Team 34 Project Abstract

Traffix: Adaptive Traffic Detection and Signal Control Using Machine Learning

Under the guidance of Dr. Mannar Mannan

Currently, on our roads, traffic signals operate in 1 out of 2 ways. Either they are pre assigned a routine where a given signal, or pair of them go green at once, whilst the rest stay red. Or they are operated manually. This has the following repercussions-

- Idle greenlit lanes- green light for a lane with no vehicles.
- Excessive congestion at crowded lanes.
- No pre-programmed pre-emption for emergency services

This project proposes an image-based machine learning (ML) system for dynamic traffic light control aimed at alleviating urban congestion. Our system addresses the limitations of traditional fixed-time methods by enabling real-time, lane-specific adjustments based on actual traffic conditions captured in camera images.

The algorithm dynamically adjusts signal timings, prioritizing lanes with longer queues or higher turning demand, with pre-emption for emergency services.

This adaptive strategy aims to:

- Minimize overall waiting times for vehicles by prioritizing queues and preventing congestion.
- Halting movement in idle greenlit lanes by dynamically adjusting to current congestion, increasing overall throughput at a given junction.
- Improve responsiveness to real-time traffic fluctuations, adapting to unpredictable spikes.

Our system differentiates itself over current solutions by being more:

- Cost-effective: Utilizes existing traffic infrastructure and readily available cameras, requiring minimal additional hardware.
- Scalable: Easily adaptable to various intersection layouts and traffic volumes.
- Data-driven: Continuously learns and improves its decision-making over time.

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