**OPTIMIZATION OF PEDESTRIAN SIGNAL CONTROL STRATEGIES: A COMPARATIVE ANALYSIS OF RECALL VS ACTUATION METHODS USING VISSIM MICROSIMULATION**

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## Abstract

Pedestrian safety remains a critical global concern, with pedestrians accounting for approximately 23% of worldwide traffic fatalities (WHO 2018) and they are more vulnerable and less protected compared to vehicles. Pedestrian safety at signalized intersections remains a pressing concern in urban transportation systems, with fatalities accounting for 7,500 pedestrian deaths in the U.S. in 2023 (NHTSA). This study addresses the critical need to optimize signal control strategies by conducting a comparative analysis of pedestrian recall and actuation methods at the intersection of W Call Street and Stadium Drive near Florida State University, a high-pedestrian-activity zone. Leveraging field observations and VISSIM microsimulation, the research evaluates how signal timing adjustments impact pedestrianvehicle interactions during peak hours.

Key behavioral metrics—such as compliance rates, walking speeds (averaging 4–5.5 ft/s), distraction levels (32.7% distracted pedestrians), and crosswalk adherence (21.6% non- compliance) were analyzed statistically, revealing that 26.6% of pedestrians risk crossing during Flashing Don't Walk phases. These findings exposed a mismatch between static signal timing and real-world pedestrian decision-making, driven by impatience, perceived risk, and infrastructural inadequacies.

The simulation tested multiple scenarios across varying pedestrian demand probabilities (PP) and side street green time ratios (SSG), quantifying trade-offs between pedestrian delay and vehicular efficiency. Results demonstrated that pedestrian recall strategies reduce delays by up to 7.1 seconds compared to actuation under moderate demand (PP ≥ 0.6), with minimal vehicular impact (under 3.5-second delay). A decision framework was developed, recommending recall implementation for main street crossings when PP exceeds 0.6, while hybrid adaptive systems are proposed for transitional demand (PP = 0.4–0.6).

The study emphasizes the necessity of implementing dynamic signal control systems that adapt

to real-time pedestrian volumes and behaviors. To address both safety and efficiency concerns, the research recommends extending walk intervals in high pedestrian areas and adjusting pedestrian signal timing to align with side street timing when SSG exceeds 1.0. The findings support deployment of smart infrastructure including automated pedestrian xi detection, speed-calibrated clearance intervals that adjust to observed walking speeds, and countdown timers to improve compliance. For locations with transitional demand patterns (PP = 0.4-0.6), hybrid adaptive systems that switch between recall and actuation based on time-of-day pedestrian patterns offer optimal performance. Additionally, implementing illuminated call confirmation indicators would reduce user confusion in areas where control strategies vary. These evidence-based interventions provide transportation engineers and urban planners with actionable guidelines to harmonize pedestrian safety with traffic flow efficiency, offering scalable solutions for signalized intersections in academic and mixed-use urban corridors