

Dynamic Traffic Light Control System Based on Real-Time Traffic Density using IR Sensors

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Abstract: As the world population continues to grow, the number of vehicles in daily use is increasing dramatically. Due to this, traffic congestion is becoming a major problem. Traffic congestion cause delays and stress among motorists and passenger. Various natural resources are not only depleting but also increasing air pollution. Although it seems ubiquitous, megacities are the most affected. At intersections, traffic light control systems are frequently utilized to regulate traffic flow. Currently, most traffic light systems use pre-time and countdown timers to control traffic flow. This paper proposes a novel approach for dynamic traffic light control based on real-time traffic density using readily available infrared (IR) sensors. The system strategically positions IR sensors at four-way intersections to detect the presence of vehicles, cyclists, or pedestrians approaching from each direction. Upon detection, a timer is initiated. If the IR sensor continuously detects activity for a predefined duration, the system prioritizes that direction by extending its green light phase. Conversely, if no activity is detected within a set timeframe, indicating low traffic density, the system immediately switches to the next signal sequence, optimizing signal timing for changing traffic patterns. This adaptive behaviour based on IR sensor data and intelligent algorithms aims to reduce congestion, improve traffic flow efficiency, and enhance overall urban mobility.

Keywords: Traffic light system, Traffic density, PIC16F877A microcontroller, IR sensor, Lcd display.

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