

ABSTRAK

Penelitian ini memodelkan dan mensimulasikan komunikasi *Vehicle-to-Vehicle* (V2V) pada sistem *platooning* tiga kendaraan untuk mendukung pengendalian jarak aman longitudinal menggunakan DSRC 5,9 GHz (IEEE 802.11p). Model terdiri dari dinamika kendaraan, modul komunikasi V2V pengiriman atau penerimaan pesan keselamatan periodik, serta pengendali longitudinal *follower* yang memanfaatkan informasi posisi dan kecepatan kendaraan acuan untuk membentuk dan mempertahankan formasi. Simulasi dilakukan pada MATLAB dengan waktu simulasi untuk waktu yang sudah ditentukan. Evaluasi kinerja difokuskan pada dua aspek: kemampuan tracking jarak terhadap set-point spacing dan keterjagaan konektivitas komunikasi berdasarkan batas jangkauan *V2VRange*, dengan metrik reliabilitas berupa *Packet Reception Ratio* (PRR). Sepuluh skenario diuji melalui variasi profil akselerasi leader dan kondisi jarak awal. Hasil menunjukkan *platoon* stabil pada skenario normal ketika jarak antar kendaraan tetap berada dalam jangkauan V2V, sehingga spacing konvergen di sekitar *set-point*. Sebaliknya, pada skenario *leader* agresif, jarak *leader-follower* melampaui *V2VRange*, kualitas pembaruan informasi menurun, dan *tracking* jarak gagal jarak divergen serta potensi jarak antar *follower* menjadi tidak aman.

Kata kunci: *Platooning* kendaraan, Komunikasi V2V, DSRC 5,9 GHz, IEEE 802.11p, PRR.



ABSTRACT

This study develops a modeling and simulation framework for Vehicle-to-Vehicle (V2V) communication in a three-vehicle platooning system to support safe longitudinal spacing control using DSRC at 5.9 GHz (IEEE 802.11p). The integrated model includes vehicle dynamics, a V2V communication module periodic safety message transmission and reception, and a longitudinal controller that uses position and speed information from the front reference vehicle to form and maintain the platoon. Simulations are conducted in MATLAB over For a set period of time. Performance is evaluated from two perspectives: spacing tracking to an set-point and V2V connectivity under a communication limit V2VRange, with reliability quantified using Packet Reception Ratio (PRR). Ten scenarios are tested by varying the leader acceleration profile and initial spacing. Results indicate stable platoon formation in nominal conditions where inter-vehicle gaps remain within V2VRange, allowing the spacing to converge near the set-point. In contrast, under an aggressive leader profile, the leader–follower gap exceeds V2VRange, cooperative information updates degrade, and spacing control fails, leading to distance divergence and potentially unsafe follower gaps. These findings highlight that platoon stability depends on keeping both leader maneuvers and operating gaps within the combined limits of control authority and communication range.

Keywords: Vehicle platooning, V2V communication, DSRC 5.9 GHz, IEEE 802.11p, PRR.

