

FOG DENSITY RECOGNITION BY IN-VEHICLE CAMERA AND MILLIMETER WAVE RADAR

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ABSTRACT. *Driving support techniques using in-vehicle sensors have attracted much attentions and have been applied to practical systems. We focus on supporting drivers in poor visibility conditions. Fog is one of the causes that lead to lack of visibility. In this paper, we propose a method of judging fog density by using in-vehicle camera images and millimeter-wave (mm-W) radar data. This method determines fog density by evaluating both the visibility of a preceding vehicle and the distance to it. Experiments showed that judgments made by the proposed method achieve a precision rate of 85% when compared to the ground-truth obtained by human judgments.*

Keywords: Weather recognition, Fog, Visibility, ITS.

1. Introduction. Recently, many systems have been developed that use computers and various sensors to assist driving [1]. Some notable examples include self-steering by white-line detection, a rear-end collision-prevention system that operates by measuring the distance to the vehicle ahead, a danger notification system that recognizes pedestrians, and a system that automatically operates the windshield wipers upon recognizing rain drops[2][3].

When considering a driving assist system, we cannot ignore changes in weather conditions, since in such adverse weather conditions as rain, snow, or fog, driving is more difficult than in fair conditions, leading to a significant increase in the accident rate. Actually, in Japan, it is said that accident rates in bad weather conditions are about 17 times higher than that in fair conditions.

In this paper, we focus on fog detection. Though fog negatively influences human perception of traffic conditions gradually, drivers are not aware of this. This is the cause of making dangerous situations. According to Cavallo et al., under foggy conditions the distance between a preceding vehicle's tail lamp is perceived to be 60% further away than under fair conditions [4]. This leads to the need of driving assist systems, such as danger alerts or automatic lighting of fog lamps.