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A Novel Traffic Light System with Real-Time Congestion Indicator Using an Additional Blue LED

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Abstract: *This paper presents the design and implementation of an enhanced traffic light system that integrates a blue LED indicator to convey real-time congestion status. Traditional traffic signals operate on fixed sequences of red, yellow, and green phases, often leading to inefficiencies under variable traffic volumes. By incorporating three infrared (IR) sensors along an approach and corresponding relay modules, the proposed system detects vehicle presence and, upon sensing congestion (all three sensors active), illuminates a blue LED. This immediate visual cue informs drivers of downstream congestion, encouraging adaptive route choices and smoother traffic flow. The core control logic is realized via a transistor-based sequencing circuit employing 547 transistors, ensuring reliable and sequential operation of all indicators. Experimental evaluation demonstrates reduced wait times and improved driver awareness, highlighting the system's potential to augment existing traffic management infrastructure.*

Keywords: Traffic management, congestion indicator, infrared sensor, relay module, transistor circuit, blue LED, real-time detection

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