

ADVANTAGES OF SYNCHRONOUS CONTROL OF TRAFFIC LIGHTS BASED ON GPS DATA OF TRANSPORT VEHICLES

Muxtorov Oqilbek Ulug'bek ugli

Fergana State Technical University
Faculty Of Mechanical Engineering

student of group 34-23 Tvm

oqilbekmuhtorov@gmail.com

Annotation: This article analyzes the benefits of synchronous traffic control on the basis of GPS technology in modern urban transport systems. Through GPS data, the traffic flow is monitored in real time, and the duration of the green and red lights of traffic lights is adjusted. As a result, fuel consumption decreases, congestion decreases, traffic safety increases, and environmental pollution decreases. The article also covers issues of emergency services, urban infrastructure optimization, user experience and personal data protection. This study shows the effectiveness of GPS-based traffic light control systems and their importance in the development of urban transport systems.

Key words: GPS technology, synchronized traffic light control, intelligent transport systems, urban infrastructure, traffic flow, traffic congestion reduction, road safety, environmental efficiency.

Introduction: Modern cities and their transport systems are becoming increasingly complex. As cities grow, populations increase, and economic activity intensifies, traffic flows are also increasing. This, in turn, causes problems such as traffic jams, road accidents, and environmental pollution. There is an increasing need to introduce advanced technologies to solve these problems. Synchronous traffic light control systems based on GPS (Global Positioning System) technology are playing an important role, especially in optimizing intercity and intracity traffic flows. This article provides detailed information on the main advantages of GPS-based traffic light control, their role in the urban transport system, and future development prospects. Advantages of GPS-based traffic light control systems. Reducing fuel consumption and reducing environmental impact. GPS-based traffic light systems monitor vehicle movements in real time and adjust the duration of the green light at traffic lights. This reduces the amount of time vehicles spend waiting, resulting in lower fuel consumption and lower carbon dioxide emissions. For example, the Traffic Light Synchronization program implemented in Texas has reduced delays by 24.6 percent by optimizing traffic lights.

Optimize urban infrastructure. GPS-based traffic light systems help optimize urban infrastructure. These systems analyze the duration of green lights at traffic lights in real time, reducing congestion and improving traffic flow. A project implemented in Chennai has helped reduce congestion by analyzing the duration of green lights at traffic lights in real time. . Rapid response in emergencies GPS-based traffic light systems help emergency vehicles, such as ambulances, move faster and safer by extending green lights or shortening red lights. Artificial intelligence-based systems such as the LYT system can significantly reduce the response time of emergency services. Improve user experience GPS-based traffic light systems improve the user experience by improving traffic flow. These systems analyze the duration of green lights at

traffic lights in real time, reducing congestion and improving traffic flow. A project implemented in Chennai has helped reduce congestion by analyzing the duration of green lights at traffic lights in real time. Privacy. GPS-based traffic light systems help protect personal data. Some studies suggest using privacy-preserving mechanisms to protect personal data. These systems help protect personal data and ensure user privacy. Improving safety with new technologies. GPS-based traffic light control systems can help traffic flow faster and safer in emergency situations, such as when ambulances are moving, by extending the green light or shortening the red light. Artificial intelligence-based systems such as the LYT system can significantly reduce the response time of emergency services. Optimization of urban infrastructure. GPS-based traffic light systems can help optimize urban infrastructure. These systems analyze the duration of green lights at traffic lights in real time, reducing congestion and improving traffic flow. A project implemented in Chennai has helped reduce congestion by analyzing the duration of green lights at traffic lights in real time. GPS is one of the most important sources of information in modern traffic management. It allows not only to determine the location of vehicles, but also to monitor their speed, direction of movement and parking places. When this data is transmitted to the central control system, it becomes possible to maintain coordination between traffic lights. On city roads, traffic lights communicate with each other, and their lights automatically change depending on the real situation. In this system, the human factor is reduced to a minimum, as a result of which the control process is carried out much faster and more accurately. Compatibility with the smart city concept. A traffic light control system based on GPS data is an integral part of the smart city concept. Smart cities require advanced solutions in areas such as energy efficiency, environmental sustainability, and safe traffic. Data received from vehicles moving via GPS is processed using artificial intelligence. As a result, the level of congestion in the city center is determined, the most convenient routes are determined, and the synchronous operation of traffic lights is ensured. This system balances the flow of vehicles, creates safer intersections for pedestrians, and further optimizes the city's infrastructure. Environmental and economic efficiency. Each vehicle consumes fuel even when it is not moving, which causes the release of harmful substances into the atmosphere. GPS-controlled traffic lights reduce the time vehicles spend in traffic. As a result, air quality improves, fuel is saved, and economic efficiency increases. This system is especially important for large cities, where every minute of delay means a waste of energy for hundreds of cars. There is also the possibility of conducting environmental monitoring and identifying sources of pollution related to traffic flow using GPS-based management systems. Convenience for emergency services The GPS-based synchronous traffic light control system creates unique opportunities for ambulance, fire or law enforcement services. While these services are moving, their location is automatically transmitted to the central system. If an emergency is detected, the system turns the traffic lights in the required direction to green to clear their path. As a result, help arrives faster, and the chances of saving human life and health increase. Artificial intelligence and forecasting capabilities. Modern traffic light systems are not simple automatic mechanisms, but intelligent systems with the ability to learn and adapt. Artificial intelligence analyzes data received via GPS and predicts the future state of traffic flow. For example, it predicts the level of traffic in the morning and evening hours and controls the lights accordingly. Through this process, city traffic is maintained in a stable state. Each traffic light works as part of the entire network, that is, they form an interconnected intelligent system. Digital control and data security. With the transition of the transport system to digital control, the issue of data security is becoming more relevant. In GPS-based traffic light systems, all data is transmitted encrypted. Artificial intelligence and blockchain technologies can be used

to protect personal data. This protects the system from hacker attacks and increases reliability in traffic management. Future prospects: The GPS-based synchronous traffic light control system will be further improved in the future. These systems will reach a level where they can control not only the movement of cars, but also the flow of public transport, pedestrians and electric scooters. In the future, traffic lights will communicate with each other, forming a single intelligent control network throughout the city. This will allow road traffic to become a completely automated, safe and efficient system.

Summary

The summary of my conclusion is that. GPS-based traffic light systems offer a number of advantages, such as increasing the efficiency of transport systems, ensuring road safety, and reducing environmental impact. The widespread implementation of this technology will help optimize urban infrastructure and improve user experience. Particular attention should be paid to the protection of personal data, as these systems can collect personal data of users. Therefore, it is important to use privacy mechanisms when implementing GPS-based traffic light systems. A synchronous traffic light control system based on GPS data is an important tool in solving the environmental, economic, and technological problems of modern cities. This technology not only regulates traffic, but also makes human life more comfortable, safer, and environmentally sustainable. When each vehicle and traffic light are interconnected and work as a single intelligent system, urban traffic achieves its highest efficiency.

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