MIT School of Engineering
Department of Computer Science and Engineering

Project Synopsis

Group ID: G-12
Project Title: Smart Traffic Light Control System
Group Members:

Enrollment Number	Roll No.	Name of student	Email Id	Contact Number
MITU22BTCS0150	**2223006**	**Arnav Sohani**	**arnav.sohani14@gmail.com**	**8767290369**
MITU22BTCS0345	**2223018**	**Ishan Gaikwad**	**Ishangaikwad100@gmail.com**	**9403761565**
MITU22BTCS0510	**2223030**	**Omkar Lonkar**	**lonkaromkar15@gmail.com**	**9373887699**
MITU22BTCS0707	**2223018**	**Samiksha Roy**	**Samiksharoy2004@gmail.com**	**8766915345**

Problem Statement: Urban traffic congestion is often worsened by outdated traffic light systems that fail to adapt to real-time conditions, leading to inefficiencies, increased travel times, and driver frustration

Abstract: Traffic congestion remains one of the most critical challenges in urban transportation systems, leading to increased travel times, excessive fuel consumption, and environmental pollution. Conventional traffic light systems, which operate on static time intervals, are often inefficient in managing the dynamic and unpredictable nature of modern traffic flow. To address this issue, this project proposes an Adaptive Traffic Light Control System (ATLCS) that utilizes real-time vehicle count data, captured through camera surveillance, to dynamically manage traffic signal timings.

The system prioritizes traffic directions based on vehicle density, allocating the duration of green signals in direct proportion to the number of vehicles detected in each direction. To ensure fairness, every direction is guaranteed a minimum green light duration of 5 seconds, irrespective of traffic load. Additionally, the green signal time is constrained by a maximum limit of 60 seconds to prevent excessive delays for other directions. The control logic follows a clockwise rotation pattern, ensuring systematic signal switching and preventing indefinite holdbacks for any lane.

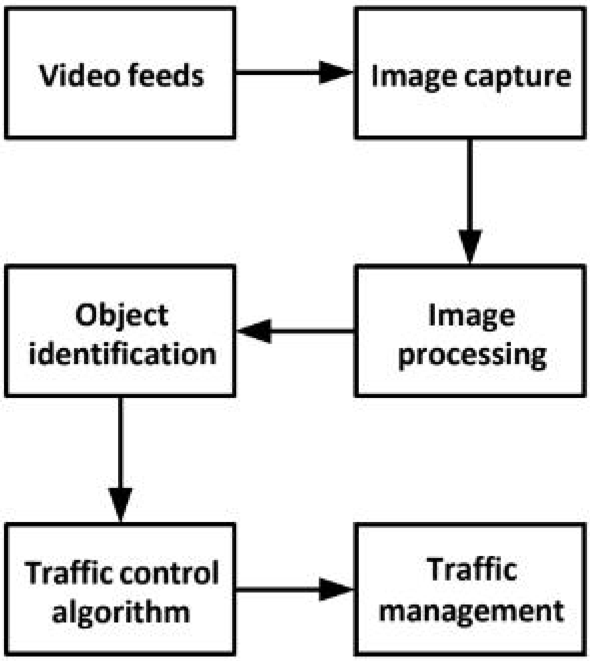
The proposed solution enhances traffic flow efficiency by continuously adapting to real-time traffic conditions, leading to reduced vehicle queuing, lower waiting times, and optimized signal utilization. Simulation results demonstrate significant improvements in traffic

management, with faster clearance rates, improved fuel efficiency, and reduced carbon emissions. This adaptive approach offers a practical and scalable solution for modern urban traffic control, aligning with the goals of smart city development and sustainable urban mobility.

Literature Survey: Detail survey done

Research papers followed for survey must be standard international journal. Conference papers can be used as supporting survey for journal paper.

Proposed System (Block Diagram):



Conclusion: Traffic congestion is a growing concern in urban areas, impacting travel efficiency, fuel consumption, and environmental health. Traditional traffic light control systems, based on fixed time intervals, fail to respond effectively to real-time traffic variations, leading to inefficient traffic management.

This project presents an Adaptive Traffic Light Control System (ATLCS) that leverages real-time vehicle count data from camera feeds to dynamically adjust green light durations in proportion to traffic density. By ensuring a minimum green time of 5 seconds for fairness and restricting the maximum green time to 60 seconds for system balance, the proposed system offers an intelligent and equitable approach to traffic signal control. Additionally, the clockwise rotation mechanism prevents indefinite holdbacks, ensuring continuous traffic flow across all directions.

Simulation results indicate significant improvements in traffic flow efficiency, with reduced vehicle waiting times, optimized signal usage, and lowered environmental impact due to decreased idling. The system's ability to adapt to real-time traffic conditions makes it a scalable and cost-effective solution for modern urban traffic challenges, contributing to the vision of smart and sustainable cities.
Future enhancements could involve integrating machine learning for traffic pattern prediction, emergency vehicle prioritization, and IoT-based centralized traffic management systems for city-wide implementation.

References:

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