

ADAPTIVE TRAFFIC SIGNAL REGULATION AS A TOOL FOR SUSTAINABLE DEVELOPMENT OF URBAN TRANSPORT

Transport and public life are closely interconnected, as the quality of each directly depends on the condition of roads, streets, and sidewalks through which we move daily. Efficient transportation links are essential for the development of the economy and the comfort of citizens. One of the most complex parts of road infrastructure is intersections, as they are areas with high traffic flow concentrations and maneuvers, which create potential conflicts and an increased risk of traffic accidents. The role of traffic lights in regulating such intersections is extremely important, as their inefficient operation can lead to significant traffic jams and increased accidents. Therefore, optimizing the operation of traffic light installations is crucial for improving road safety and increasing throughput capacity [1].

Intersections in large cities, especially four-way intersections, are the main points of concentration for traffic flows. Traditionally, traffic flow at such intersections is regulated by traffic light systems, which ensure the sequential movement of vehicles and pedestrians across the intersection [2]. However, the growing number of vehicles and changing traffic conditions require constant monitoring and adaptation of traffic light operation modes.

The increase in the number of vehicles on the roads often leads to congestion at intersections, particularly during peak hours. Existing traffic light systems typically operate on fixed time cycles, which help regulate traffic flows under normal conditions. However, these systems do not account for changes in traffic intensity, which can lead to traffic jams and increased waiting times at intersections.

Adaptive traffic light regulation models allow for dynamically adjusting the timing of light phases based on the current situation on the road, significantly reducing delays and improving safety. Adaptive regulation involves distributing the signal time based on traffic flow intensity. For each traffic stream, the system determines the necessary time to allow passage through the intersection, taking into account potential conflicts with other flows (Figure 1).

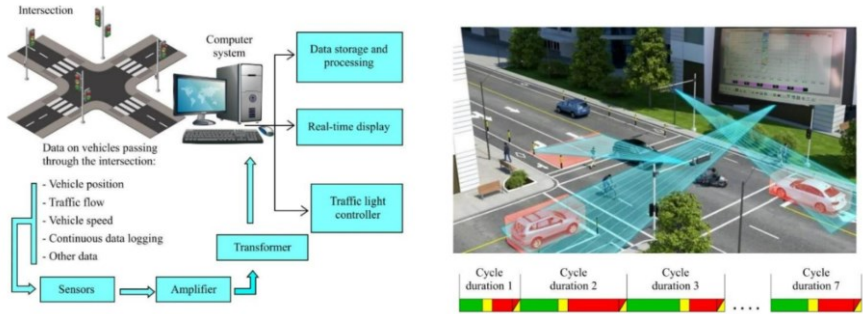


Figure 1 – Adaptive Traffic Signal Regulation Model

The use of such systems allows for a significant reduction in waiting times at traffic lights and ensures a more even distribution of the load on intersections.

Optimizing traffic light operation at four-way intersections with adaptive regulation is an important step towards improving road safety, increasing capacity, and reducing congestion in large cities. The use of such intelligent systems will help organize the movement of vehicles and pedestrians effectively, reduce the number of traffic accidents, and ensure comfortable travel on urban roads.

Adaptive traffic light regulation technologies have great potential for optimizing transportation in large cities and their continuous development.

REFERENCES

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