ABSTRAK

Kecelakaan lalu lintas pada kendaraan besar seperti *Bus Rapid Transit (BRT)* sering terjadi akibat blind spot yang mengurangi visibilitas pengemudi. Area titik buta ini menjadi tantangan utama dalam memastikan keselamatan berkendara, terutama di kota besar seperti Semarang. Berdasarkan kebutuhan ini, penelitian ini mengembangkan *SPOTGUARD* (Blind Spot Advanced Feature Equipment), sebuah sistem berbasis Arduino yang mengintegrasikan teknologi *Blind Spot Information System (BLIS)* dengan aplikasi *Geolocation Inertial Navigation System (INS)*. Sistem ini bertujuan meningkatkan kesadaran situasional pengemudi melalui deteksi dan peringatan real-time untuk mengurangi risiko kecelakaan.

Metode penelitian menggunakan pendekatan kuantitatif dengan teknik *Research and Development (R&D)*. Sistem *SPOTGUARD* mencakup sensor ultrasonik untuk mendeteksi jarak objek, *Kamera OV7670* untuk menangkap gambar titik buta, dan layar TFT untuk menampilkan hasil visual. Data dari sensor diolah oleh *Arduino Mega 2560* dan disampaikan melalui *LED* indikator serta aplikasi berbasis *Bluetooth*. Variabel bebas meliputi variasi jarak dan kondisi kendaraan, sementara variabel terikat adalah respons *LED* dan tampilan layar. Pengujian dilakukan dalam kondisi pencahayaan dan situasi lalu lintas yang bervariasi untuk mengevaluasi efektivitas alat.

Hasil penelitian menunjukkan bahwa SPOTGUARD memiliki akurasi deteksi >90% terhadap objek dalam blind spot, serta mampu mengurangi waktu respons pengemudi melalui peringatan real-time. Selain itu, INS dengan WhatsApp bot terbukti efektif dalam memberikan peringatan pelanggaran kecepatan dengan waktu tunda kurang dari 5 detik.memastikan manajemen keselamatan kendaraan lebih efektif, mendukung pengurangan risiko kecelakaan pada *BRT* Trans Semarang.

Kata kunci : Arduino, *BLIS*, *INS, SPOTGUARD*, *BRT* Trans Semarang.

ABSTRACT

Traffic accidents in large vehicles such as Bus Rapid Transit (BRT) often occur due to blind spots that reduce driver visibility. This blind spot area is a major challenge in ensuring driving safety, especially in a big city like Semarang. Based on this need, this research developed SPOTGUARD (Blind Spot Advanced Feature Equipment), an Arduino-based system that integrates Blind Spot Information System (BLIS) technology with Geolocation Inertial Navigation System (INS) application. The system aims to improve driver situational awareness through real-time detection and warning to reduce the risk of accidents.

The research method uses a quantitative approach with Research and Development (R&D) techniques. The SPOTGUARD system includes an ultrasonic sensor to detect object distance, an OV7670 camera to capture images of blind spots, and a TFT screen to display visual results. Data from the sensors is processed by an Arduino Mega 2560 and relayed through indicator LEDs and a Bluetooth-based application. The independent variables include variations in distance and vehicle conditions, while the dependent variables are the

LED response and screen display. Tests were conducted under varying lighting conditions and traffic situations to evaluate the effectiveness of the device.

The results show that SPOTGUARD has >90% detection accuracy of objects in the blind spot, and is able to reduce driver response time through real-time alerts. In addition, INS with WhatsApp bot proved effective in providing speed violation warnings with a delay time of less than 5 seconds. ensuring more effective vehicle safety management, supporting accident risk reduction on Trans Semarang BRT.

Keywords: *Arduino, BLIS, INS, SPOTGUARD, BRT Trans Semarang.*