INTISARI

Pengembangan Prototipe Sistem Peringatan Dini Tabrakan Belakang pada Truk

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Kecelakaan tabrak belakang pada truk sering terjadi akibat kurangnya kesadaran pengendara dalam menjaga jarak aman serta adanya titik buta di sekitar truk, terutama di bagian belakang. Titik buta ini menyulitkan pengemudi truk untuk mendeteksi kendaraan yang terlalu dekat, sehingga meningkatkan risiko tabrakan, khususnya saat pengereman mendadak. Untuk mengurangi risiko tersebut, penelitian ini mengembangkan prototipe sistem peringatan dini tabrakan belakang menggunakan sensor TF02-Pro LiDAR dan sensor MK421137.

Metode yang digunakan dalam sistem ini berbasis kinematika relatif, yaitu kecepatan kendaraan belakang dihitung sebagai kecepatan relatif terhadap truk berdasarkan perubahan jarak per satuan waktu. Sensor MK421137 digunakan untuk mendeteksi kecepatan truk, sedangkan sensor TF02-Pro LiDAR mendeteksi jarak kendaraan belakang. Jika jarak dan kecepatan kendaraan belakang mencapai ambang batas yang berbahaya, sistem akan mengaktifkan alarm sebagai peringatan dini kepada pengendara di belakang truk.

Hasil pengujian menunjukkan bahwa sistem mampu memberikan peringatan dengan tingkat kesalahan rata-rata sebesar 5,87% pada kondisi teduh, 5,61% pada kombinasi panas-teduh, dan 9,21% pada kondisi panas. Meski tingkat kesalahan meningkat di kondisi panas, akurasi sistem secara keseluruhan tetap dinilai baik, mengingat toleransi akurasi speedometer kendaraan hingga 10%.

ABSTRACT

Development Of Rear-End Collision Early Warning System Prototype for Trucks

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Rear-end collisions involving trucks frequently occur due to a lack of driver awareness in maintaining a safe following distance and the presence of blind spots around the truck, particularly at the rear. These blind spots make it difficult for truck drivers to detect vehicles that are too close, increasing the risk of collisions, especially during sudden braking. To mitigate this risk, this study developed a rear-end collision early warning system prototype using the TF02-Pro LiDAR sensor and the MK421137 speed sensor.

The method applied in this system is based on relative kinematics, where the speed of the following vehicle is calculated as the relative speed to the truck, determined by the change in distance over time. The MK421137 sensor is used to measure the truck's speed, while the TF02-Pro LiDAR sensor detects the distance of the following vehicle. If the distance and speed of the following vehicle reach a dangerous threshold, the system will activate an alarm to provide an early warning to the driver behind the truck.

Test results show that the system can issue warnings with an average error rate of 5.87% under shaded conditions, 5.61% under a combination of hot and shaded conditions, and 9.21% under hot conditions. Although the error rate increases under hot conditions, the system's overall accuracy is considered acceptable, given the speedometer accuracy tolerance of up to 10%.