle based on image processing and fuzzy techniques.

The first step in the proposed work was to obtain a clear digital image of the centre line of the road. Next, image processing techniques were used to extract the lines and peaks of the lines. Then, the image was blurred, subtracted from the original image, cropped to obtain the region of interest and converted into a gray-level image. An algorithm was used to increase the intensity of the centre line and the image was filtered using a median filter. Next, the image was converted into a binary image to extract the gradient. Hough transform was applied to extract the lines and peaks of the image and tangent lines were obtained using the peak points. Finally, the bend angle in the range of -15^0 to 15^0 was obtained using the tangent lines.

The final outcome of the angle for turning head lights was obtained by using a fuzzy system. This system was developed by using two input variables: bend angle extracted and the speed of the vehicle. In this method, it was assumed that the speed of the vehicle is a constant value. The fuzzy system was used to obtain a zero output for the angle to turn head lights when the speed of the vehicle is comparatively low (< 20 km h^{-1}). In order to obtain an accurate result, this system was tested with 250 images. For every image the system will produce the angle in which the light needs to be turned.

Since many consumable cameras are available in the market for obtaining images with higher frame rates such as 10 frames per second, this system can be easily implemented to be used in vehicles for safety driving.

Since this system was not tested by actually implementing it on a vehicle; final light angles are not 100% accurate. However, we can adjust the fuzzy membership functions and guide the system to produce accurate results when testing this system on a vehicle.