

**DEVELOPMENT OF A GPS AND LORA BASED AMBULANCE
DETECTION SYSTEM FOR OPTIMIZING GREEN LANE PRIORITY IN
ADAPTICE TRAFFIC CONTROL SYSTEM**

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STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.



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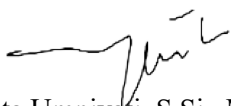
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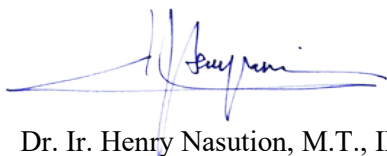


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ABSTRACT

DEVELOPMENT OF A GPS AND LORA-BASED AMBULANCE DETECTION SYSTEM FOR
OPTIMIZING GREEN LANE PRIORITY IN ADAPTIVE TRAFFIC CONTROL SYSTEM

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The priority system for emergency vehicles at signalized intersections is a crucial element of urban traffic management to ensure ambulance right of way. However, conventional traffic control systems lack dynamic responsiveness, while local sensor-based detection methods are reactive, limited in range, and highly dependent on environmental conditions. This study employs a quantitative experimental feasibility approach to evaluate a GPS-based ambulance tracking system integrated with LoRa communication. The priority zone is adaptively determined using a simplified wave-shock theory based on vehicle speed. System performance is evaluated through communication quality analysis (RSSI, SNR, latency), GPS accuracy, priority zone activation behavior, and scenario-based intersection delay simulations. The results indicate reliable LoRa communication with stable latency, adequate GPS accuracy for priority decisions, and priority activation behavior consistent with theoretical calculations. Delay simulations show sufficient clearance time in most scenarios, indicating that the proposed system is technically and operationally feasible for improving emergency response efficiency at signalized intersections.

Keywords: ambulance priority system, GPS-based tracking, LoRa communication, priority zone, intersection delay simulation



DEDICATION

This thesis is dedicated to my parents and family for their unwavering support, patience, and encouragement throughout my academic journey. I also dedicate this work to the company where I am employed, whose working environment and practical challenges inspired the ideas developed in this research.



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